PRINCIPLES OF MACROECONOMICS

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BEN BERNANKE ■ NILSS OLEKALNS ■ ROBERT FRANK KATE ANTONOVICS ■ ORI HEFFETZ

5th EDITION

Mc Graw Hill Education

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To Georgina, Patrick and Lewis — **NILSS OLEKALNS**

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PREFACE

Macroeconomics—the study of the aggregate economy—is a comparatively young discipline. In its modern guise it dates back to 1936 and the publication of John Maynard Keynes's *The General Theory of Employment, Interest and Money*. That book, published in response to the greatest economic cataclysm of the twentieth century, the Great Depression, revolutionised thinking about macroeconomics. It demonstrated that a different set of tools from those usually employed by economists was needed to understand events like the Great Depression. Since then, both the world and macroeconomics have steadily evolved. We now face macroeconomic problems that were simply not relevant at the time of Keynes. We have, for example, passed through the Great Inflation of the 1970s and 1980s—a sustained period of double-digit inflation that required further refinement of the economists' toolkit. More recently, the global financial crisis has refocused attention on the ideas first promulgated by Keynes, with renewed debate about the wisdom of using policies designed to manage the macroeconomy. And, increasingly, the effects of globalisation have been a key focus of political and public debate.

This text provides an introduction to modern macroeconomics. We do not attempt to offer an encyclopaedic treatment of the discipline. Instead, our approach is to emphasise the key ideas that have shaped modern thinking about macroeconomics and to present those ideas in the most intuitive way possible. We encourage readers to learn to 'think as an economist' by providing examples from recent Australian and world economic history to show how macroeconomics can aid the understanding of important real-world events. At the same time, we believe that students are best served by receiving a good grounding in key macroeconomic principles, the cornerstones of our discipline, which will assist analysis of whatever new macroeconomic phenomenon awaits us in the future.

A key feature of this book is its treatment of time. We begin with the very short run, a world in which output and employment, but not prices, adjust to aggregate spending changes. We then lengthen the time period to consider situations in which prices, output and employment all adjust in response to changes in aggregate spending plans, and further lengthen the time frame of analysis to consider a world in which prices alone adjust. Finally, we tackle the very long run, the period in which the economy's potential level of aggregate output is itself capable of change. Many texts in macroeconomics take a different approach to ours, beginning their analysis using the very long run and then moving downwards to the short-run world of fixed prices. We believe, however, that the order we have adopted flows more naturally, making it possible to appreciate the commonality that characterises macroeconomists' approaches to understanding the aggregate economy, while still seeing how different modelling methodologies are required for different time frames of analysis.

We have taken the opportunity provided by the preparation of this new edition to update and improve the exposition in almost every part of the book. Where appropriate, new examples have been introduced; there is an extensive discussion of the issues raised for macroeconomics by the global financial crisis.

We have provided a range of pedagogical resources to assist students and instructors in their use of this text. Details of these can be found in the 'How to use this book' section. Our guiding principle in designing these features is our belief that the best way to acquire a deep knowledge of macroeconomics is to have exposure to the way that the discipline can shed light on what happens in the real world and then to practise (and practise and practise) the use of macroeconomic concepts. Although perfection in our knowledge of how a modern macroeconomy works is impossible, there is still much to be said for the old adage that 'practice makes perfect'.

As generations of macroeconomics students will attest, ours is a complex and challenging discipline. It requires proficiency in an extraordinarily wide range of skills. As Keynes himself once wrote:

> *… the master-economist must possess a rare combination of gifts. He must reach a high standard in several different directions and must combine talents not often found together. He must be a mathematician, historian, statesman, philosopher—in some degree. He must understand symbols and speak in words. He must contemplate the particular in terms of the general, and touch abstract and concrete in the same flight of thought. He must study the present in the light of the past for the purposes of the future. No part of man's nature or his institutions must lie entirely outside his regard. He must be purposeful and disinterested in a simultaneous mood; as aloof and incorruptible as an artist, yet sometimes as near the earth as a politician.*
>
> **Source:** J.M. Keynes (1924), 'Alfred Marshall, 1842–1924', *The Economic Journal*, vol. xxxiv, no. 135, pp. 311–72.

Few of us can live up to these high standards! Yet the subject matter of macroeconomics is of such importance, dealing as it does with fundamental questions of what determines people's living standards and what governments can do to raise those standards, that we are obliged to try. In this book you will begin your study of 'the present in light of the past for the purposes of the future'. We wish you every success.

NILSS OLEKALNS

UNIVERSITY OF MELBOURNE

ASSURANCE OF LEARNING

Assurance of learning is an important element of many accreditation standards. This fifth edition of *Principles of Macroeconomics* is specifically designed to support assurance of learning initiatives with a simple yet powerful solution.

Each chapter begins with a list of numbered learning objectives; you can use Connect online to easily search for particular objectives that may relate to your course. Every testbank question maps to a specific chapter learning objective listed in the text, in addition to level of difficulty, allowing students to challenge themselves. You can also use the Connect reporting features to aggregate student results with ease, making the collection and presentation of assurance of learning data simple, comprehensive and effective.

AACSB STATEMENT

McGraw-Hill Education is a proud corporate member of AACSB International. Understanding the importance and value of AACSB accreditation, the authors of *Principles of Macroeconomics* 5e have sought to recognise the curricula guidelines detailed in AACSB standards for business accreditation by connecting questions in the testbank and online end-of-chapter material to the general knowledge and skill guidelines found in AACSB standards. It is important to note that the statements contained in *Principles of Macroeconomics* 5e are provided only as a guide for the users of this text.

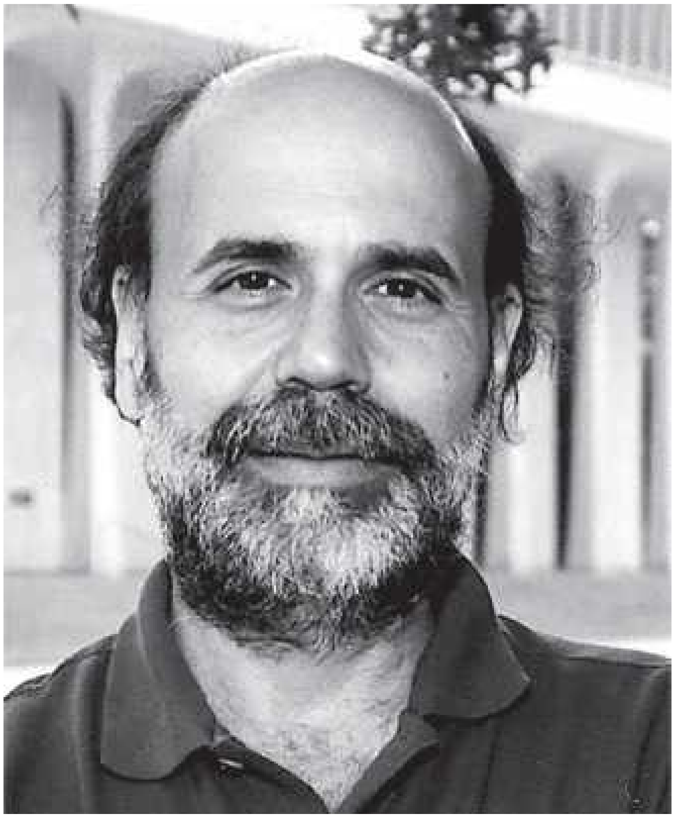
ABOUT THE AUSTRALIAN AUTHOR

NILSS OLEKALNS

Professor Olekalns received his BEc with Honours in economics from the University of Adelaide in 1982 and completed an MEc at the Australian National University in 1984. He was awarded his PhD in economics in 1993 from La Trobe University. He began teaching in the Department of Economics at the University of Melbourne in 1994, where he has lectured to first-year students in macroeconomics. He has been a visiting scholar at the International Monetary Fund, a guest lecturer at the Monetary Authority of Singapore and an invited lecturer for the Australian and New Zealand School of Government.

Professor Olekalns has published on a variety of macroeconomic topics including fiscal and monetary policies, exchange rates, output and inflation volatility and interest rates. He has also written articles on applied microeconomics, including an analysis of the impact of anti-smoking policies in Australia that was awarded the Economic Society of Australia's prize for the best paper published in the *Economic Record* in 2000. His papers have also appeared in the *Journal of Political Economy,* the *Review of Economics and Statistics,* the *Journal of Macroeconomics,* the *Journal of International Money and Finance,* and the *Southern Economic Journal,* as well as many other international journals. He has received numerous awards for his teaching, including the inaugural Edward Wood Prize for Teaching Excellence. He is currently President of the Academic Board at the University of Melbourne.

ABOUT THE US AUTHORS



BEN S. BERNANKE

Professor Bernanke received his BA in economics from Harvard University in 1975 and his PhD in economics from MIT in 1979. He taught at the Stanford Graduate School of Business from 1979 to 1985 and moved to Princeton University in 1985, where he was named the Howard Harrison and Gabrielle Snyder Beck Professor of Economics and Public Affairs and where he served as Chairman of the Economics Department. Professor Bernanke is currently a Distinguished Fellow in Residence with the Economic Studies Program at the Brookings Institution.

Professor Bernanke was sworn in on February 1, 2006, as Chairman and a member of the Board of Governors of the Federal Reserve System; his second term expired January 31, 2014. Professor Bernanke also served as Chairman of the Federal Open Market Committee, the Fed's principal monetary policymaking body. Professor Bernanke was also Chairman of the President's Council of Economic Advisers from June 2005 to January 2006.

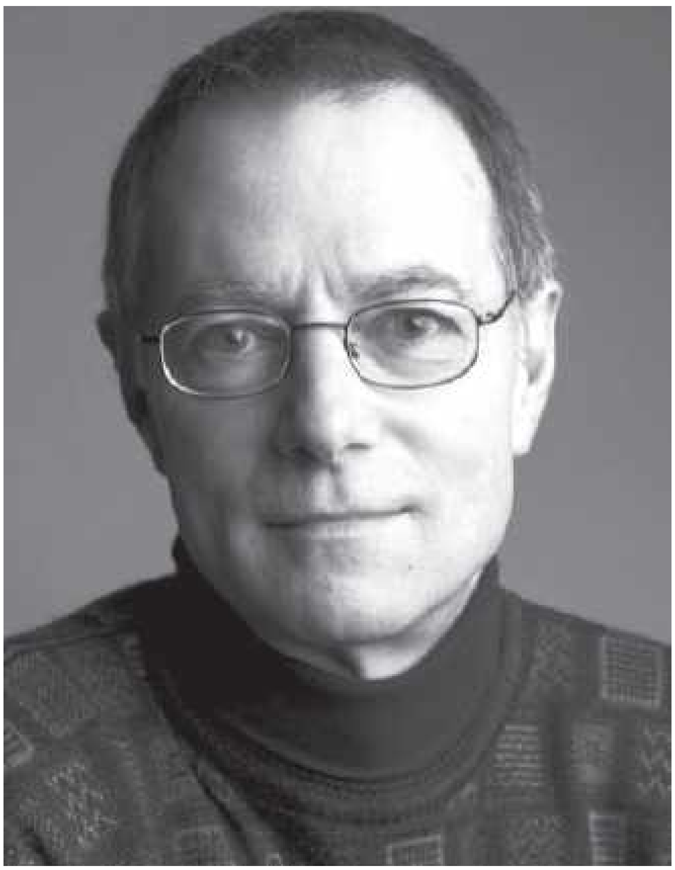
Professor Bernanke's intermediate textbook, with Andrew Abel and Dean Croushore, *Macroeconomics,* Ninth Edition (Addison-Wesley, 2017), is a best seller in its field. He has authored numerous scholarly publications in macroeconomics, macroeconomic history, and finance. He has done significant research on the causes of the Great Depression, the role of financial markets and institutions in the business cycle, and measurement of the effects of monetary policy on the economy.

Professor Bernanke has held a Guggenheim Fellowship and a Sloan Fellowship, and he is a Fellow of the Econometric Society and of the American Academy of Arts and Sciences. He served as the Director of the Monetary Economics Program of the National Bureau of Economic Research (NBER) and as a member of the NBER's Business Cycle Dating Committee. From 2001–2004, he served as editor of the *American Economic Review*. Professor Bernanke's work with civic and professional groups includes having served two terms as a member of the Montgomery Township (NJ) Board of Education. Visit Professor Bernanke's blog at www.brookings.edu/blogs/ben-bernanke.

ROBERT H. FRANK

Robert H. Frank is the H. J. Louis Professor of Management and Professor of Economics at Cornell's Johnson School of Management, where he has taught since 1972. His 'Economic View' column appears regularly in *The New York Times*. After receiving his BS from Georgia Tech in 1966, he taught math and science for two years as a Peace Corps Volunteer in rural Nepal. He received his MA in statistics in 1971 and his PhD in economics in 1972 from The

University of California at Berkeley. He also holds honorary doctorate degrees from the University of St. Gallen and Dalhousie University. During leaves of absence from Cornell, he has served as chief economist for the Civil Aeronautics Board (1978–1980), a Fellow at the Center for Advanced Study in the Behavioral Sciences (1992–1993), Professor of American Civilization at lÉcole des Hautes Études en Sciences Sociales in Paris (2000–2001), and the Peter and Charlotte Schoenfeld Visiting Faculty Fellow at the NYU Stern School of Business in 2008–2009. His papers have appeared in the *American Economic Review, Econometrica,* the *Journal of Political Economy,* and other leading professional journals.



Professor Frank is the author of a best-selling intermediate economics textbook, *Microeconomics and Behavior,* Ninth Edition (Irwin/McGraw-Hill, 2015). His research has focused on rivalry and cooperation in economic and social behavior. His books on these themes include *Choosing the Right Pond* (Oxford, 1995), *Passions Within Reason* (W. W. Norton, 1988), *What Price the Moral High Ground?* (Princeton, 2004), *Falling Behind* (University of California Press, 2007), *The Economic Naturalist* (Basic Books, 2007), *The*

Economic Naturalist's Field Guide (Basic Books, 2009), *The Darwin Economy* (Princeton, 2011), and *Success and Luck* (Princeton, 2016), which have been translated into 24 languages. *The Winner-Take-All Society* (The Free Press, 1995), co-authored with Philip Cook, received a Critic's Choice Award, was named a Notable Book of the Year by *The New York Times,* and was included in *BusinessWeek's* list of the 10 best books of 1995. *Luxury Fever* (The Free Press, 1999) was named to the *Knight-Ridder* Best Books list for 1999.

Professor Frank has been awarded an Andrew W. Mellon Professorship (1987–1990), a Kenan Enterprise Award (1993), and a Merrill Scholars Program Outstanding Educator Citation (1991). He is a co-recipient of the 2004 Leontief Prize for Advancing the Frontiers of Economic Thought. He was awarded the Johnson School's Stephen Russell Distinguished Teaching Award in 2004, 2010, and 2012, and the School's Apple Distinguished Teaching Award in 2005. His introductory microeconomics course has graduated more than 7000 enthusiastic economic naturalists over the years.

KATE ANTONOVICS

Professor Antonovics received her BA from Brown University in 1993 and her PhD in economics from the University of Wisconsin in 2000. Shortly thereafter, she joined the faculty in the Economics Department at the University of California, San Diego (UCSD), where she has been ever since.

Professor Antonovics is known for her excellence in teaching and her innovative use of technology in the classroom. Her popular introductory-level microeconomics course regularly enrols more than 900 students each year. She also teaches labour economics at both the undergraduate and graduate level. She has received numerous teaching awards, including the UCSD Department of Economics award for Best Undergraduate Teaching, the UCSD Academic Senate Distinguished Teaching Award, and the UCSD Chancellor's Associates Faculty Excellence Award in Undergraduate Teaching.

Professor Antonovics's research has focused on racial discrimination, gender discrimination, affirmative action, intergenerational income mobility, learning, and wage dynamics. Her papers have appeared in the *American Economic Review,* the *Review of Economics and Statistics,* the *Journal of Labor Economics,* and the *Journal of Human Resources*. She is a member of both the American Economic Association and the Society of Labor Economists.

ORI HEFFETZ

Professor Heffetz received his BA in physics and philosophy from Tel Aviv University in 1999 and his PhD in economics from Princeton University in 2005. He is an Associate Professor of Economics at the Samuel Curtis Johnson Graduate School of Management at Cornell University, and at the Economics Department at the Hebrew University of Jerusalem.

Bringing the real world into the classroom, Professor Heffetz has created a unique macroeconomics course that introduces basic concepts and tools from economic theory and applies them to current news and global events. His popular classes are taken by hundreds of students every year on Cornell's

Ithaca and New York city campuses and via live videoconferencing in dozens of cities across the United States, Canada, and Latin America.

Professor Heffetz's research studies the social and cultural aspects of economic behavior, focusing on the mechanisms that drive consumers' choices and on the links among economic choices, individual wellbeing, and policymaking. He has published scholarly work on household consumption patterns, individual economic decision making, and survey methodology and measurement. He was a visiting researcher at the Bank of Israel during 2011, is currently a Research Associate at the National Bureau of Economic Research (NBER), and serves on the editorial board of *Social Choice and Welfare*.

ACKNOWLEDGMENTS

In the preparation of the fifth edition, I have had an enormous amount of assistance from numerous reviewers of the manuscript whose careful reading of the text and constructive comments helped to clarify a number of key concepts for me and improved the exposition immeasurably. Any errors that remain are my sole responsibility.

Thanks also to the fantastic team at McGraw-Hill who have been a constant source of encouragement and help (and patience).

My students deserve a special vote of thanks. I have been privileged to be able to teach the Introductory Macroeconomics class at the University of Melbourne and a lot of the material in this book has been developed in the course of teaching that subject. For more than 15 years I have searched for ways to present macroeconomics to undergraduate students that fire their imaginations and enable them to see the tremendous benefits that can be had in learning to 'think as an economist'. May my students continue to bombard me with questions—each and every time I'm asked to explain something I learn a little bit more about our discipline. For that, I am extremely grateful. I also thank Renee Delahunty for her excellent research assistance.

I would also like to join McGraw-Hill Education in thanking academic colleagues who took the time to give feedback and review the manuscript, and whose contribution has greatly improved this text. They include:

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Mr Steven Hail, *Flinders University*

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Nahid Khan, *University of Melbourne*

KK Tang, *The University of Queensland*

Ben Wang, *Macquarie University*

Finally, a very special thank you to my family. They have now lived through five editions of this book. Without their support, this project would well and truly never have been completed.

NILSS OLEKALNS

HOW TO USE THIS BOOK

ACTIVE LEARNING APPROACH

The only way to learn to hit an overhead smash in tennis or to speak a foreign language is through repeated practice. The same is true for learning economics. Throughout this book you will find new ideas introduced, with simple examples, followed by applications showing how they work in familiar settings. The features within each chapter are designed to both test and reinforce understanding of these ideas.

LEARNING OBJECTIVES


LO 5.1, 5.4

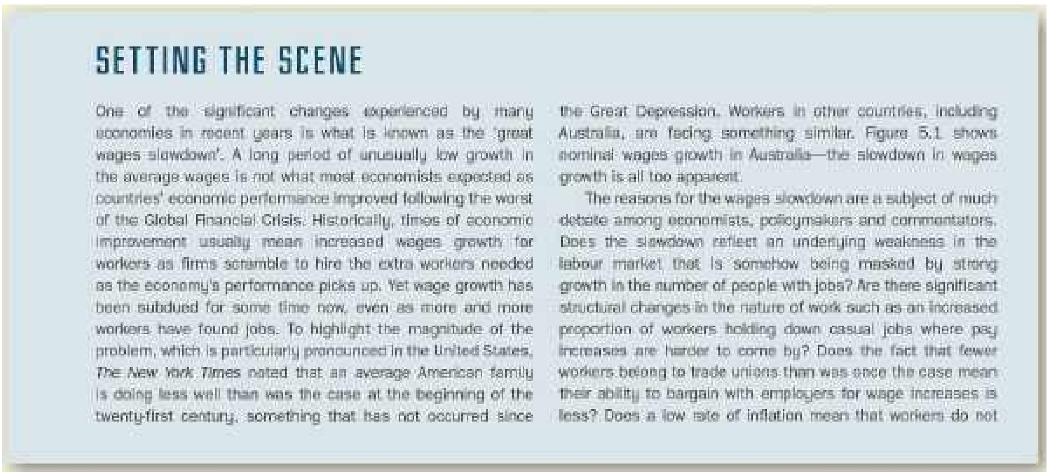
5.1 THE PERFECTLY COMPETITIVE MODEL OF THE LABOUR MARKET

From the study of microeconomics, we know how supply and demand analysis can be used to dete equilibrium prices and quantities for individual goods and services. The same approach can be equally usef studying labour market conditions.

We are going to use the *perfectly competitive model of the labour market*. In this model we assume that cannot affect the price they receive for their product; firms are *price takers*, responding to the product

Each chapter starts with a list of numbered learning objectives, highlighting what you should be able to do after working through the chapter. Once you have completed each chapter, check the learning objectives again to make sure you can answer all the questions posed. This will help you to easily identify topics that require a little more revision.

SETTING THE SCENE



SETTING THE SCENE

One of the significant changes experienced by many economies in recent years is what is known as the 'great wages slowdown'. A long period of unusually low growth in the average wages is not what most economists expected as countries' economic performance improved following the worst of the Global Financial Crisis. Historically, times of economic improvement usually mean increased wages growth for workers as firms scramble to hire the extra workers needed as the economy's performance picks up. Yet wage growth has been subdued for some time now, even as more and more workers have found jobs. To highlight the magnitude of the problem, which is particularly pronounced in the United States, *The New York Times* noted that an average American family is doing less well than was the case at the beginning of the twenty-first century, something that has not occurred since the Great Depression. Workers in other countries, including Australia, are facing something similar. Figure 5.1 shows nominal wages growth in Australia—the slowdown in wages growth is all too apparent.

The reasons for the wages slowdown are a subject of much debate among economists, policymakers and commentators. Does the slowdown reflect an underlying weakness in the labour market that is somehow being masked by strong growth in the number of people with jobs? Are there significant structural changes in the nature of work such as an increased proportion of workers holding down casual jobs where pay increases are harder to come by? Does the fact that fewer workers belong to trade unions than was once the case mean their ability to bargain with employers for wage increases is less? Does a low rate of inflation mean that workers do not

A brand new feature, these chapter-opening vignettes set the tone for each chapter while helping you see how economics affects the world around us.

BACKGROUND BRIEFING

BACKGROUND BRIEFING 5.1

Five important labour market trends

In recent decades at least five trends have characterised the labour markets of the industrialised world. We divide these trends into two groups: those affecting real wages and those affecting employment and unemployment.

TRENDS IN REAL WAGES

1. Throughout the twentieth century, all industrialised countries enjoyed substantial growth in real earnings.
2. The fastest rates of real wage increase occurred during the 1960s and early 1970s. The 1980s and 1990s were very different, with real wages growing at a much more modest rate, before recovering somewhat in the years leading to the Great Financial Crisis. However, as noted before, in recent years, the rate of wage growth has slowed significantly—the great wages slowdown.
3. Furthermore, recent decades have brought an increase in income inequality in many countries, including the United States and Australia. A growing gap in real wages between high-skilled and low-skilled workers, evidenced by the top decile of income earners increasing the gap between

These features provide interesting, factual background information on aspects of the economy covered in the chapter topics, helping to deepen and expand understanding.

THINKING AS AN ECONOMIST

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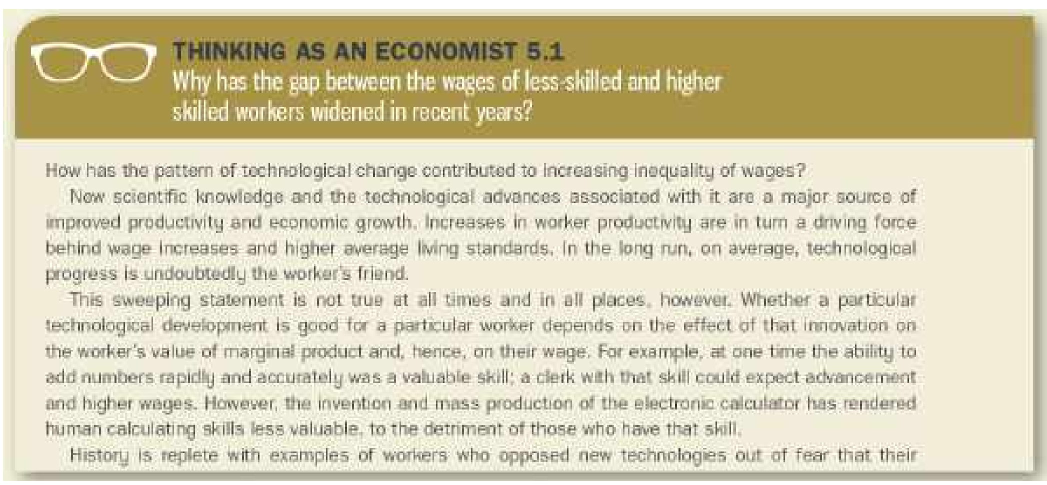


THINKING AS AN ECONOMIST 5.1

Why has the gap between the wages of less-skilled and higher skilled workers widened in recent years?

How has the pattern of technological change contributed to increasing inequality of wages?

New scientific knowledge and the technological advances associated with it are a major source of improved productivity and economic growth. Increases in worker productivity are in turn a driving force behind wage increases and higher average living standards. In the long run, on average, technological progress is undoubtedly the worker's friend.

This sweeping statement is not true at all times and in all places, however. Whether a particular technological development is good for a particular worker depends on the effect of that innovation on the worker's value of marginal product and, hence, on their wage. For example, at one time the ability to add numbers rapidly and accurately was a valuable skill; a clerk with that skill could expect advancement and higher wages. However, the invention and mass production of the electronic calculator has rendered human calculating skills less valuable, to the detriment of those who have that skill.

History is replete with examples of workers who opposed new technologies out of fear that their

These short, analytical vignettes appear throughout the book and are designed to encourage students to apply economic theory to real-world situations. These scenarios can be Australian, international or general.

EXAMPLES

EXAMPLE 5.1 – BCC'S DEMAND FOR LABOUR

Suppose that the going wage for computer technicians is \$60 000 per year. BCC managers know that this is the wage being offered by all their competitors, so they cannot hire qualified workers for less. How many technicians will BCC hire? What would the answer be if the wage were \$50 000 per year?

BCC will hire an extra worker if and only if the value of that worker's marginal product (which equals the extra revenue the worker creates for the firm) exceeds the wage BCC must pay. The going wage for computer technicians, which BCC takes as given, is \$60 000 per year. Table 5.1 shows that the value of the marginal product of the first, second and third workers each exceeds \$60 000. Hiring these workers will be profitable for BCC because the extra revenue each generates exceeds the wage that BCC must pay. However, the fourth worker's marginal product is worth only \$57 000. If BCC's managers hired the fourth worker they would be paying \$60 000 in extra wages for additional output that is worth only \$57 000. Since hiring the fourth worker is a money-losing proposition, BCC will hire only three workers. Thus the quantity of labour BCC demands when the going wage is \$60 000 per year is three technicians.

These are integrated into the text to reinforce learning and provide simple examples of theory in action. Key points are often made in the examples.

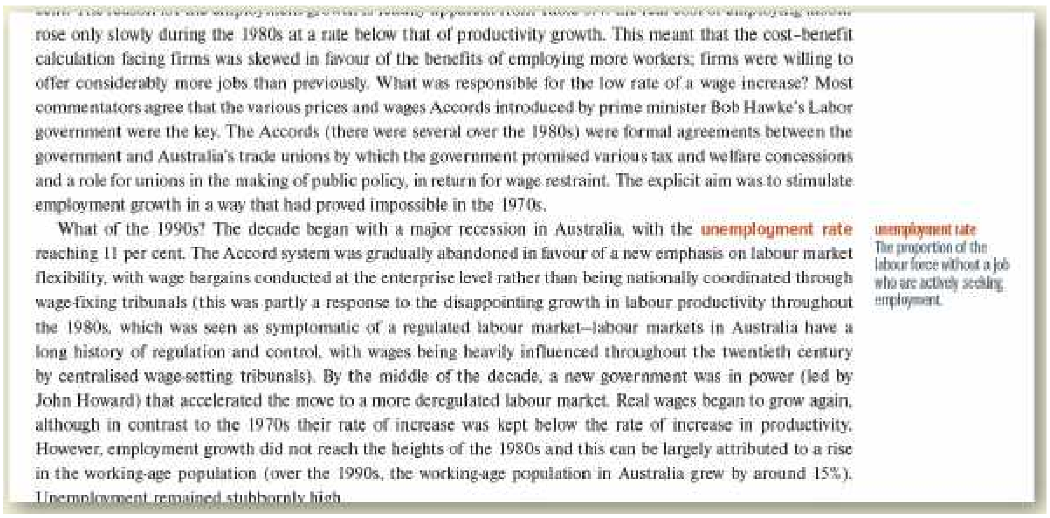
CONCEPT CHECKS

CONCEPT CHECK 5.1

How many workers will BCC hire if the going wage for technicians is \$35 000 per year?

These quick questions posed throughout each chapter are another way for you to test your understanding. Make sure you can answer them before moving on. Answers to Concept Checks can be found at the end of the book.

KEY TERMS


rose only slowly during the 1980s at a rate below that of productivity growth. This meant that the cost–benefit calculation facing firms was skewed in favour of the benefits of employing more workers; firms were willing to offer considerably more jobs than previously. What was responsible for the low rate of a wage increase? Most commentators agree that the various prices and wages Accords introduced by prime minister Bob Hawke's Labor government were the key. The Accords (there were several over the 1980s) were formal agreements between the government and Australia's trade unions by which the government promised various tax and welfare concessions and a role for unions in the making of public policy, in return for wage restraint. The explicit aim was to stimulate employment growth in a way that had proved impossible in the 1970s.

What of the 1990s? The decade began with a major recession in Australia, with the **unemployment rate** reaching 11 per cent. The Accord system was gradually abandoned in favour of a new emphasis on labour market flexibility, with wage bargains conducted at the enterprise level rather than being nationally coordinated through wage-fixing tribunals (this was partly a response to the disappointing growth in labour productivity throughout the 1980s, which was seen as symptomatic of a regulated labour market—labour markets in Australia have a long history of regulation and control, with wages being heavily influenced throughout the twentieth century by centralised wage-setting tribunals). By the middle of the decade, a new government was in power (led by John Howard) that accelerated the move to a more deregulated labour market. Real wages began to grow again, although in contrast to the 1970s their rate of increase was kept below the rate of increase in productivity. However, employment growth did not reach the heights of the 1980s and this can be largely attributed to a rise in the working-age population (over the 1990s, the working-age population in Australia grew by around 15%). Unemployment remained stubbornly high.

unemployment rate The proportion of the labour force without a job who are actively seeking employment.

Key words and phrases are highlighted in the text at the first significant use and are defined in the margin. They will help you to become familiar with the language of economics. Use the Key Terms list at the end of each chapter to check your understanding. The terms and definitions are also listed alphabetically in the Glossary.

ANZ FOCUS

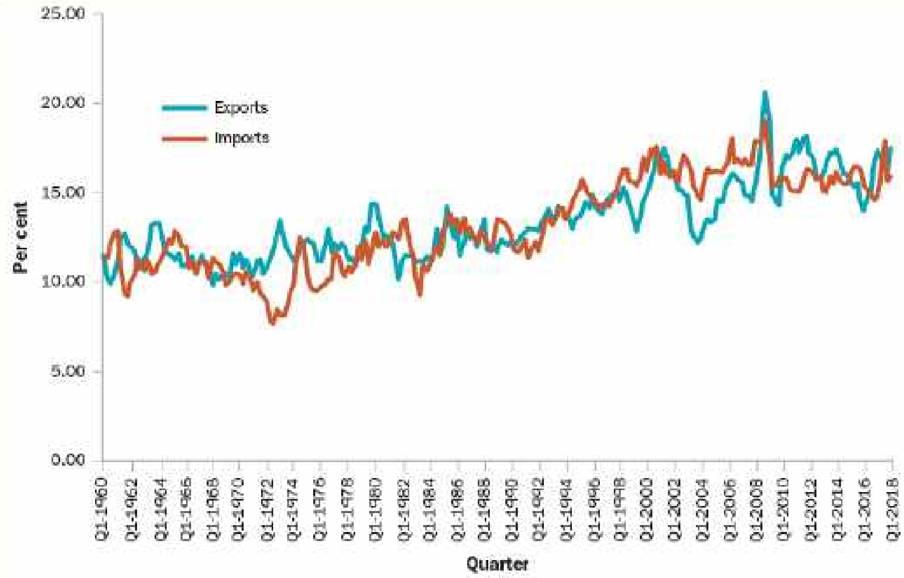


Figure 1.8 Exports and imports as a share of Australian output

Source: OECD, 'Main economic indicators – complete database', Main Economic Indicators (database), http://dx.doi.org/10.1787/data-00052-en, accessed 28 September 2018.

Figure, tables and examples are based on current Australian data, adding interest and relevance to the theory.

RECAP

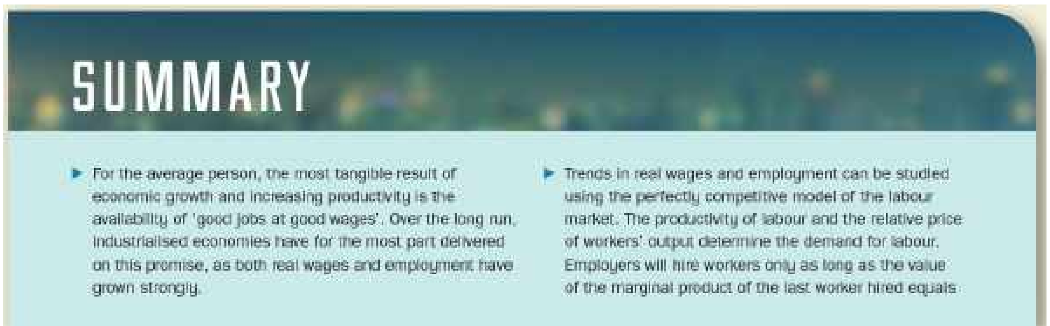
◀◀RECAP

The supply and demand analysis we have developed in this chapter is a very powerful tool for understanding labour market outcomes. Using this framework we have been able to:

1. see how long-run technological growth has contributed to increasing real wages in industrialised countries
2. explain the very different labour market outcomes in Australia in the 1980s, 1990s, 2000s and 2010s
3. examine how globalisation and technological change have led to growing wage inequality in many countries.

Recap sections summarise key points of the chapter's material and are an excellent revision aid.

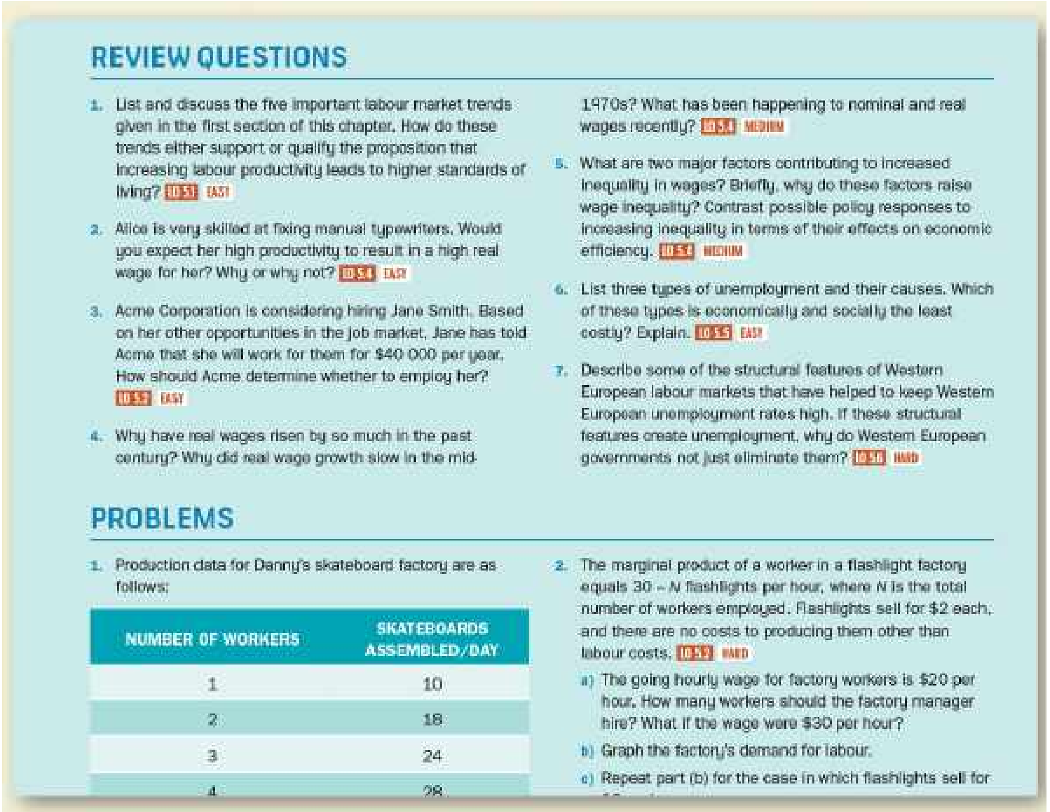
SUMMARY


SUMMARY

- For the average person, the most tangible result of economic growth and increasing productivity is the availability of 'good jobs at good wages'. Over the long run, industrialised economies have for the most part delivered on this promise, as both real wages and employment have grown strongly.
- Trends in real wages and employment can be studied using the perfectly competitive model of the labour market. The productivity of labour and the relative price of workers' output determine the demand for labour. Employers will hire workers only as long as the value of the marginal product of the last worker hired equals

At the end of each chapter a summary of the topics covered helps to reinforce the key principles.

REVIEW QUESTIONS AND PROBLEMS



REVIEW QUESTIONS

1. List and discuss the five important labour market trends given in the first section of this chapter. How do these trends either support or qualify the proposition that increasing labour productivity leads to higher standards of living? LO 5.1 EASY
2. Alice is very skilled at fixing manual typewriters. Would you expect her high productivity to result in a high real wage for her? Why or why not? LO 5.4 EASY
3. Acme Corporation is considering hiring Jane Smith. Based on her other opportunities in the job market, Jane has told Acme that she will work for them for $40 000 per year. How should Acme determine whether to employ her? LO 5.2 EASY
4. Why have real wages risen by so much in the past century? Why did real wage growth slow in the mid-1970s? What has been happening to nominal and real wages recently? LO 5.4 MEDIUM
5. What are two major factors contributing to increased inequality in wages? Briefly, why do these factors raise wage inequality? Contrast possible policy responses to increasing inequality in terms of their effects on economic efficiency. LO 5.4 MEDIUM
6. List three types of unemployment and their causes. Which of these types is economically and socially the least costly? Explain. LO 5.5 EASY
7. Describe some of the structural features of Western European labour markets that have helped to keep Western European unemployment rates high. If these structural features create unemployment, why do Western European governments not just eliminate them? LO 5.6 HARD

PROBLEMS

1. Production data for Danny's skateboard factory are as follows:

NUMBER OF WORKERS	SKATEBOARDS ASSEMBLED/DAY
1	10
2	18
3	24
4	28

2. The marginal product of a worker in a flashlight factory equals 30 – N flashlights per hour, where N is the total number of workers employed. Flashlights sell for $2 each, and there are no costs to producing them other than labour costs. LO 5.2 HARD
   a) The going hourly wage for factory workers is $20 per hour. How many workers should the factory manager hire? What if the wage were $30 per hour?
   b) Graph the factory's demand for labour.
   c) Repeat part (b) for the case in which flashlights sell for

Engaging and thought-provoking questions and problems at the end of each chapter are another excellent learning tool, reinforcing the key principles and topics covered. Each question is mapped to learning objectives and difficulty level, allowing you to test yourself on particular aspects of the chapter.

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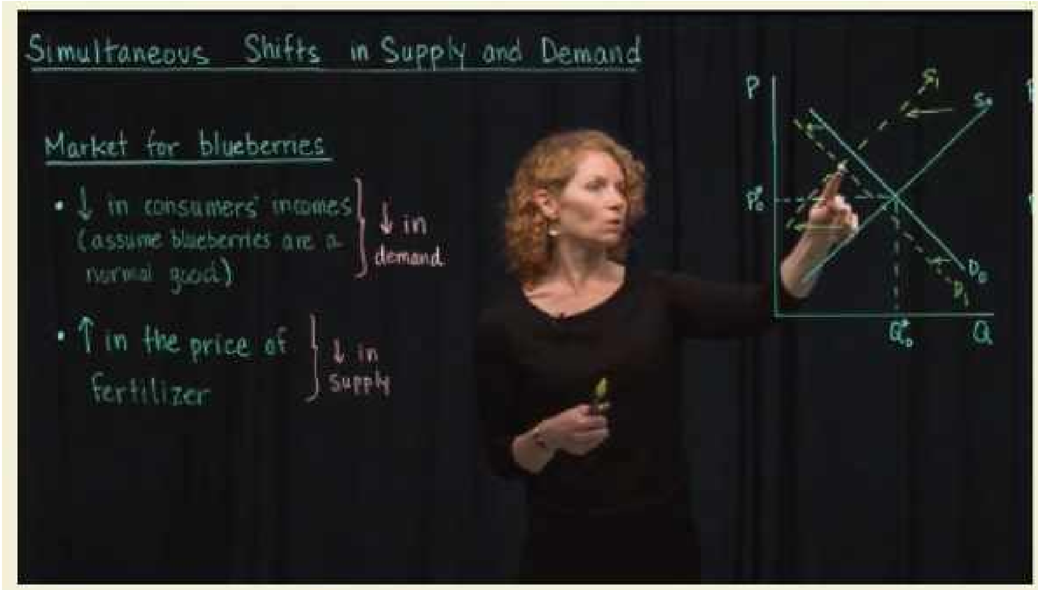

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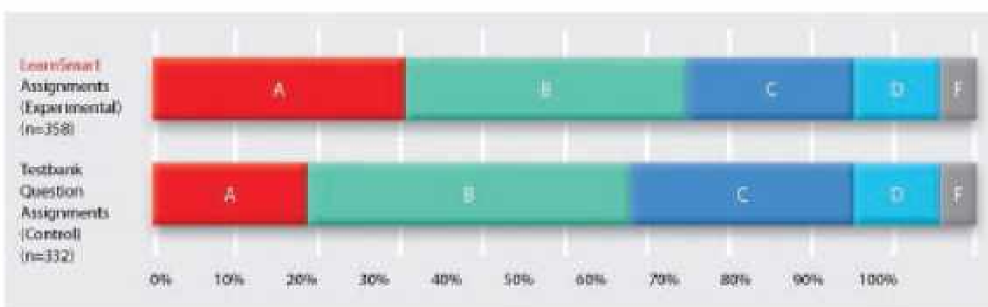

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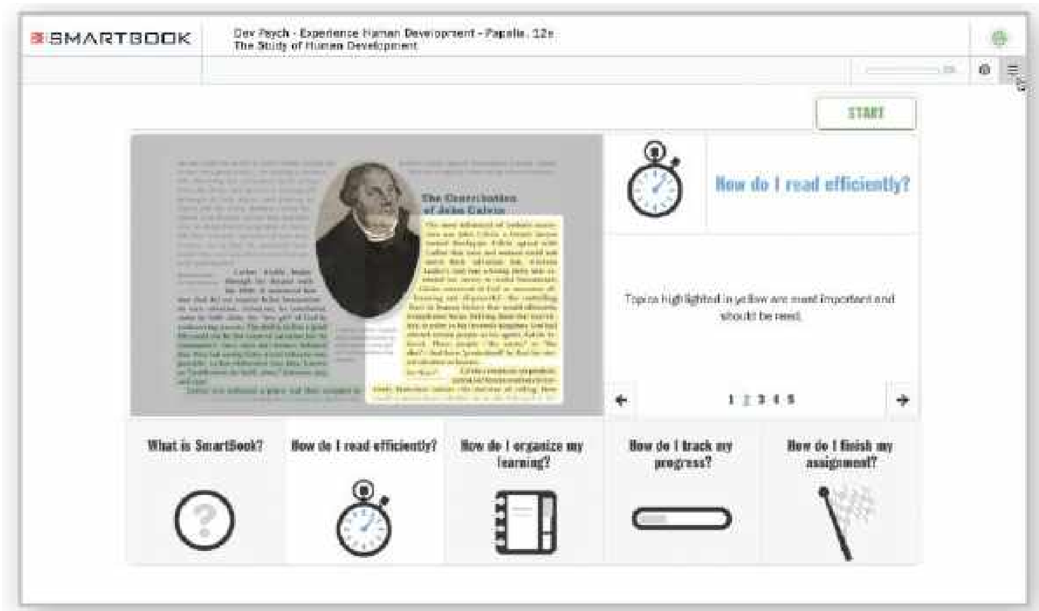

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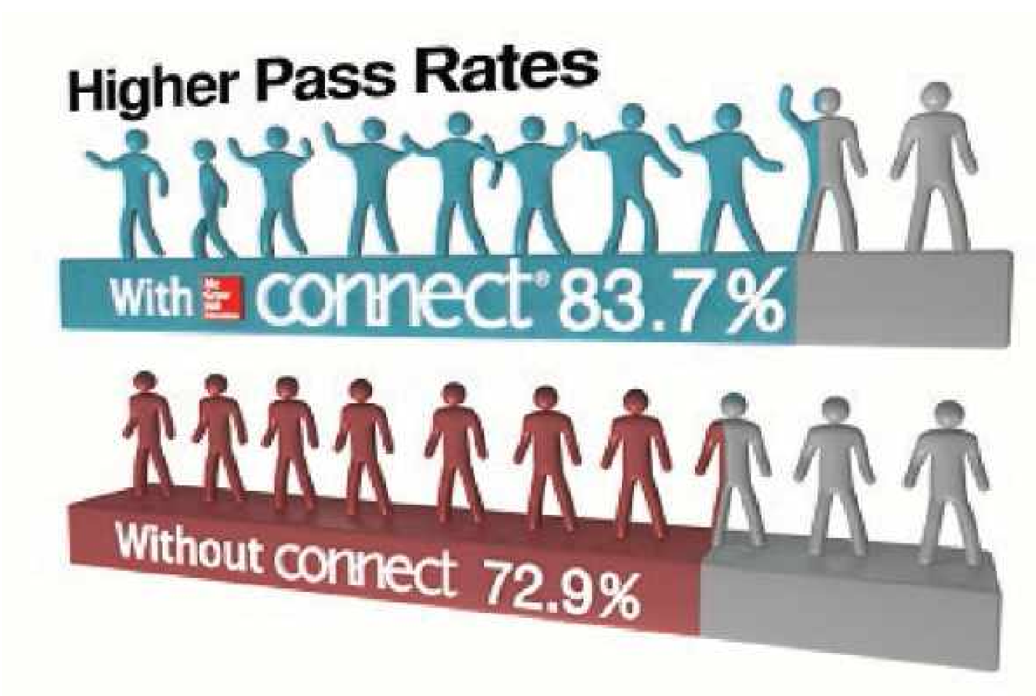

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PART 1

ISSUES IN MACROECONOMICS

PART 1 looks at some of the key issues studies by macroeconomists, and explains the main indicators that economists use to gauge the performance of the economy. Macroeconomists study the reasons underlying the performance of the national economy and consider policies that might improve that performance. This leads to the consideration of economic growth and living standards, productivity, recessions and expansions, unemployment, inflation and the interdependence among nations.

These are topics that form the basis for the material in this book.

This part of the book begins with discussions on gross domestic product (GDP), the most commonly used measure that macroeconomists have for the overall value of production in the economy. GDP has other interpretations that are equally valid; GDP is also a measure of the value of income in the economy as well as a measure of the value of total expenditure. Next, we tackle the general level of prices in the economy and the rate at which the price level changes: the inflation rate. We then construct macroeconomic models that explain how GDP and inflation are determined and the nature of the relationship between the two variables.

Moving on, the related concepts of saving and wealth are explored. Here, the primary concern is understanding exactly what is meant by 'saving' in a macroeconomic context, how this feeds into wealth and why we need to look beyond household-saving behaviour to evaluate, fully, the saving performance of an economy.

Labour market issues occupy us next: we make use of the analytical concept known as 'the perfectly competitive model' to explain important long-run trends in the labour market, particularly in relation to the wage received by workers and their likelihood of obtaining employment. The nature of unemployment is also discussed, emphasising the various types of unemployment, including the one most studied by macroeconomists: cyclical unemployment.

GRADUATE SPOTLIGHT

Name: Brody Viney
Degree studied: Bachelor of Arts (Economics and English)
University: University of Melbourne
Current position: Policy Analyst
Employer: Commonwealth Treasury

Early on, what interested you about a career in economics?

Economics captured my attention immediately. As a literature and politics student, it provided a way of thinking about the world that was quite foreign to me. I knew it would be useful for analysing the trends and problems in society that I was interested in tackling in my career.

What did you learn in your degree that has been most useful in your career?

The core frameworks of microeconomics provide a quick and intuitive way to understand an issue, which has been very useful when confronting new, complex policy problems under time pressure. Most recently, my work has focussed on macroeconomics and understanding the drivers of GDP growth has been essential in this role.

What have you been up to since graduation?

I joined the Commonwealth Treasury in Canberra after graduating, where I worked for a number of years as a policy analyst. During my time there, I had the chance to work on major tax changes, budget decision making and forecasting, and labour market analysis. In 2018 I moved to the United States to undertake a Master of Public affairs degree at Princeton University, where my studies are focussed on economics, inequality and fiscal policy.

What does your current job involve? Where is it taking you?

At the Treasury, my work was very diverse. It included modelling and analysing data, writing policy briefing documents and reports, meeting with business and community leaders and working with a range of other staff with different backgrounds and perspectives. I’m now enjoying enhancing many of these skills in my studies.

What do you enjoy most about your job?

I have had the opportunity to work on some significant policy issues that affect the lives of a lot of people. It can be daunting, but it is also very rewarding when you are able to affect policy change, even in a small way.

What advice would you share with students who want to pursue a career in economics?

Work hard and if you have done the work, have confidence in yourself. It’s good to have an opinion but it’s important that you can back it up with evidence. Also, economics students should build their communication skills, so you can explain your analysis in an engaging and clear way. Finally, I think economists should take an interest in a wide range of other disciplines e.g. political science, law, sociology, environmental science and history.

What are your thoughts on the future of the economics industry?

The discipline needs to keep evolving to grapple with the challenges faced by society. Nonetheless, economics provides a powerful set of tools for thinking about the world, so I think economists will always be valuable to society.

INDUSTRY SPOTLIGHT

Name: Dr Angelia Grant
Current Position: Division Head, Macroeconomic Conditions Division
Employer: Australian Treasury

Could you give us a brief summary of your career in economics so far?

I joined the Australian Treasury as a graduate after completing a Bachelor of Economics at the University of Queensland. I worked in a number of different areas across Treasury's revenue, fiscal and macroeconomic groups before working as an economics adviser in the office of two former prime ministers and as chief of staff to a former parliamentary secretary to the Treasurer. I then undertook some further study with the support of Treasury and the Sir Roland Wilson Foundation, and was awarded a PhD in economics from the Australian National University in 2015. I returned to Treasury's macroeconomic group after completing my PhD.

What does your current job involve?

I am currently the Head of the Macroeconomic Conditions Division. This division is responsible for producing the forecasts on the global and domestic economies for the Australian Government. This is important because the economic outlook is relevant for policy considerations and can determine what policies the government chooses to implement. The economic forecasts underpin all the revenue and expenditure estimates in the federal budget.

Why did you choose to be a macroeconomist?

Macroeconomics matters to people. It was shaped by the need to explain one of the largest economic fluctuations in history—the Great Depression—which had a significant effect on people's lives. And ever since, macroeconomists have spent a lot of time studying potential output and the fluctuations around it. To support potential output, it is important that policy settings are supportive of people building skills and participating in the labour market, people having the capital available to best do their job, and people being rewarded for innovation and new ways of operating.

Fluctuations around potential output occur when there is not enough aggregate demand in an economy to generate employment so that the unemployment rate rises, or where there is too much aggregate demand and the economy overheats and runs the risk of a sharp correction. Macroeconomic policies—both monetary and fiscal—can be used to influence aggregate demand in the short term to close the gap between actual and potential output. But in addition to a role in stabilisation, fiscal policy also has an active role in redistribution and allocation. Fiscal policy affects both economic and social outcomes and covers a massive policy spectrum. This makes working in the Australian Treasury incredibly interesting.

I also love that there is an important role for quantitative work in macroeconomics, because I really enjoy econometrics. And I enjoy the other skills that come with being a macroeconomist in public policy—communicating to a wide audience is particularly rewarding.

What advice would you share with students who want to pursue a career in economics?

I would highly recommend studying economics and pursuing a career in public policy. Working in the Treasury, I get the chance to consider complex economic issues, work with incredibly talented people, and work on a range of issues to help make a difference to Australia's future.

What current macroeconomic event are you watching with interest?

The macroeconomics discipline is currently considering a number of important issues, so it is hard to choose just one. The Global Financial Crisis, technological change, globalisation, demographics and the rise of Asia are reshaping the global economy and the geopolitical environment. I think that these issues will go on to reshape the economics discipline regardless of whether old economic trends emerge or continue to evade us.

CHAPTER 1

Macroeconomics: The bird's-eye view of the economy

After reading this chapter, you should be able to answer the following questions.

1.1 What are the broad issues that macroeconomists study and the types of data they use and interpret?

1.2 Can you identify the three major types of macroeconomic policy and discuss the difference between positive and normative analyses of macroeconomic policy?

1.3 Do you understand the difference between microeconomics and macroeconomics and how aggregation is used?

SETTING THE SCENE

In 1929, the economic performance of economies all around the world slowed dramatically in an episode known as the Great Depression. Figure 1.1 shows one measure of the size of an economy, the value of all final goods and services produced over the course of each year relative to the size of the population, a measure known as real per capita gross domestic product (GDP). We will come back to this concept in some detail in our next chapter. For now, think of this as an indicator of how much economic activity is taking place in an economy over the course of a year, as measured by the value of what is being produced per person in the economy. We give only the data for Australia and the United States, although almost all other countries around the world were affected similarly. As you can see from the figure, economic activity slowed dramatically over the first half of the 1930s. In both countries, factories, mines, retail stores, businesses and farms all dramatically cut production, throwing tens of thousands of people out of work, leaving them with meagre government handouts on which to live. The Great Depression was an economic catastrophe.

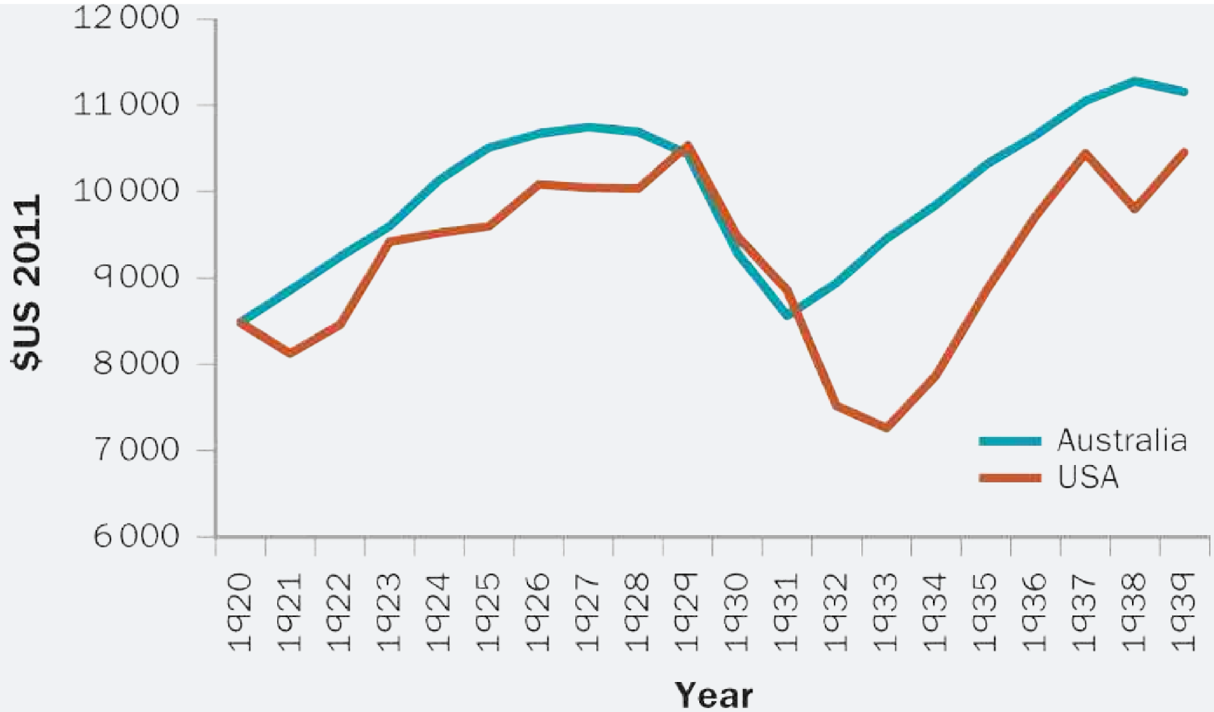

Figure 1.1 **Real per capita GDP: The Great Depression**

Note: To aid comparison, the data for the United States and Australia are both measured in United States dollars.

Source: Bolt J, Inklaar R, de Jong H, Luiten van Zanden J 2018, 'Rebasing "Maddison": New income comparisons and the shape of long-run economic development', Maddison Project working paper 10, Maddison Project Database, version 2018.

In the late 2000s, the world was again beset by an economic catastrophe, the Global Financial Crisis, or, as it is also known, the Great Recession. Once again, economies all around the world slowed, businesses cut back production and workers lost their jobs. Figure 1.2 shows how this impacted economic activity in Australia and the United States, again, using the concept of real per capita GDP.

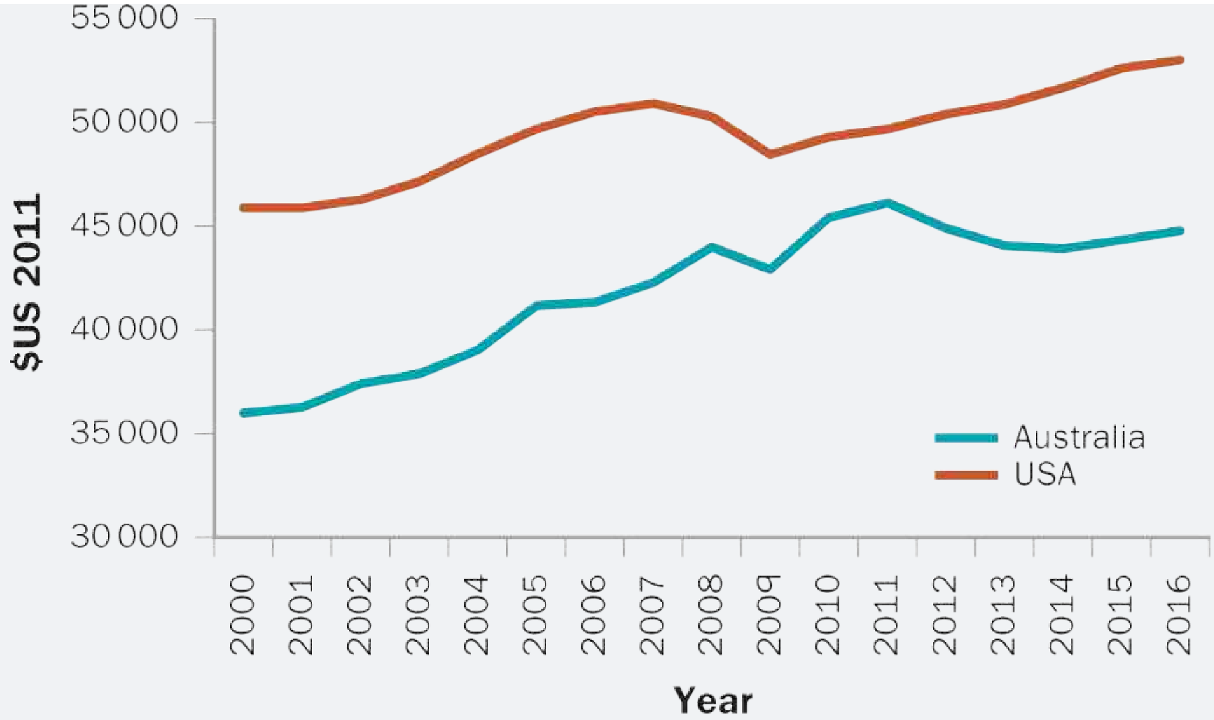

Figure 1.2 **Real per capita GDP: The Great Recession**

Source: Bolt J, Inklaar R, de Jong H, Luiten van Zanden J 2018, 'Rebasing "Maddison": New income comparisons and the shape of long-run economic development', Maddison Project working paper 10, Maddison Project Database, version 2018.

Comparing Figures 1.1 and 1.2 highlights an important difference between these two episodes: the Great Recession, although disastrous for many people, was not of the same magnitude as the Great Depression, nor did its impact on economic activity last as long.

Going back to the Great Depression, and with the benefit of Page 6 hindsight, it is now possible to see that poor policymaking was an underlying cause. Of course, economic policymakers did not set out to create an economic catastrophe. Rather, they fell prey to misconceptions of the time about how the economy worked. In other words, the Great Depression, far from being inevitable, might have been avoided—if only the state of economic knowledge had been better.

One of the few benefits of the Great Depression was that it forced economists and policymakers of the 1930s to recognise that there were major gaps in their understanding of how the economy works. This recognition led to the development of a new subfield in economics called 'macroeconomics'. Macroeconomics is the study of the performance of national economies and the policies governments use to try to improve that performance.

What then, caused the Great Recession? There is a consensus that the Great Recession had its origins in poor lending practices adopted by financial institutions in the United States and elsewhere—lending funds without due recognition of the risks involved and without proper safeguards to prevent their customers from defaulting. Following a string of defaults and failures of some leading financial institutions such as Bear Stearns, financial institutions all over the world massively curtailed their lending activities, placing further stress on cash-strapped businesses and individuals, making it much harder for both to undertake their normal levels of economic activity. However, there were lessons learnt from the Great Depression about how best to deal with such a situation and there was a significant policy response in almost all countries to try to maintain economic activity in the face of forces that many thought would lead to a repeat of the Great Depression. Debate continues as to how effective these policies were. However, Figures 1.1 and 1.2 highlight that the Great Recession, as terrible as it was for those who felt its full effects, was nowhere near the catastrophe that was the Great Depression. At the forefront, striving to preserve economic activity in the face of the Great Recession, were macroeconomists, putting into practice lessons learnt from the Great Depression and from the discipline of macroeconomics that now exists.

This chapter will introduce the subject matter and some of the tools of macroeconomics. Although understanding episodes like the Great Depression and the Great Recession remain an important concern of macroeconomists, the field has expanded to include the analysis of many other aspects of national economies. Among the issues macroeconomists study are the sources of long-run economic growth and development, the causes of high unemployment, and the factors that determine the rate of inflation. Appropriately enough for a world in which economic globalisation preoccupies businesspeople and policymakers, macroeconomists also study how national economies interact. Since the performance of the economy has an important bearing on the availability of jobs, the wages workers earn, the prices they pay, and the rates of return they receive on their saving, it's clear that macroeconomics addresses bread-and-butter issues that affect virtually everyone.

In light of nations' experiences during the Great Depression, macroeconomists are particularly concerned with understanding how **macroeconomic policies** work and how they should be applied. Macroeconomic policies are government actions designed to affect the performance of the economy as a whole (as opposed to policies intended to affect the performance of the market for a particular good or service, such as sugar or haircuts). The hope is that by understanding more fully how government policies affect the economy, economists can help policymakers do a better job and avoid serious mistakes, such as those that were made during the Great Depression. On an individual level, educating people about macroeconomic policies and their effects will make for a better-informed citizenry, capable of making well-reasoned judgements about their governments' management of the economy.

1.1 THE MAJOR MACROECONOMIC ISSUES

LO 1.1

We defined macroeconomics as the study of the performance of the national economy as well as the policies used to improve that performance. Let's now take a closer look at some of the major economic issues that macroeconomists study.

1.1.1 ECONOMIC GROWTH AND LIVING STANDARDS

Although the wealthy industrialised countries (such as Australia, the United States, Canada, Japan, and the countries of Western Europe) are certainly not free from poverty, hunger and homelessness, the typical person in those countries enjoys a *standard of living* better than at any previous time or place in history. By **standard of living** , we mean the degree to which people have access to goods and services that make their lives easier, healthier, safer and more enjoyable. People with a high living standard enjoy more and better consumer goods: technologically advanced cars, laptop and tablet computers, smartphones and the like. But they also benefit from a longer life expectancy and better general health (the result of high-quality medical care, good nutrition and good sanitation), from higher literacy rates (the result of greater access to education), from more time and opportunity for cultural enrichment and recreation, from more interesting and fulfilling career options, and from better working conditions. Of course, the **scarcity principle** will always apply, even for the citizens of a rich country: having more of one good thing means having less of another. But higher incomes make these choices much less painful than they would be otherwise. Choosing between a larger house and a nicer car is much easier than choosing between feeding your children adequately and sending them to school, the kind of hard choice people in the poorest nations face.

People in affluent countries sometimes take their standard of living for granted, or even as a 'right'. But we should realise that the way we live today is radically different from the way people have lived throughout most of history. The current standard of living in the United States, Western Europe and Australia is the result of several centuries of sustained *economic growth*, a process of steady increase in the quantity and quality of the goods and services the economy can produce. The basic equation is simple: the more we can produce, the more we can consume. Of course, not everyone in a society shares equally in the fruits of economic growth and economists are rightly concerned by the increase in economic inequality that has sometimes accompanied economic growth. That said, in most cases growth brings an improvement in the average person's standard of living.

To get a sense of the extent of economic growth over time, examine Figure 1.3, which shows how the output of the Australian economy has increased since 1820. (We discuss the measure of output used here, real gross domestic product, in the next chapter.) Although output fluctuates at times, the overall trend has been unmistakably upward. Indeed, in 2016 the output of the Australian economy was around 12 times what it was in 1946 and more than five times its level in 1965. What caused this remarkable economic growth? Can it continue? Should it? These are some of the questions macroeconomists try to answer.

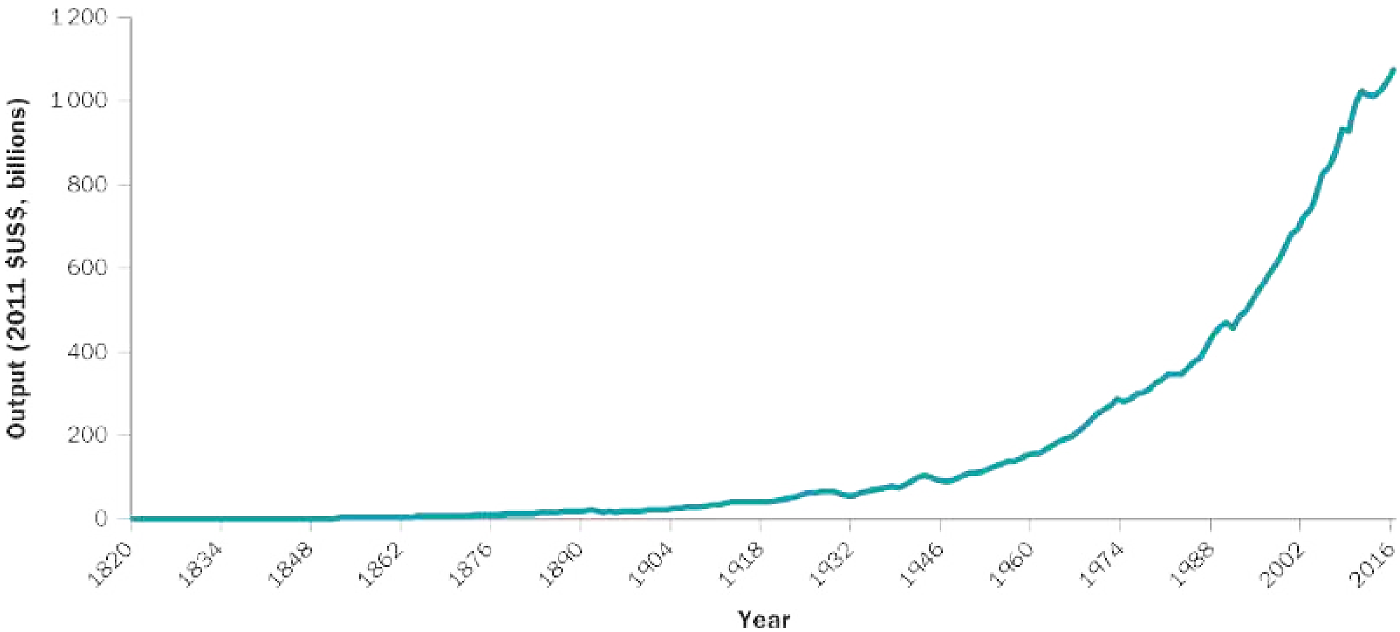

Figure 1.3 **Aggregate output of the Australian economy, 1820–2016**

Source: Bolt J, Inklaar R, de Jong H, Luiten van Zanden J 2018, 'Rebasing "Maddison": New income comparisons and the shape of long-run economic development', Maddison Project working paper 10, Maddison Project Database, version 2018.

One reason for the growth in output over the last century has been the rapid growth of the Australian population, and hence the number of workers available. Because of population growth, increases in *total* output cannot be equated with improvements in the general standard of living. Although increased output means that more goods and services are available, increased population implies that more people are sharing those goods and services. Because the population changes over time, output *per person* is a better indicator of the average living standard than total output.

Page 8

Figure 1.4 shows output per person in Australia since 1820. Note that the long-term increase in output per person is smaller than the increase in total output shown in Figure 1.3 because of population growth. Nevertheless, the gains made over this long period are still impressive: in 2016, a typical Australian resident consumed around four times the quantity of goods and services available to a typical resident at the onset of the Great Depression. To put this increase into perspective, according to the Australian Bureau of Statistics (ABS), in 2016, 86 per cent of households reported that they had access to the internet and 91 per cent of those households reported they used a desktop or laptop computer. This could hardly be imagined even a few decades ago.

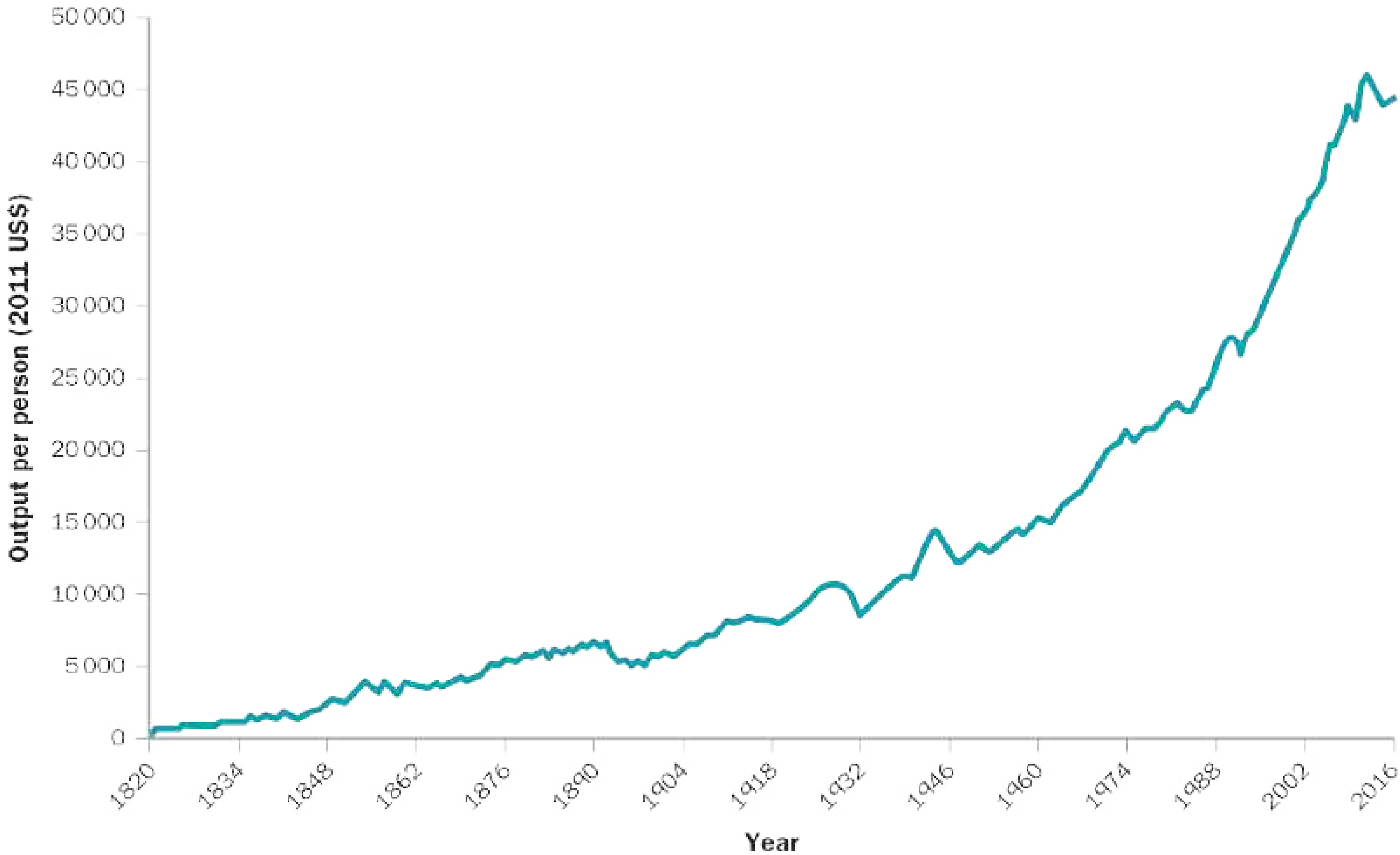

Figure 1.4 **Output per person of the Australian economy, 1820–2016**

Source: Bolt J, Inklaar R, de Jong H, Luiten van Zanden J 2018, 'Rebasing "Maddison": New income comparisons and the shape of long-run economic development', Maddison Project working paper 10, Maddison Project Database, version 2018.

1.1.2 PRODUCTIVITY

While growth in output per person is closely linked to changes in what the typical person can *consume*, macroeconomists are also interested in labour productivity—what the average worker can *produce*. Figure 1.5 shows an index of how output per hour worked (i.e. total output divided by the total number of hours worked in the economy) has increased since 1970 in a number of nations. The figure shows, for example, that in 2016, an hour of work by a worker in Australia resulted in twice the quantity of goods and services compared to 1970.

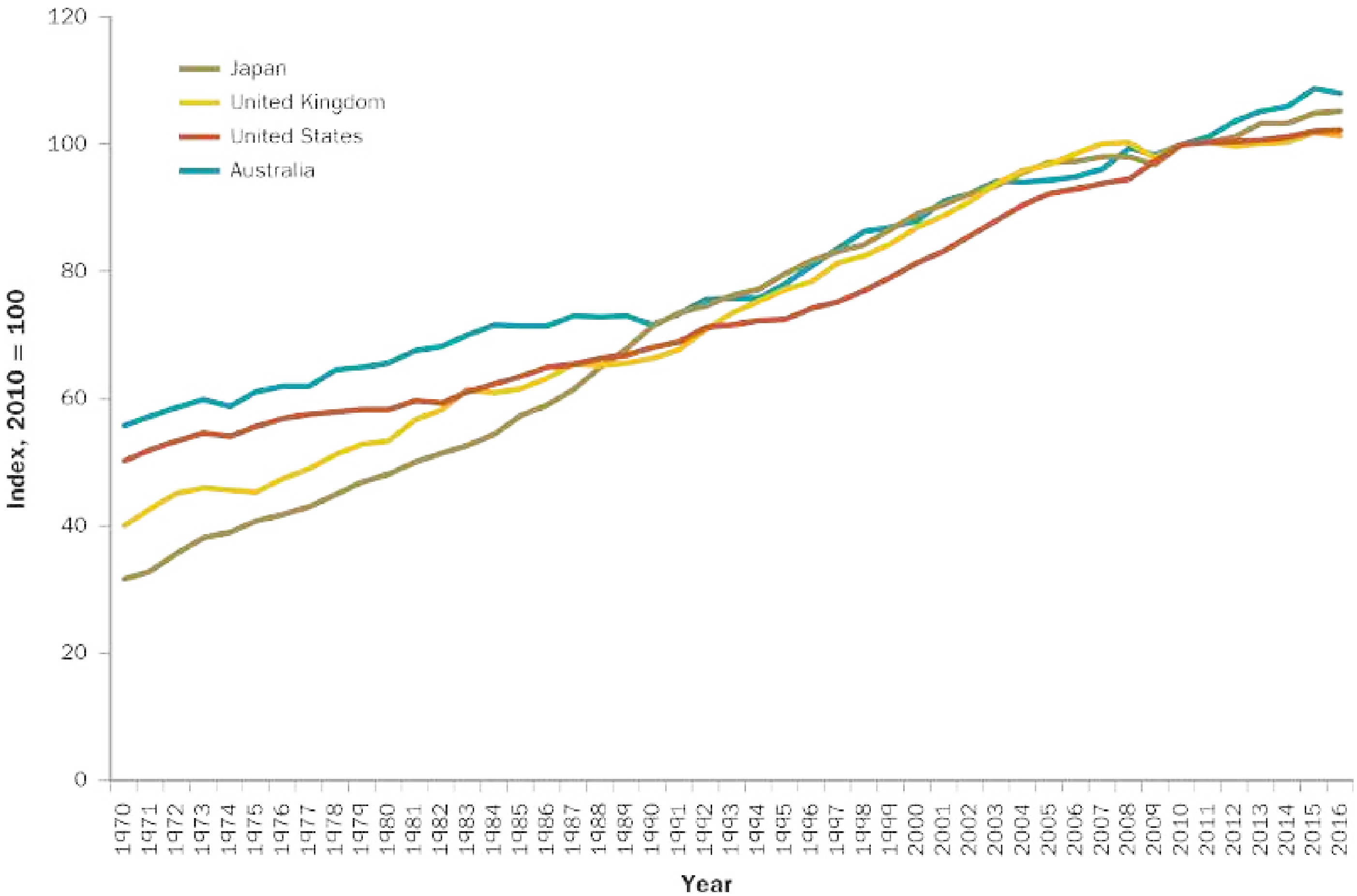

Figure 1.5 **Output per hour worked**

Source: OECD 2018, 'GDP per hour worked (indicator)', https://data.oecd.org/lprdty/gdp-per-hour-worked.htm, doi: 10.1787/1439e590-en, accessed 28 September 2018.

Economists refer to output per employed worker, or hour of work, as **average labour productivity**. Average labour productivity and output per person are closely related. This relationship makes sense as the more we can produce, the more we can consume. Because of this close link to the average living standard, average labour productivity and the factors that cause it to increase over time are of major interest to macroeconomists.

Although the long-term improvement in output per hour is impressive, the *rate* of improvement has slowed somewhat. Between 1970 and 1997 in Australia, labour productivity grew at an average annual rate of 1.6 per cent. But since 1997, the average rate of increase in labour productivity has been around 1.2 per cent, despite the introduction of new production technologies, especially those associated with information technology. Slowing productivity growth leads to less rapid improvement in living standards because the supply of goods and services cannot grow as quickly as it does during periods of rapid growth in productivity. Identifying the causes of productivity slowdowns and speedups is thus an important challenge for macroeconomists.

The current standard of living in the affluent nations is not only much higher than in the past but also much higher than in many other nations today. Why have many of the world's countries—including the developing nations of Asia, Africa and Latin America and some formerly communist countries of eastern Europe—for many decades not enjoyed the same rates of economic growth as the industrialised countries? How can a country's rate of economic growth be improved? Once again, these are questions of keen interest to macroeconomists.

Example 1.1 considers the world's largest economies, the United States and China's, and draws an important distinction.

EXAMPLE 1.1 – PRODUCTIVITY AND LIVING STANDARDS

How do China's productivity and output per person compare with those of the United States?

According to data from the World Bank (2018), in 2015 the value of the output of the US economy was about $18 121 billion. In the same year, the estimated value of the output of the People's Republic of China was $11 065 billion (US). The populations of the United States and China in 2015 were about 0.321 billion and 1.371 billion, respectively, while the numbers of employed workers in the two countries were, respectively, approximately 0.148 billion and 0.765 billion.

Find output per person and average labour productivity for the United States and China in 2015. What do the results suggest about comparative living standards in the two countries?

Output per person is simply total output divided by the number of people in an economy, and, in this instance, average labour productivity is output divided by the number of employed workers. Doing the calculations, we get the following results for 2015.

	UNITED STATES	CHINA
Output per person	$56 451	$8 071
Average labour productivity	$122 439	$14 464

Note that, although the total output of the Chinese economy is more than 60 per cent that of the US output, output per person and average labour productivity in China are each less than 15 and 12 per cent, respectively, of what they are in the United States. Thus, though the Chinese economy is predicted in the next 10 or 15 years to surpass the US economy in total output, for the time being there remains a large gap in productivity. This gap translates into striking differences in the average person's living standard between the two countries—in access to consumer goods, health care, transportation, education and other benefits of affluence.

1.1.3 RECESSIONS AND EXPANSIONS

Economies do not always grow steadily; sometimes they go through periods of unusual strength or weakness. A look back at Figure 1.4 shows that although output generally grows over time, it does not always grow smoothly. Particularly striking is the decline in output during the Great Depression of the 1930s, followed by the sharp increase in output during World War II (1939–45). But the figure shows many more moderate fluctuations in output as well.

Slowdowns in economic growth are called *recessions* or *contractions*; particularly severe economic slowdowns, like the one that began in 1929, are called *depressions*. In Australia, major recessions occurred in the early 1980s and the early 1990s (find those recessions in Figure 1.4). During recessions economic opportunities decline: jobs are harder to find, people with jobs are less likely to get wage increases, profits are lower and more companies go out of business. Recessions are particularly hard on economically disadvantaged people, who are most likely to be thrown out of work and have the hardest time finding new jobs.

Sometimes the economy grows unusually quickly. These periods of rapid economic growth are called *expansions*, and particularly strong expansions are called *booms*. During an expansion, jobs are easier to find, more people get raises and promotions, and most businesses thrive.

The alternating cycle of recessions and expansions raises some questions that are central to macroeconomics. What causes these short-term fluctuations in the rate of economic growth? Can government policymakers do anything about them? Should they try? These questions are discussed further in Chapter 6.

1.1.4 UNEMPLOYMENT

The *unemployment rate*, the fraction of people who would like to be employed but can't find work, is a key indicator of the state of the labour market. When the unemployment rate is high, work is hard to find, and people who do have jobs typically find it harder to get promotions or wage increases.

Figure 1.6 shows the unemployment rate in Australia since 1967. Unemployment rises during recessions; note the spikes in unemployment during the recessions of the early 1980s and early 1990s. But even in the so-called good times, such as the late 1960s and the 2000s, some people are unemployed. Why does unemployment rise so sharply during periods of recession? And why are there always unemployed people, even when the economy is booming?

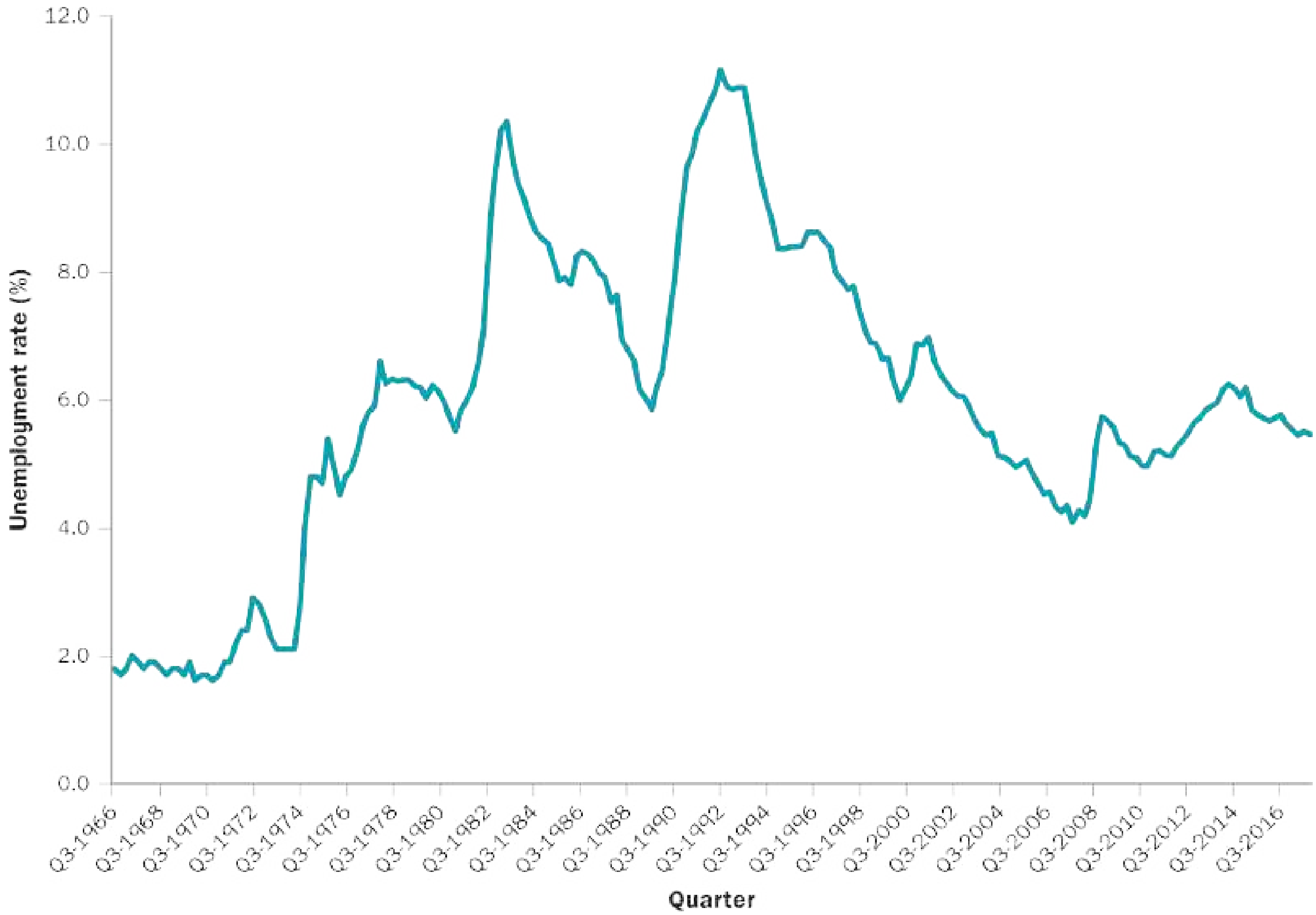

Figure 1.6 **Australian unemployment rate**

Source: OECD, 'Harmonized unemployment rate: Total: All persons for Australia', Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/LRHUTTTTAUQ156S, accessed 25 September 2018.

EXAMPLE 1.2 – UNEMPLOYMENT AND RECESSIONS

By how much did unemployment increase during the

recessions of the early 1980s and early 1990s?

Using data on the national unemployment rate, find the increase in the unemployment rate between the onset of recession in, respectively, August 1981 and July 1989 and the peak unemployment rate in the following years.

Unemployment data can be obtained from the ABS (2018a). Data from the ABS website yield the following comparisons.

UNEMPLOYMENT RATE AT THE BEGINNING OF RECESSION (%)	PEAK UNEMPLOYMENT RATE (%)	INCREASE IN UNEMPLOYMENT RATE (% POINTS)
5.8 (August 1981)	10.5 (July 1983)	+4.7
6.1 (July 1989)	11.2 (December 1992)	+5.1

Unemployment increased significantly following the onset of each recession. In comparison, during the Great Depression the unemployment rate rose from about 7 per cent in 1929 to about 20 per cent in 1932 (Gruen & Clark 2009). Clearly, the 13-percentage point change in the unemployment rate that Australians experienced in the Great Depression dwarfs the effects of more recent post-war recessions.

One question of great interest to macroeconomists is why unemployment rates sometimes differ markedly from country to country. During the 1980s and 1990s, unemployment rates in western Europe were more often than not measured in the 'double digits'. On average, more than 10 per cent of the European workforce was out of a job during that period, a rate roughly double that in the United States. (For comparison, the Australian unemployment rate averaged 8.2 per cent over the 1980s and 1990s.) The high unemployment was particularly striking, because during the 1950s and 1960s, European unemployment rates were generally much lower than those elsewhere. Most recently, from 2010 to 2016 (following the Global Financial Crisis), the euro area's unemployment rate has been close to or in the 'double digits', with dramatic differences between countries within the common currency area. What explains these differences in the unemployment rate in different countries at different times? The measurement of unemployment will be discussed further in the next chapter.

CONCEPT CHECK 1.1

Find the most recent unemployment rates for Australia, France, Germany, Spain and the United Kingdom, and compare them to the most recent unemployment rate for the United States. A useful source is the home page of the Organization for Economic Cooperation and Development (OECD), an organisation of industrialised countries (www.oecd.org). See also the OECD's publication *Main economic indicators.* Is unemployment still lower in the United States than in western Europe and Australia?

1.1.5 INFLATION

Another important economic statistic is the rate of *inflation*, which is the rate at which prices in general are increasing over time. As we will discuss in Chapter 3, inflation imposes a variety of costs on the economy. And when the inflation rate is high, people on fixed incomes, such as pensioners who receive a fixed dollar payment each month, can't keep up with the rising cost of living.

In recent years, inflation has been relatively low in many countries including Australia and the United States, but that has not always been the case (see Figure 1.7 for data on inflation in four countries going back to the 1950s). During the 1970s, inflation was a major problem; in fact, many people told poll-takers that inflation was 'public enemy number one'. Why was inflation high in the 1970s, and why is it relatively low today? What difference does it make to the average person?

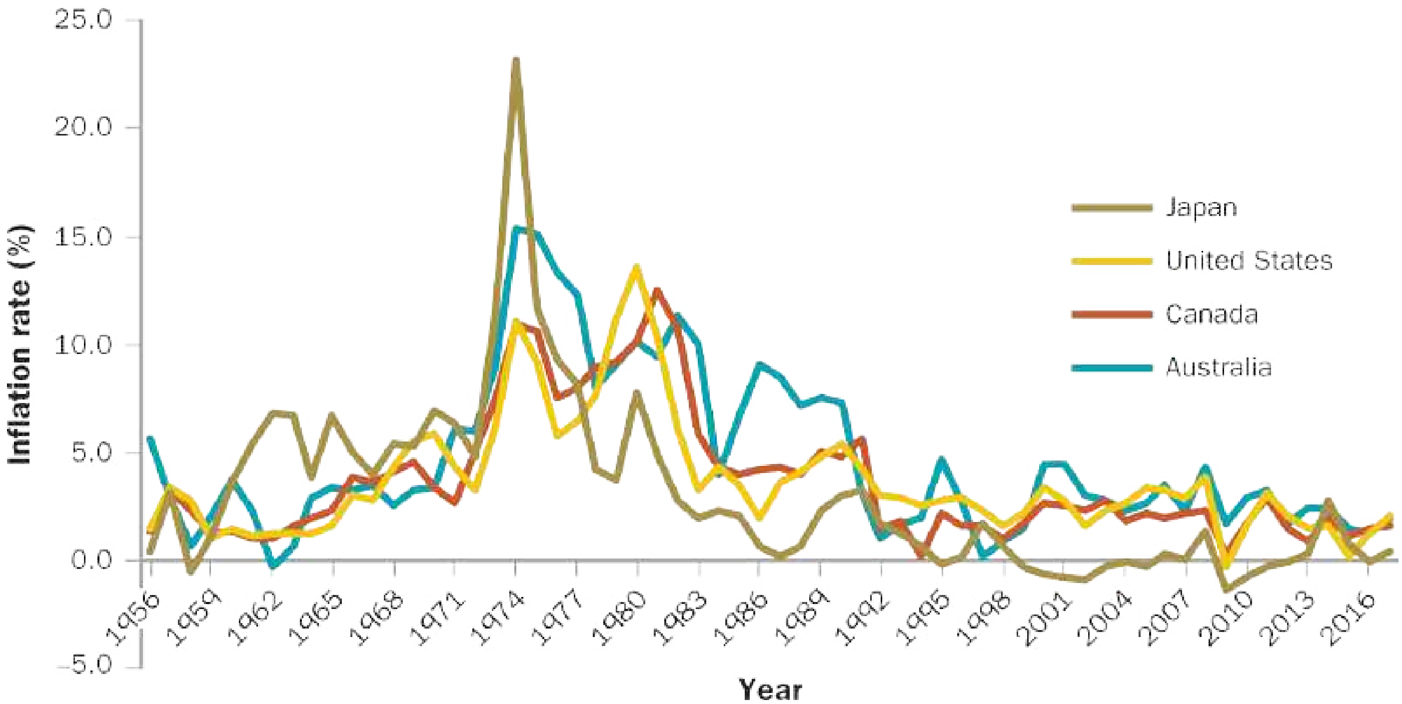

Figure 1.7 **Selected inflation rates 1956–2016**

Source: OECD n.d. 'Main economic indicators G20 – CPI All items', https://stats.oecd.org/viewhtml.aspx?datasetcode=G20_PRICES&lang=en#.

Figure 1.7 also shows that the rate of inflation can differ markedly Page 13 from country to country. Japan, for example, had relatively high inflation in the 1970s but inflation was very low, and even negative, in the 2000s. Sometimes, the differences are dramatic. For example, during the 1990s, the inflation rate averaged 3 per cent per year in countries such as the United States, but the nation of Ukraine averaged over 400 per cent annual inflation for the whole decade. And in 2008, when annual inflation in the United States was less than 4 per cent, inflation in Zimbabwe was estimated in the hundreds of millions, and then billions, of per cent, and quickly rising! What accounts for such large differences in inflation rates between countries?

Inflation and unemployment are often linked in policy discussions. One reason for this linkage is the oft-heard argument that unemployment can be reduced only at the cost of higher inflation and that inflation can be reduced only at the cost of higher unemployment. Must the government accept a higher rate of inflation to bring down unemployment, and vice versa?

1.1.6 ECONOMIC INTERDEPENDENCE AMONG NATIONS

National economies do not exist in isolation but are increasingly interdependent. Australia, for example, in 2017, exported 21 per cent of the goods and services it produces, up from a figure of 13 per cent in 1960. The corresponding figures for the Republic of Korea are 43.1 per cent (2017) and 2.6 per cent (1960); for Indonesia 20.4 per cent (2017) and 11.5 per cent (1960); and for China, 19.8 per cent (2017) and 4.3 per cent (1960) (World Bank 2018).

Sometimes international flows of goods and services become a matter of political and economic concern. For example, some politicians maintain that low-priced imports threaten the farming and manufacturing jobs of their constituents. Are free trade agreements, in which countries agree not to tax or otherwise block the international flow of goods and services, a good or bad thing?

A related issue is the phenomenon of *trade imbalances*, which occur when the quantity of goods and services that a country sells abroad (its *exports*) differs significantly from the quantity of goods and services its citizens buy from abroad (its *imports*). Figure 1.8 shows Australian exports and imports since 1959, measured as a percentage of the economy's total output. Note the many instances where imports into Australia have outstripped exports, creating a situation called a *trade deficit*. Other countries—China, for example—most times export much more than they import. A country such as China is said to have a *trade surplus*. What causes trade deficits and surpluses? Are they harmful or helpful?

Figure 1.8 **Exports and imports as a share of Australian output**

Source: OECD, 'Main economic indicators – complete database', Main Economic Indicators (database), http://dx.doi.org/10.1787/data-00052-en, accessed 28 September 2018.

▹▹ RECAP

- Over the last century, the industrialised nations have experienced remarkable economic growth and improvements in living standards. Macroeconomists study the reasons for this extraordinary growth and try to understand why growth rates vary markedly among nations.

- Average labour productivity, or output per employed worker (or per hour worked), is a crucial determinant of living standards. Macroeconomists ask: What causes slowdowns and speedups in the rate of productivity growth?
- Economies experience periods of slower growth (recessions) and more rapid growth (expansions). Macroeconomists examine the sources of these fluctuations and the government policies that attempt to moderate them.
- The unemployment rate is the fraction of people who would like to be employed but can't find work. Unemployment rises during recessions, but there are always unemployed people even during good times. Macroeconomists study the causes of unemployment, including the reasons why it sometimes differs markedly across countries.
- The inflation rate is the rate at which prices in general are increasing over time. Questions macroeconomists ask about inflation include: Why does inflation vary over time and across countries? Must a reduction in inflation be accompanied by an increase in unemployment, or vice versa?
- Modern economies are highly interdependent. Related issues studied by macroeconomists include the desirability of free trade agreements and the causes and effects of trade imbalances.

1.2 MACROECONOMIC POLICY

LO 1.2

We have seen that macroeconomists are interested in why different countries' economies perform differently and why a particular economy may perform well in some periods and poorly in others. Although many factors contribute to economic performance, government policy is surely among the most important. Understanding the effects of various policies and helping government officials develop better policies are important objectives of macroeconomists.

1.2.1 TYPES OF MACROECONOMIC POLICY

We defined macroeconomic policies as government policies that affect the performance of the economy as a whole, as opposed to the market for a particular good or service. There are three major types of macroeconomic policy: *monetary policy*, *fiscal policy* and *structural policy*.

The term **monetary policy** refers to the determination of the nation's money supply. (Cash and coin are the basic forms of money, although as we will see, modern economies have other forms of money as well.) For reasons that we will discuss in later chapters, most economists agree that changes in the money supply affect important macroeconomic variables, including national output, employment, interest rates, inflation, stock prices and the international value of the dollar. In virtually all countries, monetary policy is controlled by a government institution called the *central bank*. The Reserve Bank is the central bank of Australia.

Fiscal policy refers to decisions that determine the government's budget, including the amount and composition of government expenditures and government revenues. The balance between government spending and taxes is a particularly important aspect of fiscal policy. When government officials spend more than they collect in taxes, the government runs a *deficit*, and when they spend less, the government's budget is in *surplus*. As with monetary policy, economists generally agree that fiscal policy can have important effects on the overall performance of the economy. For example, many economists believe that large deficits run by the federal government can be harmful to the nation's economy. Likewise, many would say that the balancing of the federal budget can contribute to strong economic performance. Since the Global Financial Crisis, the federal budget in Australia has been in deficit.

Finally, the term **structural policy** refers to government policies aimed at changing the underlying structure, or institutions, of the nation's economy. Structural policies come in many forms, from minor tinkering, to moves towards freer international trade, to ambitious overhauls of the entire economic system. The move away from government control of the economy and towards a more market-oriented approach in many formerly communist countries, such as Poland, the Czech Republic and Hungary, is a large-scale example of structural policy. Many developing countries have tried similar structural reforms. Supporters of structural policy hope that, by changing the basic characteristics of the economy or by remaking its institutions, they can stimulate economic growth and improve living standards.

CONCEPT CHECK 1.2

The Australian Treasury is the government department that is charged with monitoring and projecting the federal government's surpluses or deficits. From the Treasury's home page (www.treasury.gov.au), find the most recent value of the federal government's surplus or deficit as a proportion of gross domestic product and the Treasury's projected values for the next three years. How do you think these figures are likely to affect parliament's deliberations on taxation and government spending?

1.2.2 POSITIVE VERSUS NORMATIVE ANALYSES OF MACROECONOMIC POLICY

Macroeconomists are frequently called upon to analyse the effects of a proposed policy. For example, if parliament is debating a tax cut, economists in the Treasury may be asked to prepare an analysis of the likely effects of the tax cut on the overall economy, as well as on specific industries, regions or income groups. An objective analysis aimed at determining only the economic consequences of a particular policy—not whether those consequences are desirable—is called a **positive analysis**. In contrast, a **normative analysis** includes recommendations on whether a particular policy *should* be implemented. While a positive analysis is supposed to be objective and scientific, a normative analysis involves the *values* of the person or organisation doing the analysis—conservative, liberal or middle-of-the-road.

While pundits often joke that economists cannot agree among themselves, the tendency for economists to disagree is exaggerated. When economists do disagree, the controversy often centres on normative judgements (which relate to economists' personal values) rather than on positive analysis (which reflects objective knowledge of the economy). For example, liberal and conservative economists might agree that a particular tax cut would increase the incomes of the relatively wealthy (positive analysis). But they might vehemently disagree on whether the policy *should* be enacted, reflecting their personal views about whether wealthy people deserve a tax break (normative analysis).

The next time you hear or read about a debate over economic issues, try to determine whether the differences between the two positions are primarily *positive* or *normative*. If the debate focuses on the actual effects of the event or policy under discussion, then the disagreement is over positive issues. But if the main question has to do with conflicting personal opinions about the *desirability* of those effects, the debate is normative. The distinction between positive and normative analyses is important, because objective economic research can help to resolve differences over positive issues. When people differ for normative reasons, economic analysis is of less use.

CONCEPT CHECK 1.3

Which of the following statements are positive and which are normative? How can you tell?

a) A tax increase is likely to lead to lower interest rates.
b) Congress should increase taxes to reduce the inappropriately high level of interest rates.
c) A tax increase would be acceptable if most of the burden fell on those with incomes over $100 000.
d) Higher tariffs (taxes on imports) are needed to protect American jobs.
e) An increase in the tariff on imported steel would increase employment of American steelworkers.

▹▹ RECAP

Macroeconomic policies affect the performance of the economy as a whole. The three types of macroeconomic policy are monetary policy, fiscal policy and structural policy. *Monetary policy*, which in Australia is under the control of the Reserve Bank, refers to the determination of the nation's money supply. *Fiscal policy* involves decisions about the government budget, including its expenditures and tax collections. *Structural policy* refers to government actions to change the underlying structure or institutions of the economy. Structural policy can range from minor tinkering to a major overhaul of the economic system, as with the formerly communist countries that converted to market-oriented systems.

The analysis of a proposed policy can be positive or normative. A *positive analysis* addresses the policy's likely economic consequences but not whether those consequences are desirable. A *normative analysis* addresses the question of whether a proposed policy *should* be used. Debates about normative conclusions inevitably involve personal values and thus generally cannot be resolved by objective economic analysis alone.

1.3 AGGREGATION

LO 1.3

There is an important difference between *macroeconomics*, the study of national economies, and *microeconomics*, the study of individual economic entities, such as households and firms, and the markets for specific goods and services. The main difference between the fields is one of perspective: macroeconomists take a 'bird's-eye view' of the economy, ignoring the fine details to understand how the system works as a whole. Microeconomists work instead at 'ground level', studying the economic behavior of individual households, firms and markets. Both perspectives are useful, indeed essential, to understanding what makes an economy work.

Although macroeconomics and microeconomics take different perspectives on the economy, the basic tools of analysis are much the same. In the chapters to come you will see that macroeconomists apply the same principles as microeconomists in their efforts to understand and predict economic behaviour. Even though a national economy is a much bigger entity than a household or even a large firm, the choices and actions of individual decision-makers ultimately determine the performance of the economy as a whole. So, for example, to understand saving behaviour at the national level, the macroeconomist must first consider what motivates an individual family or household to save.

CONCEPT CHECK 1.4

Which of the following questions would be studied primarily by macroeconomists? By microeconomists? Explain.

a) Does increased government spending lower the unemployment rate?

b) Does Google's dominance of internet searches harm consumers?

c) Would a school voucher program improve the quality of education? (Under a voucher program, parents are given a fixed amount of government aid, which they may use to send their children to any school, public or private.)

Page 17

d) Should government policymakers aim to reduce inflation still further?

e) Why is the average rate of household saving low in Australia?

f) Does the increase in the number of consumer products being sold over the internet threaten the profits of conventional retailers?

While macroeconomists use the core principles of economics to understand

and predict individual economic decisions, they need a way to relate millions of individual decisions to the behaviour of the economy as a whole. One important tool they use to link individual behaviour to national economic performance is **aggregation**, the adding up of individual economic variables to obtain economy-wide totals.

For example, macroeconomists don't care whether consumers drink Pepsi or Coke, go to the movie theatre or download HD videos, or ride a motorcycle or a bicycle. These individual economic decisions are the province of microeconomics. Instead, macroeconomists add up consumer expenditures on all goods and services during a given period to obtain *aggregate*, or total, consumer expenditure. Similarly, a macroeconomist would not focus on plumbers' wages versus electricians' but would concentrate instead on the average wage of all workers. By focusing on aggregate variables, like total consumer expenditures or the average wage, macroeconomists suppress the mind-boggling details of a complex modern economy to see broad economic trends.

EXAMPLE 1.3 – AGGREGATION (PART 1): CRIME STATISTICS

Is crime in Australia getting better or worse?

To illustrate not only why aggregation is needed, but also some of the problems associated with it, consider an issue that is only partly economic: crime. Suppose policymakers want to know whether *in general* the problem of crime is getting better or worse. How could an analyst obtain a statistical answer to that question?

Police keep detailed records of the crimes reported in their jurisdictions, so in principle a researcher could determine precisely how many bag snatchings occurred last year on Melbourne's streets and compare this to the situation in Sydney. But data on the number of crimes of each type in each jurisdiction would produce stacks of computer output. Is there a way to add up, or aggregate, all the crime data to get some sense of the national trend?

The ABS uses aggregation to obtain national *crime rates*, which are typically expressed as the number of 'serious' crimes committed per 100 000 population. For example, the ABS reported that in 2016–17, some 414 000 serious crimes occurred in Australia (2018b), equal to 1949 crimes per 100 000 people. This rate represented a small drop from the crime rate in 2013–14, which was about 2020 crimes per 100 000 people. So aggregation (the adding up of many different crimes into a national index) indicates that, in general, serious crime decreased somewhat in Australia between 2013–14 and 2016–17.

Although aggregation of crime statistics reveals the 'big picture', it may obscure important details. The crime index lumps together relatively minor crimes such as disorderly conduct with very serious crimes such as murder and sexual assault. All people would agree that murder and sexual assault do far more damage than a minor crime, so adding together these two very different types of crimes might give a false picture of crime in Australia. For example, although Australia's crime rate fell between 2016–17 and 2013–14, the murder rate barely changed at all. Because murder is the most serious of crimes, the reduction in crime between 2013–14 and 2016–17 was perhaps less significant than the change in the overall crime rate indicates. This loss of detail is a cost of aggregation, the price analysts pay for the ability to look at broad social or economic trends.

EXAMPLE 1.4 – AGGREGATION (PART 2): EXPORTS

How can we add together coal with education?

Australia exports a wide variety of products and services to many different countries, iron ore, coal and education services among others. Suppose macroeconomists want to compare the total quantities of Australian-made goods and services sold to various regions of the world. How could such a comparison be made?

Economists can't add tonnes of coal, bags of wheat and the teaching that is done to international students—the units aren't comparable. But they can add the *dollar values* of each—the revenue miners earned from foreign coal sales, the student fees paid to Australian universities and so on. By comparing the dollar values of Australian exports to Europe, Asia, Africa and other regions in a particular year, economists are able to determine which regions are the biggest customers for Australian-made goods.

▹▹ RECAP

Macroeconomics, the study of national economies, differs from microeconomics, the study of individual economic entities (such as households and firms) and the markets for specific goods and services. Macroeconomists take a 'bird's-eye view' of the economy. To study the economy as a whole, macroeconomists make frequent use of aggregation, the adding up of individual economic variables to obtain economy-wide totals. For example, a macroeconomist is more interested in the determinants of total exports, as measured by total dollar value, than in the factors that determine the exports of specific goods. A cost of aggregation is that the fine details of the economic situation are often obscured.

1.4 STUDYING MACROECONOMICS: A PREVIEW

This chapter introduced many of the key issues of macroeconomics. In the chapters to come we will look at each of these issues in more detail. We will start with the *measurement* of economic performance, including key variables like the level of economic activity, the extent of unemployment and the rate of inflation. Obtaining quantitative measurements of the economy, against which theories can be tested, is the crucial first step in answering basic macroeconomic questions like those raised in this chapter.

We then consider short-term fluctuations in aggregate economic activity by first providing background on what happens during recessions and expansions, as well as some historical perspective, before discussing one important source of short-term economic fluctuations, variations in aggregate spending. We will also show how, by influencing aggregate spending, fiscal policy may be able to moderate economic fluctuations. The second major policy tool for stabilising the economy, monetary policy, will then be discussed, along with the circumstances under which macroeconomic policymakers may face a short-term trade-off between inflation and unemployment.

Next, we will study economic behaviour over relatively long periods of time. We will examine economic growth and productivity improvement, the fundamental determinants of the average standard of living in the long run. We will then discuss the long-run determination of employment, unemployment and wages, and study saving and its link to the creation of new capital goods, such as factories and machines.

The international dimension of macroeconomics will be highlighted throughout the discussion and is the focus of our final few chapters. We will introduce topics such as exchange rates between national currencies and discuss how they are determined and how they affect the workings of the economy, their relation to the balance between exports and imports, and how macroeconomic policy operates in an economy open to the world.

SUMMARY

- Macroeconomics is the study of the performance of national economies and of the policies governments use to try to improve that performance. Some of the broad issues macroeconomists study are:
  - sources of economic growth and improved *living standards*
  - trends in *average labour productivity*, or output per employed worker
  - short-term fluctuations in the pace of economic growth (recessions and expansions)
  - causes and cures of unemployment and inflation
  - economic interdependence among nations.
- To help explain differences in economic performance among countries, or in economic performance in the same country at different times, macroeconomists study the implementation and effects of macroeconomic policies. *Macroeconomic policies* are government actions designed to affect the performance of the economy as a whole. Macroeconomic policies include *monetary policy* (the determination of the nation's money supply), *fiscal policy* (relating to decisions about the government's budget) and *structural policy* (aimed at affecting the basic structure and institutions of the economy).
- In studying economic policies, economists apply both *positive*

analysis (an objective attempt to determine the consequences of a proposed policy) and *normative analysis* (which addresses whether a particular policy *should* be adopted). Normative analysis involves the values of the person doing the analysis.

- Macroeconomics is distinct from microeconomics, which focuses on the behavior of individual economic entities and specific markets. Macroeconomists make heavy use of *aggregation*, which is the adding up of individual economic variables into economy-wide totals. Aggregation allows macroeconomists to study the ‘big picture’ of the economy, while ignoring fine details about individual households, firms and markets.

KEY TERMS

aggregation 17

average labour productivity 9

fiscal policy 15

macroeconomic policies 7

monetary policy 15

normative analysis 15

positive analysis 15

scarcity principle 7

standard of living 7

structural policy 15

REVIEW QUESTIONS

1. How did the experience of the Great Depression motivate the development of the field of macroeconomics? LO 1.1 **MEDIUM**
2. Generally, how does the standard of living in Australia today compare to the standard of living in other countries? To the standard of living in Australia a century ago? LO 1.1 **MEDIUM**
3. Why is average labour productivity a particularly important economic variable? LO 1.1 **EASY**
4. True or false: Economic growth within a particular country generally proceeds at a constant rate. Explain. LO 1.1 **EASY**
5. True or false: Differences of opinion about economic policy recommendations can always be resolved by objective analysis of the issues. Explain. LO 1.2 **MEDIUM**
6. What type of macroeconomic policy (monetary, fiscal, structural) might include each of the following actions? LO 1.2 **EASY**
   a) A broad government initiative to reduce the country's reliance on agriculture and promote high-technology industries.
   b) A reduction in income tax rates.
   c) Provision of additional cash to the banking system.
   d) An attempt to reduce the government budget deficit by reducing government spending.
   e) A decision by a developing country to reduce government control of the economy and to become more market-oriented.

7. Australian Football League (AFL) statistics, such as the number of kicks, are calculated and reported for each individual player, for each team, and for the league as a whole. What purposes are served by doing this? Relate to the idea of aggregation in macroeconomics. LO 1.3 **HARD**

PROBLEMS

1. Over the next 50 years the Japanese population is expected to decline, while the fraction of the population that is retired is expected to increase sharply. What are the implications of these population changes for total output and average living standards in Japan, assuming that average labour productivity continues to grow? What if average labour productivity stagnates? LO 1.1 **MEDIUM**
2. Is it possible for average living standards to rise during a period in which average labour productivity is falling? Discuss, using a numerical example for illustration. LO 1.1 **HARD**
3. The Australian Bureau of Statistics, or ABS, is a government agency that collects a wide variety of statistics about the economy. From the ABS website (www.abs.gov.au), find data for the most recent year available on Australian exports and imports of goods and services. Is Australia running a trade surplus or deficit? Calculate the ratio of the surplus or deficit to Australian exports. LO 1.1 **EASY**
4. Which of the following statements are positive and which are normative? LO 1.2 **EASY**
   a) If the Reserve Bank raises interest rates, demand for housing is likely to fall.
   b) The Reserve Bank should raise interest rates to keep inflation at an acceptably low level.

- **c)** Share prices are likely to fall over the next year as the economy slows.
- **d)** A reduction in the capital gains tax (the tax on profits made in the stock market) would lead to a 10 to 20 per cent increase in share prices.
- **e)** Parliament should not reduce capital gains taxes without also providing tax breaks for lower-income people.

5. Which of the following would be studied by a macroeconomist? By a microeconomist? LO 1.3 **EASY**

- **a)** The worldwide operations of General Motors.
- **b)** The effect of government subsidies on sugar prices.
- **c)** Factors affecting average wages in the Australian economy.
- **d)** Inflation in developing countries.
- **e)** The effects of tax cuts on consumer spending.

REFERENCES

Australian Bureau of Statistics (ABS) 2018a, 'Labour force, Australia, Jun 2018', Cat. no. 6202.0, www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6202.0Jun%202018?OpenDocument.

Australian Bureau of Statistics (ABS) 2018b, 'Recorded crime—offenders, 2016–17', Cat. no. 4519.0, www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4519.02016-17?OpenDocument.

Bolt J, Inklaar R, de Jong H, Luiten van Zanden J 2018, 'Rebasing "Maddison": New income comparisons and the shape of long-run economic development', Maddison Project working paper 10, Maddison Project Database, version 2018.

Gruen D, Clark C 2009, 'What have we learnt? The Great Depression in Australia from the perspective of today', http://archive.treasury.gov.au/documents/1689/PDF/03_Colin_Clark_speech.pdf.

Organization for Economic Co-operation and Development 2018, 'GDP per hour worked (indicator)', https://data.oecd.org/lprdty/gdp-per-hour-worked.htm, doi: 10.1787/1439e590-en, accessed 28 September 2018.

Organization for Economic Co-operation and Development n.d., 'Harmonized unemployment rate: Total: All persons for Australia', Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/LRHUTTTTAUQ156S, accessed 25 September 2018.

Organization for Economic Co-operation and Development n.d., ‘Main economic indicators G20 – CPI All items’, https://stats.oecd.org/viewhtml.aspx?datasetcode=G20_PRICES&lang=en#.

World Bank 2018, World Bank open data, http://data.worldbank.org.

CHAPTER 2

Measuring economic activity: Gross domestic product and unemployment

After reading this chapter, you should be able to answer the following questions.

2.1 How do economists define an economy's output?

2.2 Can you explain the production, expenditure and income methods for measuring GDP to analyse economic activity?

2.3 How do economists define and compute nominal GDP and real GDP?

2.4 Is there a relationship between real GDP and economic wellbeing?

2.5 How are the unemployment rate, the participation rate and the costs of unemployment calculated?

SETTING THE SCENE

China's economic growth slowed to 6.7 per cent in the second quarter of the year … down from 6.8 per cent in the first quarter of the year to its slowest pace since 2016 (Chalmers 2018).

Australia's GDP growth slipped to 2.4 per cent over 2017.

It is a step-down from the annualised rate of 2.8 per cent recorded in the third quarter, and weaker than market expectations.

It also means that there was no acceleration from 2016 when GDP also grew at 2.4 per cent.

'Growth this quarter was driven by the household sector, with continued strength in household income matched by growth in household consumption,' said Australian Bureau of Statistics chief economist Bruce Hockman (Letts 2018).

News reports like these fill the airwaves and the internet—some TV and radio stations and some websites and blogs carry nothing else. In fact, all kinds of people are interested in how the economy is performing. The average person hopes to learn something that will be useful in a business decision, a financial investment or a career move. The professional economist depends on economic data in much the same way that a doctor depends on a patient's vital signs—pulse, blood pressure and temperature—to make an accurate diagnosis. To understand economic developments and to be able to give useful advice to policymakers, business people and financial investors, an economist simply must have up-to-date, accurate data. Political leaders and policymakers also need economic data to help them in their decisions and planning.

Interest in measuring the economy, and attempts to do so, date back as far as the mid-seventeenth century when Sir William Petty (1623–87) conducted a detailed survey of the land and wealth of Ireland. The British Government's purpose in commissioning the survey was to determine the capacity of the Irish people to pay taxes to the Crown. But Petty used the opportunity to measure a variety of social and economic variables and went on to conduct pioneering studies of wealth, production and population in several other countries. He was a firm believer in the idea that scientific progress depends first and foremost on accurate measurement, an idea that today's economists endorse.

Not until the twentieth century, though, did economic measurement come into its own. World War II was an important catalyst for the development of accurate economic statistics because its outcome was thought to depend on the mobilisation of economic resources. Two economists, Simon Kuznets in the United States and Richard Stone in the United Kingdom, developed comprehensive systems for measuring a nation’s output of goods and services, which were of great help to Allied leaders in their wartime planning. Kuznets and Stone each received a Nobel Prize in economics for their work, which became the basis for the economic accounts used today by almost all the world’s countries.

In this chapter and the next, we will discuss how economists measure three basic macroeconomic variables that arise frequently in analyses of the state of the economy: the gross domestic product (or GDP), the rate of unemployment and the rate of inflation. The focus of this chapter is on the first two of these statistics, GDP and the unemployment rate, which both measure the overall level of economic activity in a country. The third statistic, the inflation rate, covered in the next chapter, measures how fast prices change in a country.

Measuring economic activity might sound like a straightforward and uncontroversial task, but that is not the case. Indeed, the basic measure of a nation’s output of goods and services—the GDP—has been criticised on many grounds. Some critics have complained that GDP does not adequately reflect factors such as the effect of economic growth on the environment or the rate of resource depletion. Because of problems like these, they charge, policies based on GDP statistics are likely to be flawed. Unemployment statistics have also been the subject of some controversy. By the end of this chapter, you will understand how official measures of output and unemployment are constructed and used and will have gained some insight into debates over their accuracy. In particular, you will understand how the statistics are defined and measured, and you will be able to discuss the strengths and limitations of the definitions as well as the measurement difficulties that governments face when turning the definitions into actual, published estimates. You will see, for example, what goes into the calculation of a nation's GDP and, importantly, what is left out. So next time you hear or read about the most recent economic statistics, you will avoid misinterpreting them.

Understanding the strengths and limitations of economic data is the first critical step towards becoming an intelligent user of economic statistics, as well as a necessary background for careful economic analysis in the chapters to come.

References

Chalmers, S 2018, 'China's economic growth cools to its slowest pace since 2016 amid trade tariff tensions', ABC News, 17 July 2018, www.abc.net.au/news/2018-07-16/china-economic-growth-cools-to-its-slowest-pace-since/10000038.

Letts, S 2018, 'Australia's economy grew by 2.4 per cent in 2017, below expectations', ABC News, 7 March 2018, www.abc.net.au/news/2018-03-07/gdp-q4-2017/9522450.

2.1 MEASURING ECONOMIC ACTIVITY: GROSS DOMESTIC PRODUCT AND UNEMPLOYMENT

LO 2.1

Rising long-run living standards and the avoidance of extremes in short-run macroeconomic performance (two indicators of good macroeconomic performance) are usually judged in the context of a nation's **gross domestic product (GDP)** . It seems a very simple concept: GDP refers to the final value of goods and services that are produced in an economy over a particular period. More formally, GDP is defined as the market value of the final goods and services produced in a country during a given period. This is usually taken to be a quarter (three months) or a year.

GDP is one of the most keenly monitored of all macroeconomic indicators. Later in this book, we show you how GDP influences macroeconomic outcomes such as the rate of unemployment and the ability of households to purchase goods and services. Countries with relatively high levels of GDP per person also tend to be countries with high standards of living, not just in material terms but also in broader influences on the quality of life such as life expectancy and access to cultural facilities and opportunities.

BACKGROUND BRIEFING 2.1

Australia’s historical GDP experience

Figure 1.3 in Chapter 1 shows how Australia’s GDP evolved since 1820. The figure shows what is known as ‘real GDP’; this involves an adjustment to the raw GDP figures to remove distortions introduced by inflation (we will deal with this concept in more detail later in this chapter).

The most obvious feature of these data is the tremendous increase in GDP over the period. Most of the increase occurred in the years after the cessation of World War II hostilities (real GDP increased by around 180% over the period from 1901 to 1939; over the period from 1946 to 2011 real GDP increased by around 993%). This is a common experience for industrialised countries; most nations that we would now regard as being relatively well-off owe their prosperity to the historically unprecedented increases in their respective GDPs after World War II.

Looking carefully at the graph reminds us that economic growth is not smooth, particularly when we narrow the time frame over which the economy is studied. The Great Depression of the late 1920s and early 1930s is clearly visible as a reduction in real GDP over that period. One manifestation of the Great Depression was that the economy produced far fewer goods and services than had previously been the case. And, as you can see from the graph, this was associated with a massive fall in GDP. Although in our lifetimes, we have seen nothing even remotely like the Great Depression, economic downturns are still with us. As the graph reveals, the early 1980s and early 1990s were both periods in which there were significant pauses in real GDP growth in Australia. These periods were recessions and, although small relative to the Great Depression, were associated with significant increases in unemployment and economic hardship. You can also detect the slowdown in economic activity associated with the Great Recession in 2009. Understanding why the economy is prone to these short-run slowdowns, and why other periods are more prosperous, is an important part of macroeconomics.

Economists' interest in GDP extends across two different time dimensions: the long run and the short run. Over reasonably short periods of time, say one to four years, GDP can fluctuate quite markedly, growing relatively strongly at times (economic expansions) and relatively sluggishly at other times (economic contractions). Macroeconomists call these fluctuations the **business cycle**. However, over longer periods of time—decades and even centuries—most countries experience reasonably steady growth in their GDP. Understanding this phenomenon is the subject matter of growth economics. In this book, we examine both the business cycle and long-run growth.

Different forces are believed responsible for the short-run fluctuations in GDP that comprise the business cycle and the long-run factors leading to sustained GDP growth. For this reason, macroeconomists usually separate the analysis of short-run business cycle fluctuations from long-run growth issues, and we follow this practice in this book.

2.1.1 GDP: THE FINE PRINT

Let us take the definition of GDP apart and examine each of its parts separately. The first key phrase in the definition is 'market value'.

Market value

To be able to talk about concepts like the 'aggregate output' or 'aggregate production'—as opposed to the production of specific items—economists need to aggregate the quantities of the many different goods and services into a single number. We do so by adding up the market values of the different goods and services the economy produces. A simple example will illustrate the process.

EXAMPLE 2.1 – ORCHARDIA'S GDP: PART I

In the imaginary economy of Orchardia, total production is four apples and six bananas. To find the

total output of Orchardia we could add the number of apples to the number of bananas and conclude that the total output is 10 pieces of fruit. But what if this economy also produced three pairs of shoes? There really is no sensible way to add apples and bananas to shoes.

Suppose we know that apples sell for $0.25 each, bananas for $0.50 each and shoes for $20.00 a pair. Then the market value of this economy’s production, or its GDP, is equal to:

$$\begin{gathered}\textbf{(4 apples} \times \textbf{\$0.25/apple)} + \textbf{(6 bananas} \times \textbf{\$0.50/banana)} \\ + \textbf{(3 pairs of shoes} \times \textbf{\$20.00/pair)} = \textbf{\$64.00}\end{gathered}$$

Notice that when we calculate total output this way, the more expensive items (the shoes) receive a higher weighting than the cheaper items (the apples and bananas). In general, the amount people are willing to pay for an item is an indication of the economic benefit they expect to receive from it. For this reason, higher-priced items should count for more in a measure of aggregate output.

EXAMPLE 2.2 – ORCHARDIA'S GDP: PART II

Suppose Orchardia were to produce three apples, three bananas and four pairs of shoes at the same prices as in the preceding text. What is its GDP now?

Now the Orchardian GDP is equal to:

$$\begin{gathered}\mathbf{(3\ apples \times \$0.25/apple) + (3\ bananas \times \$0.50/banana)} \\ \mathbf{+ (4\ pairs\ of\ shoes \times \$20.00/pair) = \$82.25}\end{gathered}$$

Notice that the Orchardian GDP is higher in Example 2.2 than in the previous example, even though two of the three goods (apples and bananas) are being produced in smaller quantities than before. The reason is that the good whose production has increased (shoes) is much more valuable than the goods whose production has decreased (apples and bananas).

CONCEPT CHECK 2.1

Suppose Orchardia produces the same quantities of the three goods as originally at the same prices. In addition, it produces five oranges at $0.30 each. What is the GDP of Orchardia now?

Market values provide a convenient way to add together, or aggregate, the many different goods and services produced in a modern economy. A drawback of using market values is that not all economically valuable goods and services are bought and sold in markets. For example, the unpaid work of a homemaker, although it is of economic value, is not sold in markets and so is not counted in GDP. However, paid housekeeping and childcare services, which are sold in markets, do count. This distinction can create some pitfalls, as Example 2.3 shows.

EXAMPLE 2.3 – WOMEN’S LABOUR FORCE PARTICIPATION AND GDP MEASUREMENT

The percentage of adult Australian women working outside the home has increased in the past five decades, from around 40 per cent in 1966 to over 70 per cent in 2017 (see Figure 2.1). These figures are known as the ‘female labour force participation rate’.

They are calculated by looking at the proportion of adult women who are either in employment or who are unemployed but actively seeking work. This trend has led to a substantial increase in the demand for paid childcare and housekeeping services, as families require more help at home. How have these changes affected measured GDP?

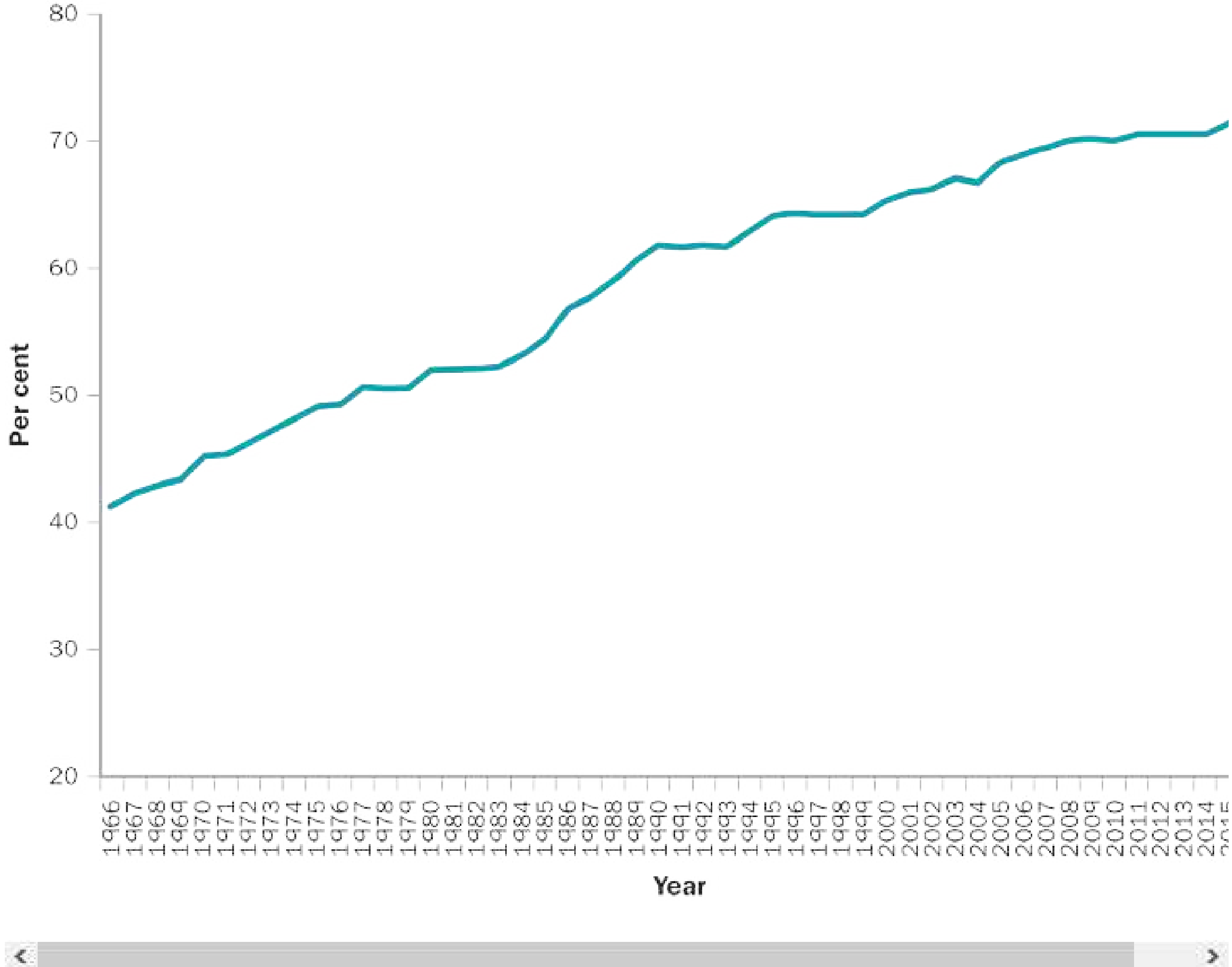

Figure 2.1 **Female labour force participation, Australia**

Source: OECD 2018, 'LFS by sex and age – indicators', https://stats.oecd.org/Index.aspx?DataSetCode=LFS_SEXAGE_I_R#.

The entry of many women into the labour market has raised measured GDP in two ways. First, the goods and services that women produce in their new jobs have contributed directly to increasing GDP. Second, the fact that paid workers took over previously unpaid housework and childcare duties has increased measured GDP by the amount paid to those workers. The first of these two changes represent a genuine increase in economic activity, but the second reflects a transfer of existing economic activities from the unpaid sector to the market sector. Overall, the increase in measured GDP associated with increased participation in the labour force by women probably overstates the actual increase in economic activity.

With a few exceptions, like goods and services provided by government agencies, GDP is calculated by adding up market values. (As market prices for publicly provided goods and services do not exist, economic statisticians add to the GDP the *costs* of providing those goods and services as rough measures of their economic value. For example, to include public education in the GDP, the statisticians add to GDP the salaries of teachers and administrators, the costs of textbooks and supplies and the like. Similarly, the economic value of the national defence establishment is approximated, for the purposes of measuring GDP, by the *costs* of defence: the pay earned by soldiers and sailors, the costs of acquiring and maintaining weapons and so on.) However, not all goods and services that have a market value are counted in GDP. As we will see next, GDP includes only those goods and services that are the end products of the production process, called 'final goods and services'. Goods and services that are used up in the production process are not counted in GDP.

THINKING AS AN ECONOMIST 2.1

What explains the trend illustrated in Figure 2.1?

In a world governed only by economic principles—without social conventions, customs or traditions—homemaking tasks like cleaning, cooking and child-rearing would be jobs like any other. As such, they would be subject to the principle of **comparative advantage** : those people (either men or women) who are relatively more efficient in performing homemaking tasks would specialise in them, freeing people whose comparative advantage lies elsewhere to work outside the home; homemaking tasks would be done by those with the lowest opportunity cost in those tasks. In such a world, to see a woman with a medical degree doing housework would be very unusual—her **opportunity cost** of doing housework would be too high; in this case, the opportunity cost is the forgoing of opportunities to practise medicine.

Of course, we do not live in a world driven only by economic considerations. Traditionally, the social custom has severely limited the economic opportunities of women (and in some societies still does). However, social restrictions on women have weakened considerably over the past century, particularly in the industrialised countries, as a result of the increased educational attainment of women, the rise of the feminist movement and other factors. As traditional social restraints on women have loosened, domestic arrangements have moved in the direction dictated by comparative advantage—to an increasing degree, homemaking tasks are now performed by paid specialists, while the majority of women (and men) work outside the home.

2.1.2 FINAL GOODS AND SERVICES

Many goods are used in the production process. Before a baker can produce a loaf of bread, grain must be grown and harvested, then the grain must be ground into flour and, together with other ingredients, baked into bread. Of the three major goods that are produced during this process—the grain, the flour and the bread—only the bread is used by consumers. Because producing the bread is the ultimate purpose of the process, the bread is called a 'final good'. In general, **final goods or services** are the end products of a process, the products or services that consumers actually use. The goods or services produced on the way towards making the final product—here, the grain and the flour—are called **intermediate goods or services**.

Since GDP measures only those items that are of direct economic value, only final goods and services are included in GDP. Intermediate goods and services are not included. To illustrate, suppose that the grain from the previous example has a market value of $0.50 (the price the milling company paid for the grain). The grain is then ground into flour, which has a market value of

$1.20 (the price the baker paid for the flour). Finally, the flour is made into a loaf of bread, worth $2.00 at the local store. In calculating the contribution of these activities to GDP, would we want to add together the values of the grain, the flour and the bread? No, because the grain and flour are intermediate goods, valuable only because they can be used to make bread. Therefore, in this example, the total contribution to GDP is $2.00, the value of the loaf of bread, the final product.

Example 2.4 illustrates the same distinction but this time with a focus on services.

EXAMPLE 2.4 – THE HAIRDRESSER AND THEIR ASSISTANT

Your hairdresser charges $30 for a haircut. In turn, the hairdresser pays their assistant $6 per haircut in return for sharpening the scissors, sweeping the floor and other chores. For each haircut given, what is the total contribution of the hairdresser and their assistant, taken together, to GDP?

The answer to this problem is $30: the price, or market value, of the haircut. The haircut is counted in GDP because it is the final service: the one that actually has value to the final user. The services provided by the assistant have value only because they contribute to the production of the haircut; thus they are not counted in GDP.

We have established the rule that only final goods and services are counted in GDP. Intermediate goods and services, which are used up in the production of final goods and services, are not counted. In practice, this rule is not easy to apply, because the production process often stretches over several periods. To illustrate, recall the earlier example of the grain that was milled into flour, which in turn was baked into a loaf of bread. The contribution of the whole process to GDP is $2.00, the value of the bread (the final product). Suppose, though, that the grain and the flour were produced near the end of 2018 and the bread was baked early the next year, in 2019. In this case, should we attribute the $2.00 value of the bread to the GDP for the year 2018 or to the GDP for the year 2019?

Neither choice seems quite right since part of the bread's production process occurred in each year. Part of the value of the bread should probably be counted in the year 2018 GDP and part in the year 2019 GDP. But how should we make the split? To deal with this problem, economists determine the market value of final goods and services indirectly, by adding up the value added by each firm in the production process. The value added by any firm equals the market value of its product or service minus the cost of inputs purchased from other firms. As we will see, summing the **value added** by all firms (including producers of both intermediate and final goods and services) gives the same answer as simply adding together the value of final goods and services. However, the value-added method eliminates the problem of dividing the value of a final good or service between two periods.

To illustrate this method, let us revisit the example of the loaf of bread, which is the result of multiple stages of production. We have already determined that the total contribution of this production process to GDP is $2.00, the value of the bread. Let us show now that we can get the same answer by summing value added. Suppose that the bread is the ultimate product of three corporations: ABC Grain Company produces the grain, General Flour produces the flour and Hot 'n' Fresh Baking produces the bread. If we make the same assumptions as before about the market value of the grain, the flour and the bread, what is the value added by each of these three companies?

ABC Grain Company produces $0.50 worth of grain, with no inputs from other companies, so ABC's value added is $0.50. General Flour uses $0.50 worth of grain from ABC to produce $1.20 worth of flour. The value added by General Flour is thus the value of its product ($1.20) less the cost of purchased inputs ($0.50), or $0.70. Finally, Hot 'n' Fresh Baking buys $1.20 worth of flour from General Flour and uses it to produce $2.00 worth of bread. So the value added by Hot 'n' Fresh is $0.80. These calculations are summarised in Table 2.1.

TABLE 2.1 Value added in bread production

COMPANY	REVENUES	−	COST OF PURCHASED INPUTS	=	VALUE ADDED
ABC Grain	$0.50		$0.00		$0.50
General Flour	$1.20		$0.50		$0.70
Hot 'n' Fresh	$2.00		$1.20		$0.80
Total					**$2.00**

You can see that summing the value added by each company gives the same contribution to GDP—$2.00—as the method based on counting final goods and services only. Basically, the value added by each firm represents the portion of the value of the final good or service that the firm creates in its stage of production. Summing the value added by all firms in the economy yields the total value of final goods and services, or GDP.

You can also see how the value-added method solves the problem of production processes that bridge two or more periods. Suppose that the grain and flour are produced during 2018 but the bread is not baked until 2019. Using the value-added method, the contribution of this production process to the year 2018 GDP is the value added by the grain company plus the value added by the flour company, or $1.20. The contribution of the production process to the year 2019 GDP is the value added by the baker, which is $0.80. Thus part of the value of the final product, the bread, is counted in the GDP for each year, reflecting the fact that part of the production of the bread took place in each year.

CONCEPT CHECK 2.2

Amy’s card shop receives a shipment of Valentine’s Day cards in December 2018. Amy pays the wholesale distributor of the cards a total of $500. In February 2019 she sells the cards for a total of $700. What are the contributions of these transactions to GDP in the years 2013 and 2014?

EXAMPLE 2.5 – A GOOD THAT CAN BE EITHER INTERMEDIATE OR FINAL

What is an intermediate good?

Farmer Chin produces $100 worth of milk. She sells $40 worth of milk to her neighbours and uses the rest to feed her pigs, which she sells to her neighbours for $120. What is Farmer Chin's contribution to the GDP?

The final goods in this example are the $40 worth of milk and the $120 worth of pigs sold to the neighbours. Adding $40 and $120, we get $160, which is Farmer Chin's contribution to the GDP. Note that part of the milk Farmer Chin produced serves as an intermediate good and part as a final good. The $60 worth of milk that is fed to the pigs is an intermediate good and so it is not counted in GDP. The $40 worth of milk sold to the neighbours is a final good and so it is counted.

A special type of good that is difficult to classify as intermediate or final is a **capital good**. A capital good is a long-lived good, which is itself produced and used to produce other goods and services. Factories and machines are examples of capital goods. Houses and apartment buildings, which produce dwelling services, are also a form of capital good. Capital goods do not fit the definition of final goods since their purpose is to produce other goods. On the other hand, they are not used up during the production process, except over a very long period, so they are not exactly intermediate goods either. For purposes of measuring GDP, economists have agreed to classify newly produced capital goods as final goods. Otherwise, a country that invested in its future by building modern factories and buying new machines would be counted as having a lower GDP than a country that devoted all its resources to producing consumer goods.

2.1.3 PRODUCED WITHIN A COUNTRY DURING A GIVEN PERIOD

The word 'domestic' in the term 'gross domestic product' tells us that GDP is a measure of economic activity within a given country. Thus, only production that takes place within the country's borders is counted. For example, Australia's GDP includes the market value of all food products produced within Australian borders, even if they are made in foreign-owned processing plants. However, food products produced in New Zealand by an Australian-based company like SPC Ardmona would not be counted in Australia's GDP.

What about food products that are produced in Australia from ingredients sourced In New Zealand? The *value-added* method introduced earlier could again be used to suggest an answer. Recall that we used this method to divide the market value of a product that was produced over two years into its contribution to the GDP of each of the years. Similarly, we can use this method to divide the value of a product that was produced in part in two different countries into its contribution to each country's GDP. Revisiting our loaf of bread example, suppose now that ABC Grain Company produced the grain in New Zealand. General Flour buys $0.50 worth of grain from ABC in New Zealand, imports it to Australia, and uses it to produce $1.20 worth of flour (in Australia). Finally, Hot'n'Fresh Baking buys $1.20 worth of flour from General Flour and uses it to produce $2.00 worth of bread (in Australia). Using the value-added method, Table 2.1 suggests that the total value of the bread, $2.00, is divided across the two countries' GDPs: $0.50 is included in New Zealand's GDP (the value of the grain produced in New Zealand) and $1.50 is included in Australia's GDP (the value added in Australia).

We have seen that GDP is intended to measure the amount of production that occurs during a given period, such as the calendar year. For this reason, only goods and services that are actually produced during a particular year are included in the GDP for that year. Example 2.6 and Concept Check 2.3 demonstrate this point.

EXAMPLE 2.6 – THE SALE OF A HOUSE AND GDP

Does the sale of an existing home count in GDP?

A 20-year-old house is sold to a young family for $200 000. The family pays the real estate agent a 6 per cent commission, or $12 000. What is the contribution of this transaction to GDP?

Because the house was not produced during the current year, its value is not counted in this year's GDP. (The value of the house was included in the GDP 20 years earlier, the year the house was built.) In general, purchases and sales of existing assets, such as old houses or used cars, do not contribute to the current year's GDP. However, the $12 000 fee paid to the real estate agent represents the market value of the agent's services in helping the family find the house and make the purchase. Since those services were provided during the current year, the agent's fee is counted in current-year GDP.

CONCEPT CHECK 2.3

Lotta Doe sells 100 shares of stock in Benson Buggywhip for $50 per share. She pays her broker a 2 per cent commission for executing the sale. How does Lotta's transaction affect the current-year GDP?

2.2 METHODS FOR MEASURING GDP

LO 2.2

GDP is a measure of the quantity of goods and services *produced* by an economy. But any good or service that is produced will also be *purchased* and used by some economic agent—a consumer buying Christmas gifts or a firm investing in new machinery, for example. For many purposes, knowing not only how much is produced, but who uses it and how, is important. (Goods that are produced but not sold in a period are called 'inventories'. By convention, economists regard these unsold goods as having been purchased by the firms that produced them.) Economic statisticians divide the users of the final goods and services that make up the GDP for any given period into four categories: households, firms, governments and the foreign sector (i.e. foreign purchasers of domestic products). They assume that all the final goods and services that are produced in a country in a given period will be purchased and used by members of one or more of these four groups. Furthermore, the amounts that purchasers spend on various goods and services should be equal to the market values of those goods and services. As a result, GDP can be measured with equal accuracy by either of two methods (see Section 2.2.2 for discussion of the third method):

1. adding up the market values of all the final goods and services that are produced domestically
2. adding up the total amount spent by each of the four groups on final goods

and services and subtracting spending on imported goods and services.

Corresponding to the four groups of final users are four components of expenditure: **consumption expenditure**, **investment**, **government purchases** and **net exports**. That is, households consume, firms invest, governments make government purchases (consumption and investment) and the foreign sector buys the nation's exports. Table 2.2 gives the dollar values for each of these components for the Australian economy over the financial year 2016–17. As the table shows, GDP for Australia in 2016–17 was about $1692 billion, roughly $68 000 per person. The item in Table 2.2 labelled 'statistical discrepancy' is a balancing item that ensures that the figure for GDP calculated by summing all the expenditures in the economy is equivalent to the figure for GDP calculated from adding together the total incomes earned in the economy. We will discuss the use of income to measure GDP shortly.

TABLE 2.2 Expenditure components of Australian GDP, 2016–17 ($ million, chain volume measures)

Household consumption	993 674
Investment	419 458
Government consumption	321 459
Exports	337 046
Imports	−374 571
Statistical discrepancy	−5 689
GROSS DOMESTIC PRODUCT	1 691 377

Source: Australian Bureau of Statistics, 'Australian national accounts: National income, expenditure and product, June 2018', Cat. no. 5206.0.

Detailed definitions of the components of expenditure and their principal subcomponents are in Table 2.3. As you read through them, refer to Table 2.2 to get a sense of the relative importance of each type of spending.

TABLE 2.3 Expenditure components of GDP

COMPONENT	DEFINITION	SUBCATEGORIES

CONSUMPTION	Spending by households on goods and services such as food, clothing and entertainment.	• **Durables:** Long-lived consumer goods such as cars and furniture. Note that new houses are not treated as consumer durables but as part of the investment. • **Non-durables:** Shorter-lived goods like food and clothing, and services, everything from haircuts and taxi rides to legal, financial and educational services.
INVESTMENT	Spending by firms on final goods and services, primarily capital goods	• **Business fixed investment:** The purchase by

	and housing.	firms of new capital goods such as machinery, factories and office buildings. (Remember that for the purposes of calculating GDP, long-lived capital goods are treated as final goods rather than as intermediate goods.) Firms buy capital goods to increase their capacity to produce. • **Residential investment:** The construction of new homes and apartment

buildings. For GDP accounting purposes, residential investment is treated as an investment by the business sector, which then sells the homes to households.

- **Inventory investment:** The addition of unsold goods to company inventories—in other words, the goods that a firm produces but does not sell during the current period are treated, for accounting

		purposes, as if the firm had bought those goods from itself. (This convention guarantees that production equals expenditure.)
GOVERNMENT EXPENDITURE	Purchases by federal, state and local governments of final goods, such as fighter planes, and services, such as teaching in public schools. Government purchases do not include transfer payments, which are payments made by the government in return for which no current goods or services are received. Examples of transfer payments (which, again,	

	are not included in government purchases) are Social Security benefits, unemployment benefits, pensions paid to government workers and welfare payments. Interest paid on the government debt is also excluded from government purchases.	
NET EXPORTS	**Exports minus imports** Exports are domestically produced final goods and services that are sold abroad. Imports are purchases by domestic buyers of goods and services that were produced abroad. Imports are subtracted from exports to find the net amount of spending on domestically	

produced goods and services.

2.2.1 THE NATIONAL INCOME ACCOUNTING IDENTITY

The relationship between GDP and expenditures on goods and services can be summarised by an equation. Let:

$$
\begin{aligned}
Y &= \textbf{GDP, or output} \\
C &= \textbf{consumption expenditure} \\
I &= \textbf{investment} \\
G &= \textbf{government expenditure} \\
NX &= \textbf{net exports}
\end{aligned}
$$

Using these symbols, we can write that GDP equals the sum of the four types of expenditure algebraically as:

$$Y = C + I + G + NX$$

Equation 2.1

In writing the equation this way, we are assuming that the measures of consumption, investment and government expenditure include expenditure on imported goods and services. As they represent expenditure on the GDP of other countries, these imports need to be subtracted from the calculation of domestic GDP. This is why it is *net* exports, and not just exports alone, that appears in the equation.

Equation 2.1 is a very important concept in macroeconomics. It is known as the **national income accounting identity**. As you will see, the national income accounting identity provides the starting point for many important macroeconomic models in common use today.

EXAMPLE 2.7 – MEASURING GDP BY PRODUCTION AND BY EXPENDITURE

An economy produces 1 000 000 cars valued at $15 000 each. Of these, 700 000 are sold to consumers, 200 000 are sold to businesses, 50 000 are sold to the government and 25 000 are sold abroad. No cars are imported. The cars left unsold at the end of the year are held in inventory by the car producers. Find GDP in terms of (a) the market value of production and (b) the components of expenditure. You should get the same answer both ways.

PRODUCTION METHOD		EXPENDITURE ME		
UNITS PRODUCED (CARS)	VALUE OF PRODUCTION	EXPENDITURE COMPONENT	UNITS SOLD	VALUE EXPEN
1 000 000	1 000 000 × \$15 000 = \$15 billion	Consumption	700 000	700 00 \$15 00 \$10.5 l
		Investment	200 000 (sold to business) 25 000 (unsold inventory)	(200 0 \$15 00 (25 00 \$15 00 \$3.375
		Government purchases	50 000	50 000 \$15 00 \$0.75 l
		Net exports	25 000	25 000 \$15 00 \$0.375
GDP	\$15 billion			\$15 bil

CONCEPT CHECK 2.4

Extending Example 2.7, suppose that 25 000 of the cars purchased by households are imported rather than domestically produced. Domestic production remains at 1 000 000 cars valued at $15 000 each. Once again, find GDP in terms of (a) the market value of production and (b) the components of expenditure.

2.2.2 GDP AND THE INCOMES OF CAPITAL AND LABOUR

GDP can be thought of as either a measure of total production or as a measure of total expenditure—either method of calculating the GDP gives the same final answer. There is yet a third way to think of the GDP, which is as the incomes of capital and labour.

Whenever a good or service is produced or sold, the revenue from the sale is distributed to the workers and the owners of the capital involved in the production of the good or service. Thus, except for some technical adjustments that we will ignore, GDP also equals labour income plus capital income. Labour income (equal to about 75% of GDP) comprises wages, salaries and the incomes of the self-employed. Capital income (about 25% of GDP) is made up of payments to owners of physical capital (e.g. factories, machines, office buildings) and intangible capital (e.g. copyrights, patents). The components of capital income include items such as profits earned by business owners, the rents paid to owners of land or buildings, interest received by bondholders in non-financial private firms and the royalties received by the holders of copyrights or patents. Both labour income and capital income are to be understood as measured prior to payment of taxes; ultimately, of course, a portion of both types of income is captured by the government in the form of tax collections.

A related concept is gross national income. This is defined as income earned by all citizens of a country regardless of where those citizens live. GDP and gross national income can differ if many of a country's citizens work elsewhere and the citizens of other countries work domestically.

A useful way of summarising the relationships between the expenditure, production and income approaches to measuring GDP is a concept known as the **circular flow of income**. To illustrate this concept we will use a very simple, stylised representation of an economy known as the **two-sector model**. This is a scaled-down version of the economy, in which only firms and households are assumed to exist. The government is absent and there are no exports and imports. There is, of course, no such economy in the real world. Nonetheless, economists often work with a simplified model such as this as it enables key fundamental characteristics of the economy to be highlighted in a way that would not be possible if all of the complexities of an actual economy were also considered.

Figure 2.2 shows a representation of how households and firms interact in a two-sector model. These interactions are associated with various flows that take place between the two sectors. The first set of flows relates to production. Households send a flow of factors of production to firms. In this simple economy, these factors of production are of two types. The first is labour services: the hours of work supplied by households to firms. The second relates to the services from capital: firms are assumed to rent the plant and equipment needed to produce goods and services from households. Firms use these factors of output to produce goods and services which, in turn, are sold to households. The revenue produced by these sales enables firms to pay for their use of labour and capital services. These payments represent a flow of income to households.

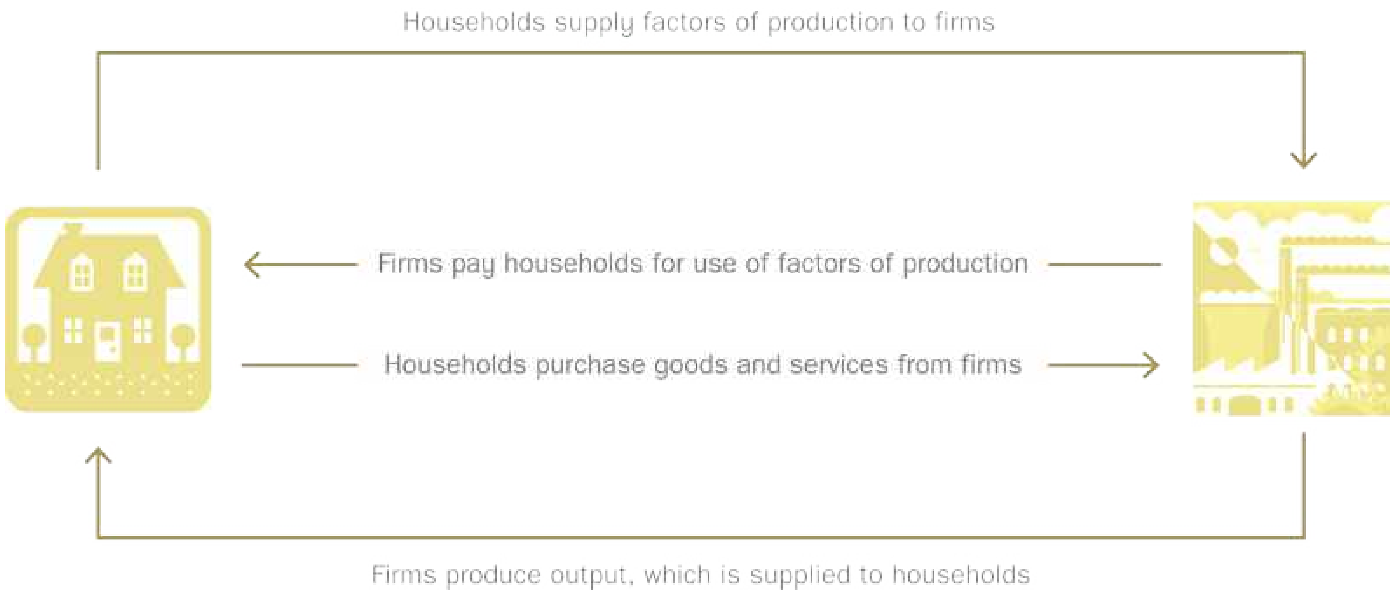

Figure 2.2 **The circular flow of income**

Note: The circular flow of income in a two-sector economy traces the flows of income, expenditure and production of resources between households and firms.

The circular flow highlights why economists regard production, income or expenditure as equivalent means to describe the same concept, GDP. Firms, by producing and then selling output, generate income for households, who use the income to purchase the goods and services produced by firms. In this simple *closed* system, income, expenditure and production are three different words describing the same concept.

Economies, in reality, are much more complex than the simple representation illustrated by the circular flow of income. When the respective values of production, expenditure and income flows are measured over a period, they are never exactly equivalent. Background Briefing 2.2 discusses one reason why this is so, the failure to record properly many economic transactions.

BACKGROUND BRIEFING 2.2

The underground economy

One problem with the official estimates of GDP is that they exclude what for many countries may be a significant form of economic activity, the 'underground economy'. This term refers to economic transactions that are not recorded in the official statistics, often because they represent illegal activity and/or they are a result of an attempt to avoid taxes. A cash payment to a tradesperson for which a receipt is not issued is one form of underground economic activity—such an arrangement may suit the tradesperson as the payment would not be counted as income for the purposes of assessing taxable income. Criminal transactions, such as the proceeds from drug sales, are also part of the underground economy.

How significant is the underground economy? A report by the Australian Bureau of Statistics (ABS 2012) attempted the task of quantifying the underground economy. This is a difficult task. By their nature, transactions in the underground economy may be difficult to detect using anything other than very indirect means. For example, audits conducted by the taxation department can be used to infer the degree of under-reporting of income. Expenditure data on commodity groups, used to calculate the amount owing to the government through Australia’s goods and services tax (GST), can be matched against production data to again estimate the degree of under-reporting.

The ABS research concluded that the size of the underground economy might be lower than many people realise, requiring adjustments to GDP of no more than 3 per cent. This is well down on other estimates. For example, a well-known study by the World Bank (Schneider, Buehn & Montenegro 2010) concluded the underground economy in Australia was around 15 per cent of official GDP. However, the World Bank study used a very different methodology to that adopted by the ABS, a reminder of how difficult it can be to agree on a definitive way of quantifying highly complex economic phenomena.

References

Australian Bureau of Statistics (ABS) 2013, ‘Information paper: The non-observed economy and Australia’s GDP, 2012’, Cat no. 5204.0.55.008, www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/5204.0.55.008Main%20Features22012?opendocument&tabname=Summary&prodno=5204.0.55.008&issue=2012&num=&view=.

Schneider F, Buehn A, Montenegro C 2010, ‘Shadow economies all over the world: New estimates for 162 countries from 1999 to 2007’, The World

Bank,http://econ.worldbank.org/external/default/main?pagePK=64165259&theSitePK=478060&piPK=64165421&menuPK=64166093&entityID=000158349_20101014160704.

▻▻ RECAP

Expenditure components of GDP

GDP can be expressed as the sum of expenditures on domestically produced final goods and services. The four types of expenditure that are counted in the GDP, and the economic groups that make each type of expenditure, are as follows:

TYPE OF EXPENDITURE	WHO MAKES THE EXPENDITURE?	EXAMPLES
Consumption	Households	Food, clothes, haircuts, new cars
Investment	Business firms	New factories and equipment, new houses, increases in inventory stocks
Government purchases	Governments	New school buildings, new military hardware, salaries of soldiers and government officials
Net exports, or exports minus imports	Foreign sector	Exported manufactured goods, legal or financial services provided by domestic residents to foreigners

GDP also equals labour income plus capital income.

2.3 NOMINAL GDP VERSUS REAL GDP

LO 2.3

As a measure of the total production of an economy over a given period, such as a particular year, GDP is useful in comparisons of economic activity. For example, GDP data for the year 2017, broken down by state, could be used to compare aggregate production in South Australia and Victoria during that year. However, economists are interested in comparing levels of economic activity not only in different *locations* but *over time* as well.

Using GDP to compare economic activity at two different points in time may give misleading answers, as the following example shows. Suppose for the sake of illustration that the economy produces only pizzas and pasta. The prices and quantities of the two goods in the years 2013 and 2018 are shown in Table 2.4. Also shown is *nominal* GDP, obtained by multiplying the quantity of each commodity by its current price, and then adding the values derived to get an overall measure of the value of commodities produced in this economy.

TABLE 2.4 Prices and quantities in 2013 and 2018

	QUANTITY OF PIZZAS	PRICE OF PIZZAS	QUANTITY OF PASTA	PRICE OF PASTA	NOMINAL GDP
2013	10	$10	15	$5	$175
2018	20	$12	30	$6	$420

Comparing the GDP for the year 2018 to the GDP for the year 2013, we might conclude that it is 2.4 times greater ($420/$175). But look more closely at the data given in Table 2.4 . Can you see what is wrong with this conclusion? The quantities of both pizzas and pasta produced in the year 2018 are exactly twice the quantities produced in the year 2013. If economic activity, as measured by actual production of both goods, exactly doubled over the six years, why do the calculated values of GDP show a greater increase?

The answer, as you can also see from the table, is that prices, as well as quantities, rose between 2013 and 2018. Because of the increase in prices, the market value of production grew more over those six years than the physical volume of production. So in this case, GDP is a misleading gauge of economic growth, since the physical quantities of the goods and services produced in any given year, not the dollar values, are what determine people’s economic wellbeing. Indeed, if the prices of pizzas and pasta had risen 2.4 times between 2013 and 2018, GDP would have risen 2.4 times as well, with no increase in physical production! In that case, the claim that the economy's (physical) output had more than doubled would obviously be wrong.

As this example shows, if we want to use GDP to compare economic activity at different points in time we need some method of excluding the effects of price changes. In other words, we need to adjust for inflation. To do so, economists use a common set of prices to value quantities produced in different years. The standard approach is to pick a particular year, called the 'base year', and use the prices from that year to calculate the market value of output. When GDP is calculated using the prices from a base year, rather than the current year's prices, it is called 'real GDP', to indicate that it is a measure of real physical production. **Real GDP** is GDP adjusted for inflation. To distinguish real GDP, in which quantities produced are valued at base-year prices, from GDP valued at current-year prices, economists refer to the latter measure as **nominal GDP**.

EXAMPLE 2.8 – CALCULATING THE CHANGE IN REAL GDP

Using data from Table 2.4 and assuming that 2013 is the base year, find real GDP for the years 2018 and 2013. By how much did real output grow between 2013 and 2018?

To find real GDP for the year 2018 we must value the quantities produced that year using the prices in the base year, 2013. Using the data in Table 2.4 :

$$\begin{aligned}\textbf{Year 2018 real GDP} &= \textbf{(year 2018 quantity of pizzas} \times \textbf{year 2013 price of pizzas)}\\ &+ \textbf{(year 2018 quantity of pasta} \times \textbf{year 2013 price of pasta)}\\ &= \mathbf{(20 \times \$10) + (30 \times \$5)}\\ &= \mathbf{\$350}\end{aligned}$$

The real GDP of this economy in the year 2018 is \$350. What is the real GDP for 2013?

By definition, the real GDP for 2013 equals 2013 quantities valued at base-year prices. The base year in this example happens to be 2013, so real GDP for 2013 equals 2013 quantities valued at 2013 prices, which is the same as nominal GDP for 2013. In general, in the base year, real GDP and nominal GDP are the same. We have already found nominal GDP for 2013, \$175, so that is also the real GDP for 2013. We can now determine how much real production has actually grown over the six-year period. Since real GDP was \$175 in 2013 and \$350 in 2018, the physical volume of production doubled between 2013 and 2018. This conclusion makes good sense since Table 2.4 shows that the production of both pizzas and pasta exactly doubled over the period. By using real GDP, we have eliminated the effects of price changes and obtained a measure of the actual change in physical production over the six-year span.

Of course, the production of all goods will not necessarily grow in equal proportion as in Example 2.8. Concept Check 2.5 asks you to find real GDP when pizza and pasta production grow at different rates.

CONCEPT CHECK 2.5

Suppose the production and prices of pizza and pasta in 2013 and 2018 are the same as those in Table 2.4, except that pizza production has tripled rather than doubled between 2013 and 2018. Find real GDP in 2018 and 2013, and calculate the growth in real output over the six-year period. (Continue to assume that 2013 is the base year.)

If you complete Concept Check 2.5, you will find that the growth in real GDP between 2013 and 2018 reflects a weighted average of the growth in physical production of pizzas and pasta where the weights are the relative values of pizza and pasta. Real GDP, therefore, remains a useful measure of overall physical production, even when the production of different goods and services grows at different rates.

One final point before we move on. The ABS, in practice, calculates real GDP using a slightly different technique from the one we have described. It is known as 'chain volume measurement'. The method is designed to address the problem with the conventional way of calculating real GDP that the further away in time one is from the base year, the less relevant are the base-year prices. Previously, the ABS tried to resolve the problem by updating the base year every five years. However, frequent changes in relative prices between commodities meant that this was not frequent enough to maintain the accuracy of the real GDP data. Therefore, rebasing now occurs every year and the resulting indexes are linked to arrive at the chain volume measures. More detail can be found in the ABS, *Australian National Accounts: Concepts, Sources and Methods*, Ch. 6, 'Price and volume measures' (www.abs.gov.au).

▹▹ RECAP

A nation's GDP is a measure of the final value of goods and services produced in that country over a particular period. Economists closely monitor GDP, as the value of production is one of the most fundamental measures we have of an economy's performance.

Since GDP comprises thousands and thousands of diverse commodities, a common unit of measurement must be found to enable a single measure of the value of production to be calculated. Prices—market values—provide such a common measurement unit, since we conventionally express the value of commodities in terms of its price. Problems arise with commodities that are valuable but not traded in markets and which therefore do not have a market price.

GDP measures only the final value of goods and services. This means that the value of intermediate goods, on their own, are counted in GDP only to the extent that they form part of the final value of goods and services. To ensure that only the final value of goods and services is counted, at each stage of the production process only the value added to the inputs is counted in GDP.

An alternative to measuring GDP by the value-added method is to calculate the total expenditure on final goods and services that occurs in an economy over some period. As unsold output is counted as inventory investment expenditure, this gives a figure that corresponds to the value of final goods and services sold.

As the value of final goods and services is paid out to the factors of production, labour and capital, GDP can also be valued by adding together the incomes that are earned in the economy over a particular period.

Nominal GDP measures the final value of goods and services at current market prices. Real GDP measures the final value of goods and services using current quantities but the prices that prevailed in some past period. The advantage of using real GDP is that, unlike nominal GDP, it does not change if only the price of output has changed. Changes in real GDP occur only if the actual quantity of goods and services produced in the economy changes.

2.4 REAL GDP IS NOT THE SAME AS ECONOMIC WELLBEING

LO 2.4

Government policymakers pay close attention to real GDP, often behaving as if the greater the GDP, the better. However, real GDP is not the same as economic wellbeing. At best, it is an imperfect measure of economic wellbeing because, for the most part, it captures only those goods and services that are priced and sold in markets. Many factors that contribute to people's economic wellbeing are not priced and sold in markets and thus are largely or even entirely omitted from GDP. Maximising real GDP is not, therefore, always the right goal for government policymakers. Whether or not policies that increase GDP will also make people better off has to be determined on a case-by-case basis.

To understand why an increase in real GDP does not always promote economic wellbeing, let's look at some factors that are not included in GDP but do affect whether people are better off.

2.4.1 LEISURE TIME

Most people in industrialised countries work many fewer hours than their great-grandparents did 100 years ago. Early in the twentieth century some industrial workers—steelworkers, for example—worked as many as 12 hours a day, seven days a week. Today, the 40-hour working week is typical. Today, many people also tend to start working later in life (after completing tertiary education) and, in many cases, are able to retire earlier. The increased leisure time available to workers in industrialised countries—which allows them to pursue many worthwhile activities, including being with family and friends, participating in sports and hobbies, and pursuing cultural and educational activities—is a major benefit of living in a wealthy society. These extra hours of leisure are not priced in markets, however, and therefore are not reflected in GDP.

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2.4.2 NON-MARKET ECONOMIC ACTIVITIES

Not all economically important activities are bought and sold in markets; with a few exceptions, such as government services, non-market economic activities are omitted from GDP. We mentioned earlier the example of unpaid housekeeping services. Another example is volunteer services, such as the volunteer firefighters who serve many small rural towns. The fact that these unpaid services are left out of GDP does not mean that they are unimportant. The problem is that, because there are no market prices and quantities for unpaid services, estimating their market values is very difficult.

THINKING AS AN ECONOMIST 2.2

Why do people work fewer hours today than their great-grandparents did?

The opportunity cost of working less—retiring earlier, for example, or working fewer hours per week—is the earnings you forgo by not working. If you can make $400 per week at a summer job in a department store, for example, then leaving the job two weeks early to take a trip with some friends has an opportunity cost of $800. The fact that people are working fewer hours today suggests that their opportunity cost of forgone earnings is lower than their grandparents' and great-grandparents' opportunity cost. Why this difference?

Over the past century, rapid economic growth in industrialised countries has greatly increased the purchasing power of the average worker's wages. In other words, the typical worker today can buy more goods and services with their hourly earnings than ever before. This fact would seem to suggest that the opportunity cost of forgone earnings (measured in terms of what those earnings can buy) is greater, not smaller, today than in earlier times. However, because the buying power of wages is so much higher today than in the past, people can often achieve a reasonable standard of living by working fewer hours than they did in the past. This is known as the **income effect** of higher real wages. Thus, while your grandparents may have had to work long hours to pay the rent or put food on the table, today the extra income from working long hours is more likely to buy relative luxuries, like nicer clothes or a fancier car. Because such discretionary purchases are easier to give up than basic food and shelter, the true opportunity cost of forgone earnings is lower today than it was 50 years ago. And so it is the income effect that means even though real wages are higher, many people have chosen to enjoy more leisure.

How far do economists go wrong by leaving non-market economic activities out of GDP? The answer depends on the type of economy being studied. Although non-market economic activities exist in all economies, they are particularly important in poor economies. For example, in rural villages in developing countries, people commonly trade services with each other or cooperate on various tasks without exchanging any money. Families in these communities also tend to be relatively self-sufficient, growing their own food and providing many of their own basic services. Because such non-market economic activities are not counted in official statistics, GDP data may substantially understate the true amount of economic activity in the poorest countries. In 2017, according to the United Nations, the official GDP per person in Nepal was about US$725, an amount that seems impossibly low (United Nations n.d.). Part of the explanation for this figure is that because the Nepalese seldom use formal markets, many economic activities that would ordinarily be included in GDP are excluded from it in Nepal.

Closely related to non-market activities is the underground economy, which we discussed in Background Briefing 2.2 . The underground economy encompasses both legal and illegal activities, from informal babysitting jobs to criminal activities such as narcotics production. As explained in Background Briefing 2.2 , economists who have tried to estimate the value of such services have concluded that these sorts of transactions may be quite important, even in advanced industrial economies.

2.4.3 ENVIRONMENTAL QUALITY AND RESOURCE DEPLETION

China has recently experienced tremendous growth in real GDP. However, in expanding its manufacturing base, it has also suffered a severe decline in air and water quality. Increased pollution certainly detracts from the quality of life, but because air and water quality are not bought and sold in markets, the Chinese GDP does not reflect this downside of its economic growth.

The exploitation of finite natural resources also tends to be overlooked in GDP. When an oil company pumps and sells a barrel of oil, GDP increases by the value of the oil. But the fact that there is one less barrel of oil in the ground, waiting to be pumped sometime in the future, is not reflected in GDP.

A number of efforts have been made to incorporate factors like air quality and resource depletion into a comprehensive measure of GDP. Doing so is difficult since it often involves placing a dollar value on intangibles, like having a clean river to swim in instead of a dirty one. But the fact that the benefits of environmental quality and resource conservation are hard to measure in dollars and cents does not mean that they are unimportant.

BACKGROUND BRIEFING 2.3

Collecting and reporting information on environmental variables

The United Nations has developed a statistical framework allowing for systematic information to be collected and reported on environmental variables and on the interrelationship between the environment and market-based measures of economic activity. This framework is known as the 'System of Environmental Economic Accounting (SEEA)': the most recent version was formally adopted by the United Nations in 2012. (Details can be found at http://unstats.un.org/unsd/envaccounting/default.asp.) The intent is to provide a set of accounts enabling informed decisions to be made regarding environmental initiatives in a way that is comparable to how national accounts data are used to guide economic decision-making. In addition, links between environmental and economic variables are made more explicit so that, for example, questions such as the effect of resource depletion on income flows can be addressed. The ABS now uses the SEEA in its own set of environmental accounts (ABS 2013).

Reference
Australian Bureau of Statistics (ABS) 2013, '4655.0.55.002 Information paper: Towards the Australian environmental economic accounts, 2013', www.abs.gov.au/AUSSTATS/abs@.nsf/Latestproducts/4655.0.55.002Appendix12013?opendocument&tabname=Notes&prodno=4655.0.55.002&issue=2013&num=&view=.

2.4.4 QUALITY OF LIFE

What makes a particular town or city an attractive place in which to live? Some desirable features you might think of are reflected in GDP: spacious, well-constructed homes, good restaurants, stores, a variety of entertainment and high-quality medical services. However, other indicators of the good life are not sold in markets and so may be omitted from GDP. Examples include a low crime rate, minimal traffic congestion, active community organisations and open space. Thus citizens of a rural area may be justified in opposing the construction of a new shopping centre because of its presumed negative effect on the quality of life—even though the new centre may increase GDP.

2.4.5 POVERTY AND ECONOMIC INEQUALITY

GDP measures the total quantity of goods and services produced and sold in an economy, but it conveys no information about who gets to enjoy those goods and services. Two countries may have identical per capita GDPs but differ radically in the distribution of economic welfare across the population. Suppose, for example, that in one country—call it Equalia—most people have a comfortable middle-class existence; both extreme poverty and extreme wealth are rare. But in another country, Inequalia—which has the same real GDP as Equalia—a few wealthy families control the economy, and the majority of the population lives in poverty. While most people would say that Equalia has a better economic situation overall, that judgement would not be reflected in the GDPs of the two countries, which are the same.

One study found that, for Australia, almost three million people, around 13 per cent of the population, lived in poverty (cited in Australian Council of Social Service (2016), ‘Poverty in Australia 2016’). One should never trivialise the hardships associated with poverty. However, overall growth in the economy means that people who are considered poor today may live as well as many middle-class people did in the 1950s.

Related to poverty is the inequality of income which in Australia has generally been rising. The chief executive officer of a large corporation may earn hundreds of times what the typical worker in the same firm receives. Psychologists tell us that people’s economic satisfaction depends not only on their absolute economic position—the quantity and quality of food, clothing and shelter they have—but on what they have compared to what others have. If you own an old, beat-up car but are the only person in your neighbourhood to have a car, you may feel privileged. But if everyone else in the neighbourhood owns a luxury car, you are likely to be less satisfied. To the extent that such comparisons affect people's wellbeing, inequality matters as well as absolute poverty. Again, because GDP focuses on total production rather than on the distribution of output, it does not capture the effects of inequality.

2.4.6 GDP IS RELATED TO ECONOMIC WELLBEING

You might conclude from the list of important factors omitted from the official figures that GDP is flawed as a measure of economic welfare. Indeed, numerous critics have made that claim; see, for example, an article titled 'GDP growth and human wellbeing: A brief look at why we need a better measure of progress' by Judith McNeill (1999). Clearly, in evaluating the effects of a proposed economic policy, considering only the likely effects on GDP is not sufficient. Planners must also ask whether the policy will affect aspects of economic wellbeing that are not captured in GDP. Environmental regulations may reduce production of coal, for example, which reduces GDP. But that fact is not a sufficient basis on which to decide whether such regulations are good or bad. The right way to decide such questions is to apply the cost–benefit principle. Are the benefits of cleaner air worth more to people than the costs the regulations impose in terms of lost output and lost jobs? If so, then the regulations should be adopted; otherwise, they should not.

Although looking at the effects of a proposed policy on real GDP is not a good enough basis on which to evaluate a policy, real GDP per person does tend to be positively associated with many things people value, including a high material standard of living, better health and life expectancies, and better education. We discuss next some of the ways in which a higher real GDP implies greater economic wellbeing.

2.4.7 AVAILABILITY OF GOODS AND SERVICES

Obviously, citizens of a country with a high GDP are likely to possess more and better goods and services (after all, that is what GDP measures). On average, people in high-GDP countries enjoy larger, better-constructed and more comfortable homes, higher quality food and clothing, a greater variety of entertainment and cultural opportunities, better access to transportation and travel, better communications and sanitation, and other advantages. While social commentators may question the value of material consumption—and we agree that riches do not necessarily bring happiness or peace of mind—the majority of people in the world place great importance on achieving material prosperity. Throughout history, people have made tremendous sacrifices and taken great risks to secure a higher standard of living for themselves and their families.

2.4.8 LIFE EXPECTANCY

Beyond an abundance of consumer goods, a high GDP brings other more basic advantages. Table 2.5 shows trends with regard to life expectancy at birth. The table shows significant differences in life expectancy. A child born in a more developed country has a life expectancy of nearly 80 years, compared to about 69 years for a child born in one of the less developed regions of the world. The table also shows how growing income through time has increased life expectancy everywhere including the least developed countries. Superior nutrition, sanitation and medical services as countries become richer account for these large discrepancies and changes in life expectancy.

TABLE 2.5 GDP and life expectancy

	LIFE EXPECTANCY AT BIRTH (YEAR			
	1950–5	**2010–15**	**ABSOLUTE CHANGE**	**PERCE**
World	46.8	70.5	23.7	
More developed regions	64.7	78.3	13.6	
Less developed regions	41.5	68.8	27.2	

Least developed countries	36.1	62.2	26.0
Other less developed countries	42.3	70.2	27.9
Africa	37.3	59.5	22.2
Asia	42.1	71.6	29.5
Europe	63.6	77.0	13.4
Latin America and the Caribbean	51.2	74.5	23.3
Northern America	68.6	79.2	10.6
Oceania	60.4	77.5	17.0

Source: United Nations 2015, 'World mortality report 2015 (highlights)', www.un.org/en/development/desa/population/publications/pdf/mortality/WMR2015/WMR2015_Highlights.pdf.

▹▹ RECAP

For a variety of reasons, it is a mistake to equate a nation's real GDP with the welfare of its citizens. These reasons essentially relate to the fact that not all the factors that contribute to people's quality of life are measured in GDP. Examples would include leisure time, non-market activities, the quality of the environment and the degree of poverty and income inequality. However, GDP is believed to be positively related to these factors, so monitoring GDP does give some insight into people's general economic wellbeing.

THINKING AS AN ECONOMIST 2.3

Why do far fewer children complete high school in poor countries than in rich countries?

One possible explanation is that people in poor countries place a lower priority on getting an education than people in rich countries. But immigrants from poor countries often put a heavy emphasis on education—though it may be that people who emigrate from poor countries are unrepresentative of the population as a whole.

An economist's explanation for the lower schooling rates in poor countries would rely not on cultural differences but on differences in opportunity cost. In poor societies, most of which are heavily agricultural, children are an important source of labour. Beyond a certain age, sending children to school imposes a high opportunity cost on the family. Children who are in school are not available to help with planting, harvesting and other tasks that must be done if the family is to survive. In addition, the cost of books and school supplies imposes a major hardship on poor families. In rich, non-agricultural countries, school-age children have few work opportunities, and their potential earnings are small relative to other sources of family income. The low opportunity cost of sending children to school in rich countries is an important reason for the higher enrolment rates in those countries.

2.5 UNEMPLOYMENT AND THE UNEMPLOYMENT RATE

LO 2.5

In assessing the level of economic activity in a country, economists look at a variety of statistics. Besides real GDP, one statistic that receives a great deal of attention, both from economists and from the general public, is the rate of unemployment. The unemployment rate is a sensitive indicator of conditions in the labour market. When the unemployment rate is low, jobs are secure and relatively easier to find. Low unemployment is often also associated with improving wages and working conditions, as employers compete to attract and retain workers.

We will discuss labour markets and unemployment in detail in Chapter 5. This section will explain how the unemployment rate and some related statistics are defined and measured. It will close with a discussion of the costs of unemployment, both to the unemployed and to the economy as a whole.

2.5.1 MEASURING UNEMPLOYMENT

In Australia, defining and measuring unemployment is the responsibility of the Australian Bureau of Statistics (ABS). Each month the ABS surveys about 26 000 randomly selected dwellings, including hospitals, boarding schools, colleges etc. Each person in those households who is 15 years or older is placed in one of three categories:

1. *Employed*. A person is employed if they worked full time or part time for at least one hour during the past week or was on vacation or sick leave from a regular job.
2. *Unemployed*. A person is unemployed if they did not work during the preceding week but was available for work and was actively seeking work.
3. *Out of the labour force.* A person is considered to be out of the labour force if they did not work in the past week and was not unemployed. In other words, people who are neither employed nor unemployed (in the sense of looking for work but not being able to find it) are 'out of the labour force'. Full-time students, unpaid homemakers, retirees and people unable to work because of disabilities are examples of people who are out of the labour force.

Based on the results of the survey, the ABS estimates how many people in the whole country fit into each of the three categories. The working age population is the sum of the three categories and consists of the population age 15 and over.

To find the **unemployment rate**, the ABS must first calculate the size of the **labour force**. The labour force is the total number of employed and unemployed people in the economy.

The unemployment rate is then defined as the number of unemployed people divided by the labour force. Notice that people who are out of the labour force (e.g. because they are in school, have retired, are disabled) are not counted as unemployed and thus do not affect the unemployment rate. In general, a high rate of unemployment indicates that the economy is performing poorly.

Another useful statistic is the **participation rate**, or the percentage of the working-age population in the labour force (i.e. the percentage that is either employed or looking for work). The participation rate is calculated by dividing the labour force by the working-age (15 years and older) population.

Table 2.6 illustrates the calculation of key labour market statistics, using data based on the ABS survey for June 2018. In that month unemployment was 5.4 percent of the labour force. The participation rate was 65.7 percent; that is, almost two out of every three adults had a job or were looking for work. Figure 1.6 in our previous chapter shows the Australian unemployment rate since 1967 and highlighted the increase in unemployment associated with economic contractions. We will discuss these economic upswings (or expansions) and downswings (recessions) and their relationship with unemployment in greater detail in Chapter 6.

TABLE 2.6 Australian unemployment data, June 2018 (in thousands)

Employed	12 573.6
	+
Unemployed	720.3
	=
Labour force	13 293.9
	+
Not in the labour force	8 255.5
	=
Working age (over 15) population	21 549.4
Unemployment rate = Unemployed / Labour force	720.3 / 13 293.9 = 5.4%
Participation rate = Labour force / Working-age population	13 293.9 / 21 549.4 = 61.7%

Source: Adapted from Australian Bureau of Statistics 2018, ‘Labour force, Australia, June 2018’, Cat. no. 6202.0, www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6202.0Jun%202018?OpenDocument.

2.5.2 THE COSTS OF UNEMPLOYMENT

Unemployment imposes economic, psychological and social costs on a nation.

From an *economic* perspective, the main cost of unemployment is the output that is lost because the workforce is not fully utilised. Much of the burden of the reduced output is borne by the unemployed themselves, whose incomes fall when they are not working and whose skills may deteriorate from lack of use. However, society at large also bears part of the economic cost of unemployment. For example, workers who become unemployed are liable to stop paying taxes and start receiving government support payments, such as unemployment benefits. This net drain on the government's budget is a cost to all taxpayers.

The *psychological* costs of unemployment are felt primarily by unemployed workers and their families. Studies show that lengthy periods of unemployment can lead to a loss of self-esteem, feelings of loss of control over ones life, depression, and even suicidal behaviour. The unemployed worker's family is likely to feel increased psychological stress, compounded by the economic difficulties created by the loss of income.

The *social* costs of unemployment are a result of the economic and psychological effects. People who have been unemployed for a while tend not only to face severe financial difficulties, but also to feel anger, frustration and despair. Not surprisingly, increases in unemployment tend to be associated with increases in crime, domestic violence, alcoholism, drug abuse and other social problems. The costs created by these problems are borne not just by the unemployed but by society in general, as more public resources must be spent to counteract these problems—for example, by hiring more police to control crime or increasing spending on social services.

2.5.3 THE DURATION OF UNEMPLOYMENT

In assessing the impact of unemployment on jobless people, economists must know how long individual workers have been without work. Generally, the longer a person has been out of work, the more severe are the economic and psychological costs that person will face. People who are unemployed for only a few weeks, for example, are not likely to suffer a serious reduction in their standard of living, experience psychological problems such as depression or loss of self-esteem, and have their skills deteriorate (in turn reducing future earnings)—at least not to the same extent as someone who has been out of work for months or years.

A period during which an individual is continuously unemployed is called an **unemployment spell**; it begins when the worker becomes unemployed and ends when the worker either finds a job or leaves the labour force. (Remember, people outside the labour force are not counted as unemployed.) The length of an unemployment spell is called its **duration**. The duration of unemployment rises during recessions, reflecting the greater difficulty of finding work during those periods.

At any given time, a substantial fraction of unemployed workers have been unemployed for six months or more; we will refer to this group as the 'long-term unemployed'. Long-term unemployment creates the highest economic, psychological and social costs, both for the unemployed and for society as a whole.

When the economy is in a recession, average unemployment spells are longer. Figure 2.3 shows the average duration of unemployment in Australia, measured in months. You can see from the figure how the average duration of unemployment spells increased during the recessions of the early 1980s and early 1990s as well as during the Great Recession.

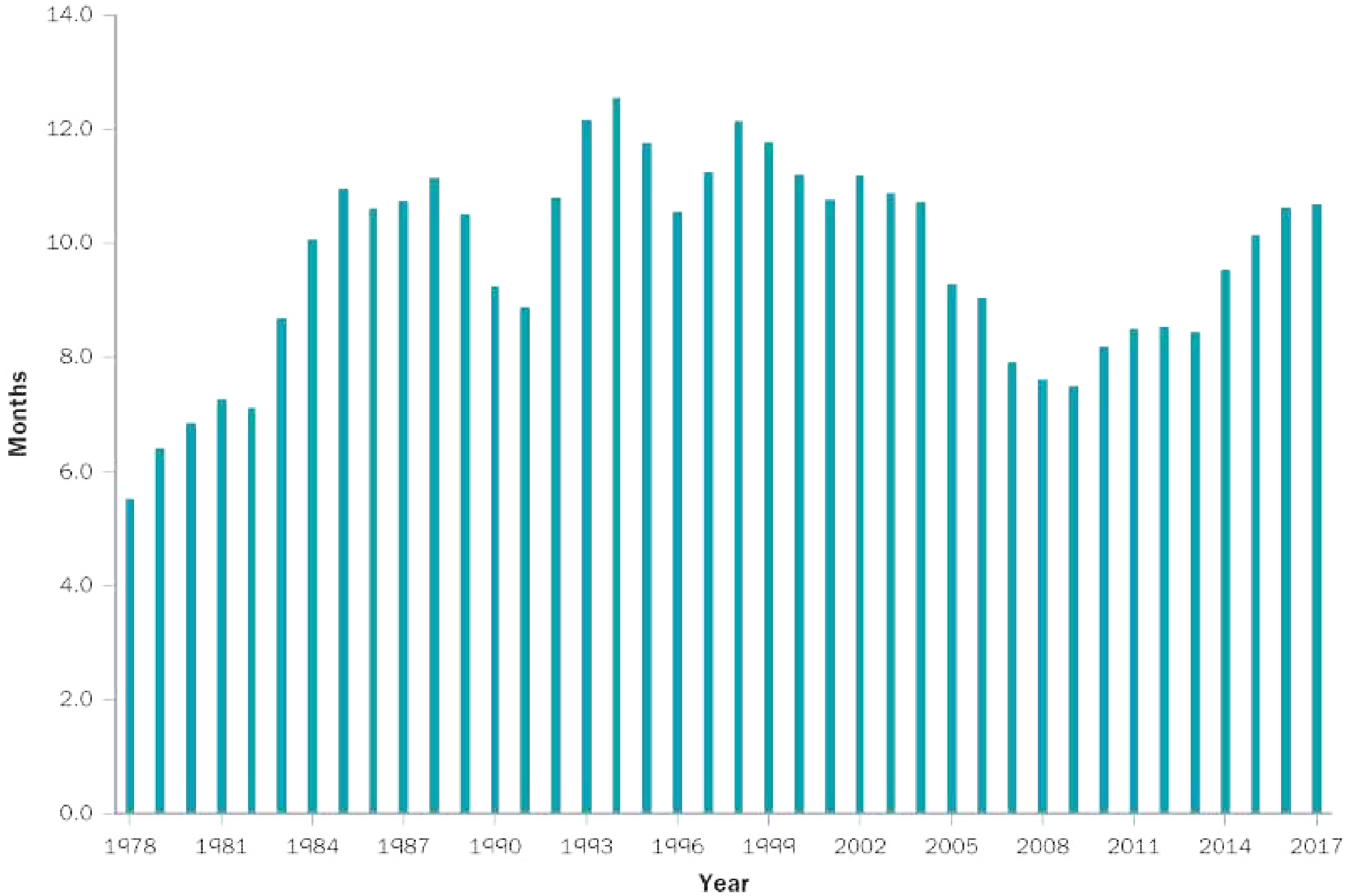

Figure 2.3 **The duration of unemployment, Australia**

Source: Organisation for Economic Co-operation and Development 2018, 'Average duration of unemployment', https://stats.oecd.org/index.aspx?DataSetCode=AVD_DUR#.

Even these statistics are a bit deceptive; short unemployment spells can arise from two very different patterns of labour market experience. Some people have short unemployment spells that end in their finding a stable long-term job. For the most part, these workers, who we will refer to as the 'short-term unemployed', do not typically bear a high cost of unemployment. But other workers have short unemployment spells that typically end either in their withdrawal from the labour force or in a short-term or temporary job that soon leaves the worker unemployed again. Workers whose unemployment spells are broken up by brief periods of employment or withdrawals from the labour force are referred to as the 'chronically unemployed'. In terms of the costs of unemployment, the experience of these workers is similar to that of the long-term unemployed.

2.5.4 THE UNEMPLOYMENT RATE VERSUS 'TRUE' UNEMPLOYMENT

Like GDP measurement, unemployment measurement has its critics. Most of them argue that the official unemployment rate understates the true extent of unemployment. They point in particular to two groups of people who are not counted among the unemployed: so-called 'discouraged workers' and 'involuntary part-time workers'.

Discouraged workers are people who say they would like to have a job but have not made an effort to find one in the past four weeks. Often, discouraged workers tell the survey-takers that they have not searched for work because they have tried without success in the past or because they are convinced that labour market conditions are such that they will not be able to find a job. Because they have not sought work, discouraged workers are counted as being out of the labour force rather than unemployed. Some observers have suggested that treating discouraged workers as unemployed would provide a more accurate picture of the labour market.

Involuntary part-time workers are people who say they would like to work full-time but are able to find only part-time work. Because they do have jobs, involuntary part-time workers are counted as employed rather than unemployed. These workers are sometimes referred to as ‘underemployed’ or ‘part-time workers for economic reasons’. Some economists have suggested that these workers should be counted as partly unemployed. The problem of discouraged and underemployed workers is likely to be fairly significant. Nevertheless, whether in an official or adjusted version, the unemployment rate is a good overall indicator of labour market conditions. A high unemployment rate tends to be bad news even for those people who are employed since pay increases and promotions are hard to come by in a ‘slack’ labour market. We will discuss the causes and cures of unemployment at some length in Chapter 5 and subsequent chapters.

SUMMARY

- The basic measure of an economy's output is *gross domestic product (GDP)*, the market value of the final goods and services produced in a country during a given period. Expressing output in terms of market values allows economists to aggregate the millions of goods and services produced in a modern economy. *(LO 2.1)*
- Only *final goods and services* (which include *capital goods*) are counted in GDP since they are the only goods and services that directly benefit final users. *Intermediate goods and services*, which are used up in the production of final goods and services, are not counted in GDP, nor are sales of existing assets, such as a 20-year-old house. Summing the value added by each firm in the production process is a useful method for determining the value of final goods and services. *(LO 2.1)*
- GDP can also be expressed as the sum of four types of expenditure: *consumption, investment, government purchases* and *net exports*. These four types of expenditure correspond to the spending of households, firms, the government and the foreign sector, respectively. *(LO 2.2)*
- To compare levels of GDP over time, economists must eliminate the effects of inflation. They do so by measuring the market value of goods and services in terms of the prices fixed at some point in the past. GDP measured in this way is called *real GDP*, while GDP

measured in terms of current-year prices is called *nominal GDP*. Real GDP should always be used in making comparisons of economic activity over time. *(LO 2.3)*

- Real GDP per person is an imperfect measure of economic wellbeing. With a few exceptions, notably government purchases of goods and services (which are included in GDP at their cost of production), GDP includes only those goods and services sold in markets. It excludes important factors that affect people's wellbeing, such as the amount of leisure time available to them, the value of unpaid or volunteer services, the quality of the environment, quality of life indicators such as the crime rate, and the degree of economic inequality. *(LO 2.4)*
- Real GDP is still a useful indicator of economic wellbeing, however. Countries with a high real GDP per person not only enjoy high average standards of living; they also tend to have higher life expectancies, low rates of infant and child mortality, and high rates of school enrolment and literacy. *(LO 2.4)*
- The unemployment rate, perhaps the best-known indicator of the state of the labour market, is based on surveys conducted by the ABS. The surveys classify all respondents over age 15 as employed, unemployed or not in the labour force. The *labour force* is the sum of employed and unemployed workers—that is, people who have a job or are looking for one. The *unemployment rate* is calculated as the number of unemployed workers divided by the labour force. The *participation rate* is the percentage of the working-age population that is in the labour force. *(LO 2.5)*

- The costs of unemployment include the economic cost of lost output, the psychological costs borne by unemployed workers and their families, and the social costs associated with problems like increased crime and violence. The greatest costs are imposed by long *unemployment spells* (periods of unemployment). Critics of the official unemployment rate argue that it understates ‘true’ unemployment by excluding *discouraged workers* and *involuntary part-time workers*. (*LO 2.5*)

KEY TERMS

business cycle 23

capital good 28

circular flow of income 32

comparative advantage 26

consumption expenditure, or consumption 29

discouraged workers 43

duration 42

final goods or services 26

government purchases 29

gross domestic product (GDP) 22

income effect 37

intermediate goods or services 26

investment 29

involuntary part-time workers 43

labour force 41

national income accounting identity 31

net exports 29

nominal GDP 35

opportunity cost 26

participation rate 41

real GDP 35

two-sector model 32

unemployment rate 41

unemployment spell 42

value added 27

REVIEW QUESTIONS

1. Why do economists use market values when calculating GDP? What is the economic rationale for giving high-value items more weight in GDP than low-value items? LO 2.1 **EASY**
2. A large part of the agricultural sector in developing countries is subsistence farming, in which much of the food that is produced is consumed by the farmer and the farmer's family. Discuss the implications of this fact for the measurement of GDP in poor countries. LO 2.1 **MEDIUM**
3. Give examples of each of the four types of aggregate expenditure. Which of the four represents the largest share of GDP in Australia? Can an expenditure component be negative? Explain. LO 2.2 **EASY**
4. Al's Shoeshine Stand shined 1000 pairs of shoes last year and 1200 pairs this year. He charged $4 for a shine last year and $5 this year. If last year is taken as the base year, find Al's contribution to both nominal GDP and real GDP in both years. Which measure would be better to use if you were trying to measure the change in Al's productivity over the past year? Why? LO 2.3 **MEDIUM**
5. Would you say that real GDP per person is a useful measure of economic wellbeing? Defend your answer. LO 2.4 **MEDIUM**
6. True or false: A high participation rate in an economy implies a low unemployment rate. LO 2.5 **HARD**

7. What are the costs of a high unemployment rate? Do you think providing more generous government benefits to the unemployed would increase these costs, reduce these costs or leave them unchanged? Discuss. LO 2.5 **HARD**

PROBLEMS

1. George and John, stranded on an island, use clamshells for money. Last year George caught 300 fish and five wild boars. John grew 200 bunches of bananas. In the two-person economy that George and John set up, fish sell for one clamshell each, boars sell for 10 clamshells each, and bananas go for five clamshells a bunch. George paid John a total of 30 clamshells for helping him to dig bait for fishing, and he also purchased five of John's mature banana trees for 30 clamshells each. What is the GDP of George and John's island in terms of clamshells? LO 2.1 **HARD**
2. How would each of the following transactions affect Australia's GDP? LO 2.1 **EASY**
   - **a)** The Australian Government pays $1 billion in salaries for government workers.
   - **b)** The Australian Government pays $1 billion to welfare recipients.
   - **c)** The Australian Government pays an Australian firm $1 billion for newly produced airplane parts.
   - **d)** The Australian Government pays $1 billion in interest to holders of Australian Government bonds.
   - **e)** The Australian Government pays $1 billion to Saudi Arabia for crude oil to add to Australian official oil reserves.
3. Intelligence Incorporated produces 100 computer chips and sells them for $200 each to Bell Computers. Using the chips and other labour and materials, Bell produces 100 personal computers. Bell

sells the computers, bundled with software that Bell licenses from Macrosoft at $50 per computer, to PC Charlie's for $800 each. PC Charlie's sells the computers to the public for $1000 each. Calculate the total contribution to GDP using the value-added method. Do you get the same answer by summing up the market values of the final goods and services? LO 2.1 **MEDIUM**

4. MNLogs harvested logs (with no inputs from other companies) from its property in northern New South Wales. It sold these logs to MNLumber for $1500 and MNLumber cut and planed the logs into lumber. MNLumber then sold the lumber for $4000 to MNFurniture. MNFurniture used the lumber to produce 100 tables that it sold to customers for $70 each. LO 2.1 **MEDIUM**

   a) Complete the following table to calculate the value added by each firm.

COMPANY	REVENUES	COST OF PURCHASED INPUTS	VALUE ADDED
MNLogs			
MNLumber			
MNFurniture			

   b) Suppose that all of these transactions took place in 2016. By how much did GDP increase because of these transactions?

c) Suppose that MNLogs harvested the logs in October 2016 and sold them to MNLumber in December 2016. MNLumber then sold the finished lumber to MNFurniture in April 2017 and MNFurniture sold all 100 tables during the rest of 2017. By how much did GDP increase in 2016 and 2017 because of these transactions?

5. For each of the following transactions, state the effect both on Australia's GDP and on the four components of aggregate expenditure. LO 2.2 **MEDIUM**

   a) Your mother-in-law buys a new car from an Australian producer.

   b) Your mother-in-law buys a new car imported from Sweden.

   c) Your mother-in-law's car rental business buys a new car from an Australian producer.

   d) Your mother-in-law's car rental business buys a new car imported from Sweden.

   e) The Australian Government buys a new, domestically produced car for the use of your mother-in-law, who has been appointed the ambassador to Sweden.

6. Calculate the four components of expenditure and GDP for the following economy using data from the following table. LO 2.2 **HARD**

Consumption expenditures	$600
Exports	75
Government purchases of goods and services	200
Construction of new homes and apartments	100
Sales of existing homes and apartments	200
Imports	50
Beginning-of-year inventory stocks	100
End-of-year inventory stocks	125
Business fixed investment	100
Government payments to retirees	100
Household purchases of durable goods	150

7. The nation of Potchatoonie produces cricket balls, cases of beer and sandals. The following table lists prices and quantities of the three goods in the years 2014 and 2017. LO 2.3 **MEDIUM**

	CRICKET BALLS		BEER		SAND
YEAR	QUANTITY	PRICE	QUANTITY	PRICE	QUANTIT
2014	100	$5	300	$20	100
2017	125	$7	250	$20	110

Assume that 2014 is the base year. Find nominal GDP and real GDP for both years.

8. The government is considering a policy to reduce air pollution by restricting the use of 'dirty' fuels by factories. In deciding whether to implement the policy, how, if at all, should the likely effects of the policy on real GDP be taken into account? LO 2.4 **MEDIUM**

9. We discussed how the opportunity cost of sending children to school affects the level of school enrolment across countries. The United Nations Human Development Report 2016 reports the following data for per capita income in 2015 (in the equivalent of 2011 US dollars). LO 2.4 **MEDIUM**

Canada	$42,891
Denmark	$43,415
Greece	$24,617
Lesotho	$ 2,517
Ethiopia	$ 1,530

Source: Adapted from United Nations Development Program 2016, *Human Development Report 2016*.

a) Which country would you expect to have the highest school enrolment rate? The lowest rate?

b) Discuss what other factors besides GDP per capita a family might consider when applying the cost–benefit principle to the decision of whether or not to send a child to school.

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10. The following is a report from an ABS survey-taker: 'There were 65 people in the houses I visited. Ten of them were children under 16, 25 people had full-time jobs, and five had part-time jobs. There were 10 retirees, five full-time homemakers, five full-time students over age 16, and two people who were disabled and cannot work. The remaining people did not have jobs but all said they would like one. One of these people had not looked actively for work for three months, however.' Find the labour force, the unemployment rate and the participation rate implied by the survey-taker's report. LO 2.5 **MEDIUM**

11. Ellen is downloading labour market data for the most recent month, but her connection is slow and so far this is all she has been able to get:

Unemployment rate	5.0%
Participation rate	62.5%
Not in the labour force	60 million

Find the labour force, the working-age population, the number of employed workers and the number of unemployed workers. LO 2.5 **HARD**

12. The towns of Sawyer and Thatcher each have a labour force of 1200 people. In Sawyer, 100 people were unemployed for the entire year, while the rest of the labour force worked continuously. In Thatcher, every member of the labour force was unemployed for one month and employed for 11 months. LO 2.5 **MEDIUM**

a) What is the average unemployment rate over the year in each of the towns?

b) What is the average duration of unemployment spells in each of the towns?

c) In which town do you think the costs of unemployment are higher?

REFERENCES

Australian Bureau of Statistics (2013a), `Information paper: The non-observed economy and Australia's GDP, 2012', Cat no. 5204.0.55.008, www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/5204.0.55.008Main%20Features22012?opendocument&tabname=Summary&prodno=5204.0.55.008&issue=2012&num=&view=.

Australian Bureau of Statistics (2013b) 4655.0.55.002, Information Paper: Towards the Australian Environmental-Economic Accounts, 2013. www.abs.gov.au/AUSSTATS/abs@.nsf/Latestproducts/4655.0.55.002Appendix12013?opendocument&tabname=Notes&prodno=4655.0.55.002&issue=2013&num=&view=.

Australian Bureau of Statistics (2016), *Australian National Accounts: Concepts, Sources, and Methods*, Ch. 6, 'Price and volume measures', www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/5216.02015?OpenDocument.

Australian Bureau of Statistics 2018, 'Labour force, Australia, June 2018', Cat. no. 6202.0, www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6202.0Jun%2

02018?OpenDocument.

Australian Council of Social Services (2016), Poverty in Australia 2016, www.acoss.org.au/wp-content/uploads/2016/10/Poverty-in-Australia-2016.pdf.

Chalmers, S 2018, 'China's economic growth cools to its slowest pace since 2016 amid trade tariff tensions', ABC News, 17 July 2018, www.abc.net.au/news/2018-07-16/china-economic-growth-cools-to-its-slowest-pacesince/10000038.

Letts, S 2018, 'Australia's economy grew by 2.4 per cent in 2017, below expectations', ABC News, 7 March 2018, www.abc.net.au/news/2018-03-07/gdp-q4-2017/9522450.

McNeill J 1999, 'GDP growth and human wellbeing: A brief look at why we need a better measure of progress', Paper prepared for Higher School Certificate students, UNE HSC Day, 1999, www.une.edu.au/__data/assets/pdf_file/0007/52387/1999.-GDP-Growth-and-Human-Wellbeing.pdf.

OECD 2018a, 'Average duration of unemployment', https://stats.oecd.org/index.aspx?DataSetCode=AVD_DUR#.

OECD 2018b, 'LFS by sex and age - indicators', https://stats.oecd.org/Index.aspx?DataSetCode=LFS_SEXAGE_I_R#.

Schneider F, Buehn A, Montenegro C 2010, 'Shadow economies all over the world: New estimates for 162 countries from 1999 to

2007', The World Bank, http://econ.worldbank.org/external/default/main?pagePK=64165259&theSitePK=478060&piPK=64165421&menuPK=64166093&entityID=000158349_20101014160704.

United Nations (2018a), Country Stats, http://data.un.org/CountryProfile.aspx?crName=Nepal.

United Nations n.d., Data for Nepal, http://data.un.org/CountryProfile.aspx?crName=Nepal.

United Nations (2018b), System of Environmental Accounting, http://unstats.un.org/unsd/envaccounting/default.asp.

United Nations (2017), World Mortality Report 2015, www.un.org/en/development/desa/population/publications/pdf/mortality/WMR2015/WMR2015_Highlights.pdf.

CHAPTER 3

Measuring the price level and inflation

After reading this chapter, you should be able to answer the following questions.

3.1	How is the consumer price index (CPI) constructed and how is it used to calculate the inflation rate?
3.2	Can you show how the CPI is used to adjust dollar amounts to eliminate the effects of inflation?
3.3	What are the two most important biases in the CPI?
3.4	What is the difference between inflation and relative price changes and how does this relate to the true costs of inflation?
3.5	Can you explain the connections among inflation, nominal interest rates and real interest rates?

SETTING THE SCENE

How much money do you need to live on? This could be the most fundamental of all economic questions, the answer to which guides us in all sorts of choices about what job to accept, what goods and services to buy, how many children we might like to raise and so on. It is not always an easy question to answer. And it is a question that has a long history in terms of affecting approaches to public policy.

One of the most well-known instances in Australian history where it became important to determine the amount of money necessary to survive was the Harvester Decision. This is the name given to a case heard by the newly formed Australian Arbitration Court in 1907. The case was presided over by Justice Henry Bournes Higgins, and involved the owner of the Melbourne-based Harvester Company seeking an exemption from a government excise levied on agricultural machinery. An Act of Parliament, the *Excise Tariff (Agricultural Machinery) Act*, allowed for such exemptions if it could be established that the workers employed by the firm seeking an exemption were being paid 'fair and reasonable' wages. In making his judgment, which incidentally went against the Harvester Company, Justice Higgins had to establish what constituted a 'fair and reasonable' wage. He arrived at a figure of 7 shillings a day as being the minimum amount required to support a worker in 'reasonable and frugal comfort’. This translates into a payment of A$0.70 per day.

No one today would think that a daily wage of A$0.70 is a fair return for a day’s work. In fact, the average level of daily earnings for an Australian worker in 2017 was around $238, according to Australian Bureau of Statistics (ABS) figures on average weekly earnings (ABS 2018). This difference illustrates a simple but very important point: the value of money depends entirely on the prices of goods and services one wants to buy. In the 1900s, $0.70 per day was enough to live on as the prices of goods and services prevailing then were much lower than they are today. Inflation—ongoing increases in the prices of most goods and services—has meant that the amount of money needed today to provide a satisfactory standard of living is much higher than that required 100 years ago. Inflation, the term given to the rate of increase in aggregate prices in the economy, has lowered the purchasing power of Australian currency through time.

3.1 THE CONSUMER PRICE INDEX: MEASURING THE PRICE LEVEL

LO 3.1

We turn now to measuring the average level of prices in the economy. One of the indicators of successful macroeconomic performance is the maintenance of the purchasing power of the currency, something that can be achieved by maintaining a stable average level of prices in the economy. To judge whether the economy is meeting this goal, an objective measure of the average price level and the rate at which that level changes (inflation) is required. This measure is the consumer price index (CPI). In this chapter, we look at some of the practical issues surrounding the measurement of prices and inflation, why high inflation is seen as a problem for an economy, how inflation and interest rates are related and what is meant by deflation.

The basic tool economists use to measure the price level and inflation is the consumer price index or CPI for short. The **consumer price index** is a summary measure, calculated by the ABS, that records the percentage change in the price of a collection (or basket) of goods. Technically, it is a weighted average of the percentage change in the price of each good in the basket, with the weights reflecting the relative importance of each good in the average household's budget. A simple example will help to explain how the CPI is calculated.

Suppose a typical household purchases only three goods: movie tickets, electricity and hamburgers. In 2017, a movie ticket cost $16.00, a hamburger $12.00, and an hour of electricity $4.50. The corresponding prices in 2018 are a movie ticket $17.00, a hamburger $12.50, and electricity $4.75 an hour. The percentage price changes for each good are displayed in Table 3.1.

TABLE 3.1 Percentage price changes

GOOD	PRICE IN 2017	PRICE IN 2018	PERCENTAGE CHANGE IN PRICE
Movie ticket	$16.00	$17.00	$100 \times \frac{(17-16)}{16} = 6.250\%$
Hamburger	$12.00	$12.50	$100 \times \frac{(12.5-12)}{12} = 4.167\%$
An hour of electricity	$4.50	$4.75	$100 \times \frac{(4.75-4.5)}{4.5} = 5.556\%$

What has been the overall rate of inflation for this typical household? You can see that each good purchased by the household has increased in price. However, the rate of price increase has been different for each good. Is there a summary measure that best captures how the price changes displayed in Table 3.1 have affected this household? One option would be to simply average the price increases—if you make this calculation, you might conclude the rate of inflation for this household is 5.324 per cent. A moment's reflection, however, should convince you that this way of calculating the effect of the price increases is not very helpful. This is because a simple average does not consider the relative importance of each good to the household's overall budget. For example, suppose the members of this household go to the movies once a week and buy only two hamburgers during the week. However, they leave their lights burning for 12 out of every 24 hours. Then the household's total expenditure over a week in 2017 would be (1 × $16.00) + (2 × $12.00) + (84 × $4.50) = $418.00. For this household, what matters most is the price of electricity, as electricity represents the highest proportion, 90 per cent of weekly expenditure.

A weighted average would be a more effective way to capture the impact of these price increases on the household, where the highest weight would be attached to the change in the electricity price, the next highest weight to hamburgers and the lowest weight to movie tickets. It seems natural to take each respective good's share of the total household budget as the weight:

$$\frac{84 \times 4.50}{418} \times 5.556\% + \frac{2 \times 12.00}{418} \times 4.167\% + \frac{1 \times 16}{418} \times 6.250\% = 5.502\%.$$

The CPI is then calculated by choosing a base period (in our example, 2017) letting the value of the CPI in that period be 100.0, and then projecting forward using the weighted average percentage increase—this would give a CPI value of 105.502 in 2018. The weighted average rate of a price increase between 2017 and 2018 for this household is around 5.5 per cent.

Whereas our example has only three goods, in practice the ABS performs this calculation every three months for thousands of goods purchased by Australian households. While the scale of the calculation is much larger than in our example, the method used by the ABS is the same.

This way of calculating the CPI is an application of what is known more generally as a **Laspeyres price index**. The distinguishing feature of a Laspeyres price index is that the weights applied to each price change reflect the relative importance of each good in the household's budget in the *base period*. If expenditure patterns change through time, however, the weights become less relevant and the index can no longer be relied on as an accurate measure of how price changes impact a household. For this reason, the weights are reviewed annually by the ABS.

CONCEPT CHECK 3.1

Using the data in Table 3.1, calculate the value of the CPI in 2018 if the price of electricity in 2018 was $4.10 an hour.

3.2 INFLATION

LO 3.2

The inflation rate is the percentage change in the CPI over the specified period. For example, to calculate the annual **rate of inflation** as of December 2017, we find the percentage increase in the CPI over the 12 months leading up to December 2017. The calculation is made using the following formula:

$$\text{Inflation rate as at December 2017} = 100 \times \frac{(\text{CPI}_{\text{Dec},2017} - \text{CPI}_{\text{Dec},2016})}{\text{CPI}_{\text{Dec},2016}}$$

EXAMPLE 3.1 – CALCULATING INFLATION RATES: 2013–2017

How do we calculate the inflation rate using the CPI?

Australian CPI values for the years 2013 through 2017 are shown in the following table. Find the rates of inflation between 2013 and 2014, 2014 and 2015, 2015 and 2016, and 2016 and 2017.

YEAR	CPI
2013	1.077
2014	1.104
2015	1.120
2016	1.135
2017	1.157

Source: Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/search?st=inflation+australia.

The inflation rate between 2014 and 2015 is the percentage increase in the price level between those years, or (1.104 – 1.077)/1.077 = 0.027/1.107 = 0.025 = 2.5%. Do the calculations on your own to confirm that inflation during each of the next three years was 1.5, 1.3 and 1.9 per cent respectively. Note that before the early 1990s, inflation rates were much higher than the 1 to 3 per cent inflation rates that have prevailed since then.

CONCEPT CHECK 3.2

Following are CPI values for the years 1929 through 1933. Find the rates of inflation between 1929 and 1930, 1930 and 1931, 1931 and 1932, and 1932 and 1933.

YEAR	CPI
1929	0.091
1930	0.087
1931	0.078
1932	0.074

Source: Australian Bureau of Statistics 2012, 'Year book', Table 29.8 Retail/consumer price index numbers, http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/1301.0~2012~Main%20Features~Consumer%20Price%20Index%20(CPI)~158.

How did inflation rates in the 1930s differ from those in the 1970s?

Figure 3.1 shows Australia's inflation rate since 1949. The figure shows that inflation in Australia peaked in the early 1950s, coinciding with a brief commodity price boom associated with the Korean War, and then fell rapidly, re-emerging in the mid-1970s. Inflation then gradually subsided (the rate of inflation was even negative for a brief period of time in 1997, an instance of *deflation*), and has been relatively constant since around the early 2000s. (You can also see clearly the spike in inflation caused by the introduction of the goods and services tax (GST) in 2000.)

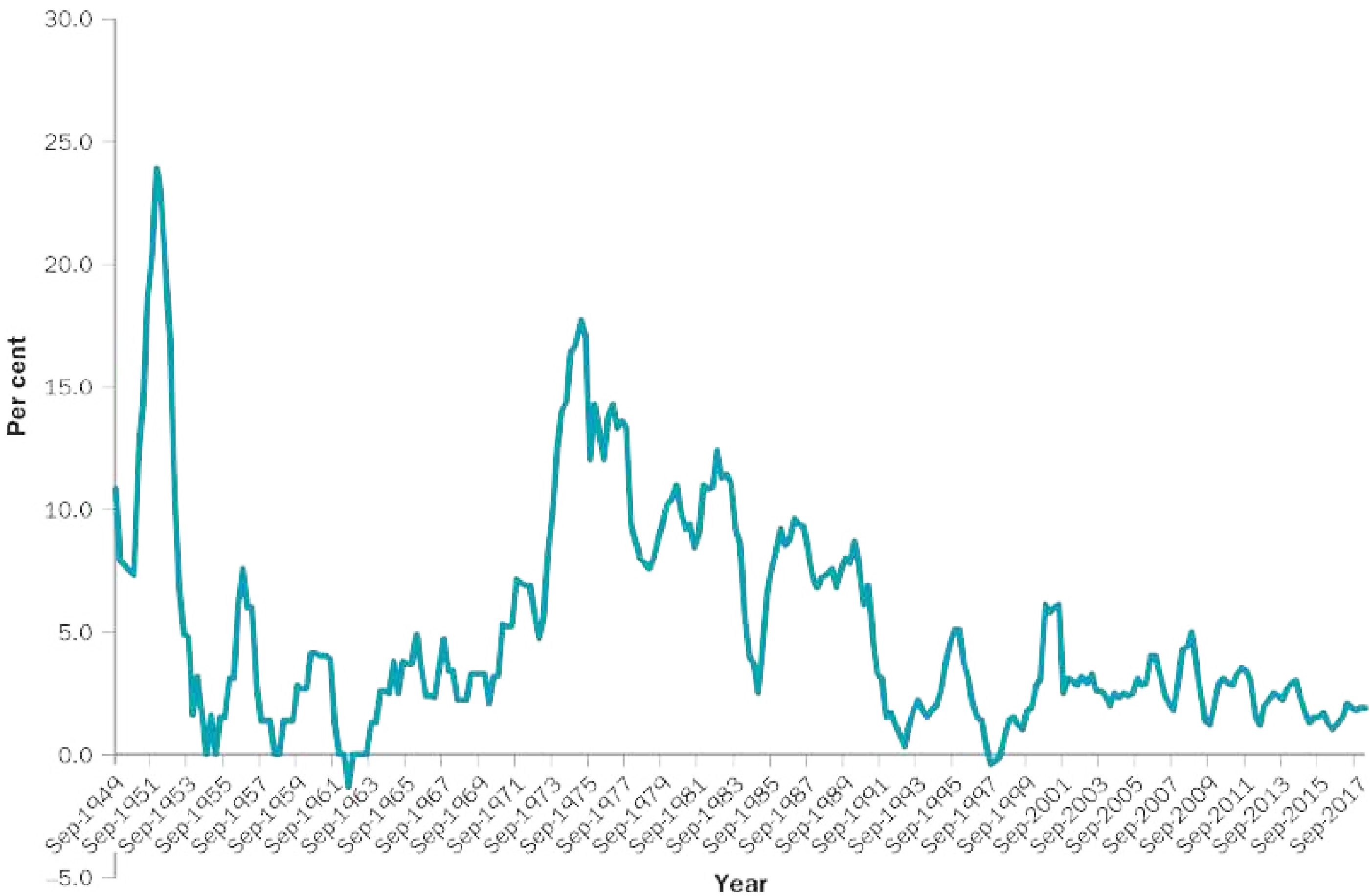

Figure 3.1 **Inflation in Australia**

Source: Based on Australian Bureau of Statistics, 'Consumer price index', March 2018,www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6401.0Mar%202018?OpenDocument.

Along with GDP, the economy's rate of inflation is a keenly monitored economic variable. This is because the rate of inflation, if high, imposes real costs on the economy. We discuss these costs in more detail below.

3.2.1 A COMMON MISPERCEPTION ABOUT INFLATION

Suppose you visit a particular restaurant each Friday night with your family for a meal. Ever since you have been going to this restaurant the price for a large supreme pizza has been $18.50. One night, to your horror, you find that the proprietor of the restaurant has increased the price of large supreme pizzas to $20.50. 'Inflation has ruined our night out,' you fume before you and your family storm out of the restaurant to find somewhere cheaper.

In fact, what has happened here is not an example of inflation. Rather, Page 53 it is a change in relative prices. The price of pizzas at that particular restaurant, relative to other goods and services, has increased. But this is not inflation. **Relative price** changes happen all the time in the economy. These are simply responses to changes in demand and supply conditions. Such relative price changes provide the means by which a market economy efficiently allocates resources.

Remember, inflation is a sustained change in the economy's price level. It is not simply a rise in the price of individual goods or services. Inflation occurs if there is a general rise in prices in the economy.

3.2.2 ADJUSTING FOR INFLATION

The CPI is an extremely useful tool. Not only does it allow us to measure changes in the cost of living, it also can be used to adjust economic data to eliminate the effects of inflation. In this section, we will see how the CPI can be used to convert quantities measured at current dollar values into real terms, a process called **deflating** . The CPI can be used to convert real quantities into current-dollar terms, a procedure called **indexing** . Both procedures are useful not only to economists but to anyone who needs to adjust payments, accounting measures or other economic quantities for the effects of inflation.

To illustrate the use of the CPI to adjust nominal quantities—quantities measured at their current dollar values—for the effects of inflation, suppose we know that the typical family in a certain suburb had a total income of $40 000 in 2015 and $44 000 in 2018. Was this family economically better off in 2018 than in 2015?

Without any more information than this, we might be tempted to say yes. After all, their income rose by 10 per cent over the three-year period. But prices also might have been rising, as fast as or faster than the family's income. Suppose the prices of the goods and services the family consumes rose 25 per cent over the same period. Since the family's income rose only 10 per cent, we would have to conclude that the family is worse off, in terms of the goods and services they can afford to buy, despite the increase in their nominal, or current-dollar, income.

We can make a more precise comparison of the family's purchasing power in 2015 and 2018 by calculating their incomes in those years in real terms. In general, a **real quantity** is one that is measured in physical terms—for example, in terms of quantities of goods and services (recall our discussion of real GDP in Chapter 2). To convert a **nominal quantity** into a real quantity, we must divide the nominal quantity by a price index for the period, as shown in Table 3.2. The calculations in the table show that in real or purchasing power terms, the family's income actually decreased by $4800, or 12 per cent of their initial real income of $40 000, between 2015 and 2018.

TABLE 3.2 Comparing the real values of a family's income in 2015 and 2018

YEAR	NOMINAL FAMILY INCOME	CPI	REAL FAMILY INCOME = NOMINAL FAMILY INCOME/CPI
2015	$40 000	1.00	$40 000/1.00 = $40 000
2018	$44 000	1.25	$44 000/1.25 = $35 200

The problem for this family is that though their income has been rising in nominal (dollar) terms, it has not kept up with inflation. Dividing a nominal quantity by a price index to express the quantity in real terms is called 'deflating the nominal quantity'. (Be careful not to confuse the idea of deflating a nominal quantity with deflation, or negative inflation. The two concepts are different.)

Deflating a nominal quantity is a very useful tool. It can be used to eliminate the effects of inflation from comparisons of any nominal quantity—workers' wages, healthcare expenditures, the components of the federal government's budget—over time. Why does this method work? In general, if you know both how many dollars you have spent on a given item and the item's price, you can figure out how many of the item you bought (by dividing your expenditures by the price). For example, if you spent $100 on hamburgers last month and hamburgers cost $2.50 each, you can determine that you purchased 40 hamburgers. Similarly, if you divide a family's dollar income or expenditures by a price index, which is a measure of the average price of the goods and services they buy, you will obtain a measure of the real quantity of goods and services they purchased. Such real quantities are sometimes referred to as inflation-adjusted quantities.

BACKGROUND BRIEFING 3.1

Real earnings of Australian workers

How do you compare workers' real earnings?

The mining industry went through a boom in Australia, beginning roughly in the early 2000s, brought about, to a large degree, by demand for raw materials from China. In contrast, during the same period, the accommodation and food service industries faced relatively tough times. How were these different experiences reflected in the earnings of workers in the respective sectors?

The average Australian mining worker earned around $1020 per week in 1995 and nearly $2400 in 2012. The corresponding figures for workers in the accommodation and food services sector were $844 in 1995 and $989 in 2012. How did the real earnings in the two sectors change in these years?

To find real earnings, we need to know the CPI in each year over the period 1995 through to 2012 and then divide nominal earnings in each year by the CPI for that year. Figure 3.2 shows nominal and real earnings for these two groups of Australian workers for the period 1995–2012. For both groups, nominal earnings show an upward trend with the trend being relatively stronger for mining workers, an unsurprising result given the rapid expansion of mining in Australia over this period. Note carefully, however, the trends in real earnings. For mining workers, the increase in nominal earnings was also translated into increased real earnings. The same was not true for workers in the accommodation and food services sector where **real wages** were largely unchanged, indeed even falling in some years. This shows the importance, when analysing the rewards workers receive, of adjusting carefully for the effects of inflation so that real earnings become the point of comparison.

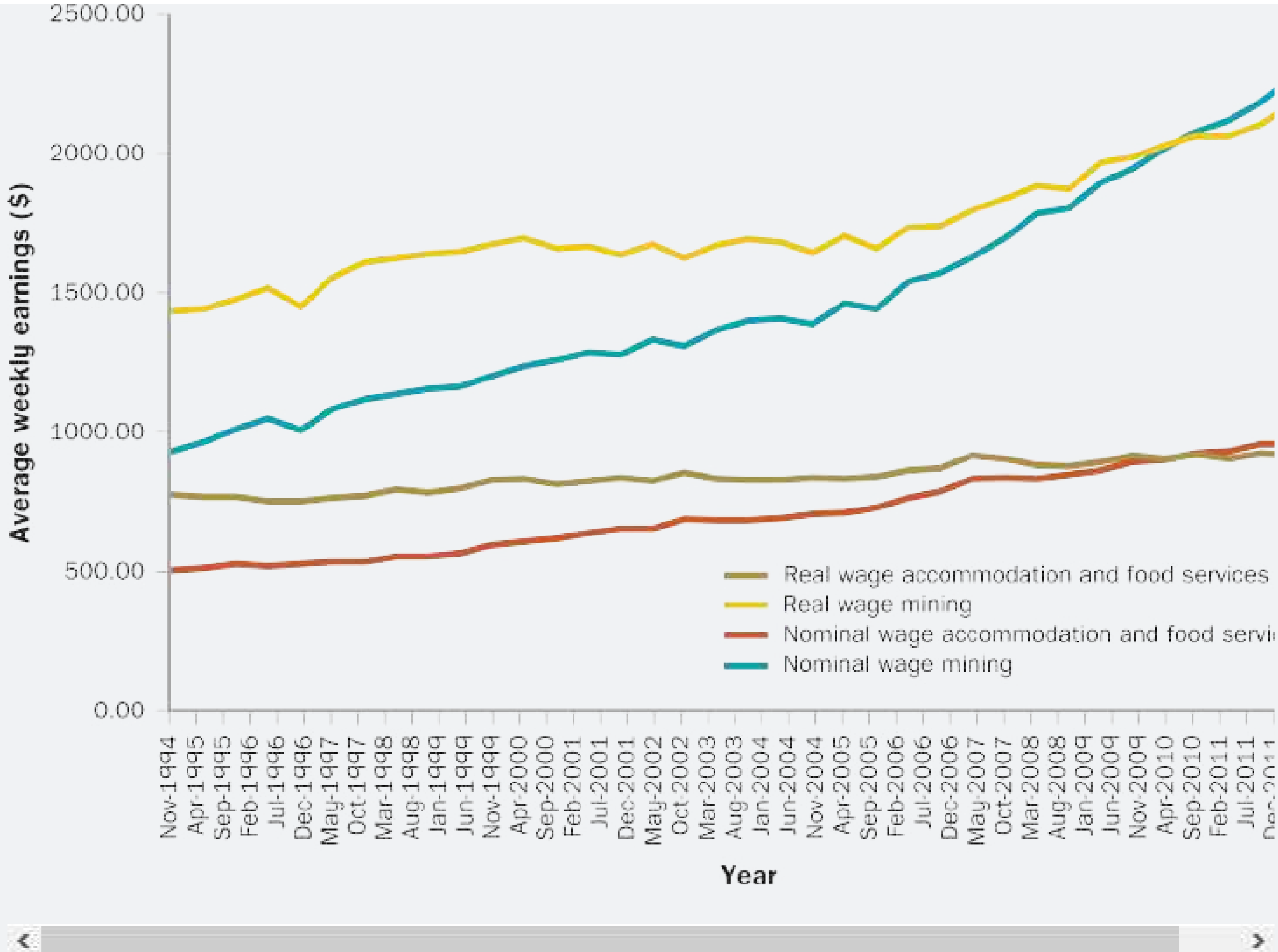

Figure 3.2 **Nominal and real earnings for mining and accommodation/food service workers, Australia**

Source: Australian Bureau of Statistics, 'Average weekly earnings, Australia and Organization for Economic Co-operation and Development, Consumer price index of all items in Australia' Cat. no. 6302.0, retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/AUSCPIALLQINMEI, accessed 13 September 2018.

Indexing to maintain buying power

The consumer price index also can be used to convert real quantities to nominal quantities. Suppose, for example, that in the year 2015 the government paid certain social welfare recipients $1000 per month in benefits. Let's assume that the government would like the buying power of these benefits to remain constant over time so that the recipients' standard of living is unaffected by inflation. To achieve that goal, at what level should the monthly social welfare benefit be set in the year 2018?

The nominal, or dollar, benefit that should be paid in the year 2018 to maintain the purchasing power of social welfare recipients depends on how much inflation has taken place between 2015 and 2018. Suppose that the CPI has risen 20 per cent between 2015 and 2018. That is, on average, the prices of the goods and services consumers buy have risen 20 per cent over that period. For social welfare recipients to 'keep up' with inflation, their benefit in the year 2018 must be $1000 + 0.2 × ($1000) = $1200 per month, or 20 per cent more than it was in 2010. In general, to keep purchasing power constant, the dollar benefit must be increased each year by the percentage increase in the CPI.

The practice of increasing a nominal quantity according to changes in a price index to prevent inflation from eroding purchasing power is called indexing. Some employment contracts are indexed as well so that wages are adjusted fully or partially for changes in inflation.

EXAMPLE 3.2 – AN INDEXED EMPLOYMENT

CONTRACT

How much do workers get paid when they have an indexed contract?

An employment contract provides for a first-year wage of \$12.00 per hour and specifies that the real wage will rise by 2 per cent in the second year of the contract and by another 2 per cent in the third year. The CPI is 1.00 in the first year, 1.05 in the second year and 1.10 in the third year. What are the dollar wages that must be paid in the second and third years of the contract?

Because the CPI is 1.00 in the first year, both the nominal wage and the real wage are \$12.00. Let w_2 stand for the nominal wage in the second year. Deflating by the CPI in the second year, we can express the real wage in the second year as $w_2/1.05$. The contract says that the second-year real wage must be 2 per cent higher than the real wage in the first year, so $w_2/1.05 = \$12.00 \times 1.02 = \$12.24$. Multiplying through by 1.05 to solve for w2, we get w2 = \$12.85, the nominal wage required by the contract in the second year. In the third year the nominal wage w3 must satisfy the equation $w_3/1.10 = \$12.24 \times 1.02 = \$12.48$. Solving this equation for w_3 yields \$13.73 as the nominal wage that must be paid in the third year.

3.3 DOES THE CPI MEASURE ‘TRUE’ INFLATION?

LO 3.3

FIND ONLINE

Policymakers pay close attention to the latest inflation numbers when deciding what actions to take. However, what if changes in the CPI are a poor measure of ‘true’ inflation? First, the indexing of government benefits to the CPI could be costing the government millions of dollars more than necessary every year. Second, an overstated rate of inflation could lead us to underestimate the true improvement in living standards over time. For instance, if the typical family’s nominal income increases by 3 per cent per year, and inflation is reported to be 3 per cent per year, economists would conclude that families are experiencing no increase in their real income. But if the ‘true’ inflation rate is really 2 per cent per year, then the family’s real income is actually rising by 1 per cent per year (the 3% increase in nominal income minus 2% inflation).

A very famous US report, known as the Boskin Commission Report (www.ssa.gov/history/reports/boskinrpt.html), concluded that the official CPI inflation rate overstates the true inflation rate by as much as 1 to 2 percentage points a year. It gave a number of reasons why this might be this case, reasons that would apply in all countries, not just the United States; two are particularly important. First, in practice, government statisticians cannot always adjust adequately for changes in the quality of goods and services.

Suppose a new personal computer has 20 per cent more memory, computational speed and data storage capacity than last year's model. Suppose too for the sake of illustration that its price is 20 per cent higher. Has there been inflation in computer prices? Economists would say no; although consumers are paying 20 per cent more for a computer, they are getting a 20 per cent better machine. The situation is really no different from paying 20 per cent more for a pizza that is 20 per cent bigger. However, because quality change is difficult to measure precisely and because they have many thousands of goods and services to consider, government statisticians often miss or understate changes in quality. In general, whenever statisticians fail to adjust adequately for improvements in the quality of goods or services, they will tend to overstate inflation. This type of overstatement is called **quality adjustment bias**.

An extreme example of quality adjustment bias can occur whenever a totally new good becomes available. For instance, the introduction of the first effective AIDS drugs significantly increased the quality of medical care received by AIDS patients. In practice, however, quality improvements that arise from totally new products are likely to be poorly captured by the CPI, if at all. The problem is that since the new good was not produced in the base year, there is no base-year price with which to compare the current price of the good. Government statisticians use various approaches to correct for this problem, such as comparing the cost of the new drug to the cost of the next-best therapies. But such methods are necessarily imprecise and open to criticism.

The second problem emphasised by the Boskin Commission arises from the fact that the CPI is calculated for a fixed basket of goods and services. This procedure does not allow for the possibility that consumers can switch from products whose prices are rising to those whose prices are stable or falling. Ignoring the fact that consumers can switch from more expensive to less expensive goods leads statisticians to overestimate the true increase in the cost of living.

Suppose, for instance, that people like coffee and tea equally well and in the base year consumed equal amounts of each. But then a frost hits a major coffee producing nation, causing the price of coffee to double. The increase in coffee prices encourages consumers to forgo coffee and drink tea instead—a switch that doesn't make them worse off since they like coffee and tea equally well. However, the CPI, which measures the cost of buying the base-year basket of goods and services, will significantly rise when the price of coffee doubles. This rise in the CPI, which ignores the fact that people can substitute tea for coffee without being made worse off, exaggerates the true increase in the cost of living. This type of overstatement of inflation is called **substitution bias** .

EXAMPLE 3.3 – SUBSTITUTION BIAS

Why does substitution bias matter?

2015		PRICE	QUANTITY	EXPENDITURE
	Coffee	$1	50	$50
	Tea	$1	50	$50
	Scones	$1	100	$100
	Total			$200
2018	Coffee	$2	0	$0
	Tea	$1	100	$100
	Scones	$1.50	100	$150
	Total			$250

Suppose we have the following information on the average person's spending patterns across two years, 2015 and 2018:

Assume that consumers are equally happy to drink coffee or tea with their scones. In 2015, coffee and tea cost the same, and the average person drinks equal amounts of coffee and tea.

In the year 2018, coffee has doubled in price to $2 per cup. Tea remains at $1 per cup and scones are $1.50 each. What has happened to the cost of living as measured by the CPI?

How does this result compare to the true cost of living?

Calculating the CPI for 2018 using the Laspeyres index, as outlined in Section 3.1, gives a value for the CPI in 2018 of 150. This calculation leads us to conclude that the cost of living has increased 50 per cent between 2015 and 2018.

However, we have overlooked the possibility that consumers can substitute a cheaper good (tea) for the relatively more expensive one (coffee). Indeed, since consumers like coffee and tea equally well, when the price of coffee doubles they will shift entirely to tea. Their new consumption basket—100 cups of tea and 100 scones—is just as enjoyable to them as their original basket. If we allow for the substitution of less expensive goods, how much has the cost of living really increased? The cost of 100 cups of tea and 100 scones in the year 2018 is only $250, not $300. From the consumer's point of view, the true cost of living has risen by only $50, or 25 per cent. The 50 per cent increase in the CPI, therefore, overstates the increase in the cost of living as the result of substitution bias.

3.3.1 THE COSTS OF INFLATION: NOT WHAT YOU THINK

Although inflation rates have not been very high in recent years, today many people remain concerned about inflation or the threat of inflation. Why do people worry so much about inflation? Detailed opinion surveys often find that many people are confused about the meaning of inflation and its economic effects. When people complain about inflation, they are often concerned primarily about relative price changes.

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Before describing the true economic costs of inflation, which are real and serious, let’s examine this confusion people experience about inflation and its costs.

We need first to distinguish between the price level and the relative price of a good or service. The price level is a measure of the overall level of prices at a particular point in time as measured by a price index such as the CPI. Recall that the inflation rate is the percentage change in the price level from year to year. In contrast, a relative price is the price of a specific good or service in comparison to the prices of other goods and services. For example, if the price of oil were to rise by 10 per cent while the prices of other goods and services were rising on average by 3 per cent, the relative price of oil would increase. But if oil prices rise by 3 per cent while other prices rise by 10 per cent, the relative price of oil would decrease. That is, oil would become cheaper relative to other goods and services, even though it has not become cheaper in absolute terms.

Public opinion surveys suggest that many people are confused about the distinction between inflation, which is an increase in the overall price level, and an increase in a specific relative price. Suppose that supply disruptions in the Middle East were to double the price of petrol at the pump, leaving other prices unaffected. Appalled by the increase in petrol prices, people might demand that the government do something about ‘this inflation’. But while the increase in petrol prices hurts consumers, is it an example of inflation? Petrol is only one item in a consumer’s budget, one of the thousands of goods and services that people buy every day. Thus, the increase in the price of petrol might affect the overall price level, and hence the inflation rate, only slightly. In this example, inflation is not the real problem. What upsets consumers is the change in the relative price of petrol, particularly compared to the price of labour (wages). By increasing the cost of using a car, the increase in the relative price of petrol reduces the income people have left over to spend on other things.

Again, changes in relative prices do not necessarily imply a significant amount of inflation. For example, increases in the prices of some goods could well be counterbalanced by decreases in the prices of other goods, in which case the price level and the inflation rate would be largely unaffected. Conversely, inflation can be high without affecting relative prices. Imagine, for instance, that all prices in the economy, including wages and salaries, go up exactly 10 per cent each year. The inflation rate is 10 per cent, but relative prices are not changing. Indeed, because wages (the price of labour) are increasing by 10 per cent per year, people’s ability to buy goods and services is unaffected by the inflation.

These examples show that changes in the price level and changes in the relative prices of specific goods are two quite different issues. The public's tendency to confuse the two is important because the remedies for the two problems are different. To counteract changes in relative prices, the government would need to implement policies that affect the supply and demand for specific goods. In the case of an increase in oil prices, for example, the government could try to encourage the development of alternative sources of energy. To counteract inflation, however, the government must resort (as we will see) to changes in macroeconomic policies such as monetary or fiscal policies. If, in confusion, the public forces the government to adopt anti-inflationary policies when the real problem is a relative price change, the economy could actually be hurt by the effort. This is an important example of why economic literacy is important, to both policymakers and the general public.

EXAMPLE 3.4 – THE PRICE LEVEL, RELATIVE PRICES AND INFLATION

How are the price level, relative prices and inflation related?

Suppose the value of the CPI is 1.20 in the year 2016, 1.32 in 2017 and 1.40 in 2018. Assume also that the price of oil increases 8 per cent between 2016 and 2017 and another 8 per cent between 2017 and 2018. What is happening to the price level, the inflation rate and the relative price of oil?

The price level can be measured by the CPI. Since the CPI is higher in 2017 than in 2016 and higher still in 2018 than in 2017, the price level is rising throughout the period. Since the CPI increases by 10 per cent between 2016 and 2017, the inflation rate between those years is 10 per cent. However, the CPI increases only about 6 per cent between 2017 and 2018 (1.40/1.32 = 1.061), so the inflation rate decreases to about 6 per cent between those years. The decline in the inflation rate implies that although the price level is still rising, it is doing so at a slower pace than the year before.

The price of oil rises 8 per cent between 2016 and 2017. But because the general inflation over that period is 10 per cent, the relative price of oil—that is, its price relative to all other goods and services—falls by about 2 per cent (8% − 10% = −2%). Between 2017 and 2018 the price of oil rises by another 8 per cent, while the general inflation rate is about 6 per cent. Hence the relative price of oil rises between 2017 and 2018 by about 2 per cent (8% − 6%).

3.4 THE TRUE COSTS OF INFLATION

LO 3.4

Having dispelled the common confusion between inflation and relative price changes, we are now free to address the true economic costs of inflation. There is a variety of such costs, each of which tends to reduce the efficiency of the economy. As the past teaches us, these costs can be significant. For example, many industrialised countries experienced a period during the decades of the 1970s and 1980s that has become known as the Great Inflation. These were years in which the annual rate of inflation was often above 10 per cent, and in some years considerably higher. Those years taught economists, policymakers and the general public that inflation imposed real costs on society. We now describe six of the main costs.

3.4.1 SHOE-LEATHER COSTS

An important function of money is that it acts as a medium of exchange; that is, money is used to purchase goods and services. Although alternative payment means are also available, such as credit cards, money has the advantage of being universally accepted in any circumstance in which a transaction takes place, regardless of its size or purpose. Inflation, however, raises the cost of holding money to consumers and businesses. This is because inflation erodes the real purchasing power of any given amount of cash. The longer cash is held during a period of inflation, the larger is this reduction in purchasing power.

When faced with this loss in purchasing power, people are likely to take actions to economise on their money holdings. Typically, this is done by leaving as much money as is possible in bank accounts where the interest paid on deposits acts to insulate money's purchasing power from the effects of inflation. However, there is a trade-off with this behaviour, as it makes it more likely that individuals will have to visit their banks or an ATM more frequently in order to withdraw the cash needed to complete transactions. The inconvenience associated with the increased frequency of these visits is a real cost of inflation (known traditionally as shoe-leather costs, since more trips to the bank implies wearing out shoe leather at a greater rate). There may be other associated costs, for example, businesses may have to employ extra staff to make these trips.

Shoe-leather costs are probably not a great problem for countries such as Australia today, where inflation is only 2–3 per cent per year. But in economies with high rates of inflation they can become quite significant.

3.4.2 NOISE IN THE PRICE SYSTEM

Economists are very familiar with the idea that the role of the price system is to allocate resources efficiently. Economists think of this in terms of prices for goods and services adjusting in response to demand and supply forces to achieve market equilibrium. When inflation is high, however, the subtle signals that are transmitted through the price system become more difficult to interpret, in much the same way that static, or ‘noise’, makes a radio message harder to interpret. For example, in an economy with little or no inflation the supplier of specialty foodstuffs will immediately recognise the increase in chanterelle prices as a signal to bring more to market. If inflation is high, however, the supplier must ask whether a price increase represents a true increase in the demand for chanterelles or is just a result of the general inflation, which causes all food prices to rise. If the price rise reflects only inflation, the price of chanterelles relative to other goods and services has not really changed. The supplier, therefore, should not change the quantity of mushrooms they brought to market.

In an inflationary environment, to discern whether the increase in chanterelle prices is a true signal of increased demand, the supplier needs to know what is happening to the prices of other goods and services. Since this information takes time and effort to collect, the supplier’s response to the change in chanterelle prices is likely to be more tentative than would ordinarily be the case.

In summary, price changes are the market’s way of communicating information to suppliers and demanders. An increase in the price of a good or service, for example, tells demanders to economise on their use of the good or service and tells suppliers to bring more of it to market. But, in the presence of inflation, prices are affected not only by changes in the supply and demand for a product but also by changes in the general price level. Inflation creates static, or ‘noise’, in the price system, obscuring the information transmitted by prices and reducing the efficiency of the market system. This reduction in efficiency imposes real economic costs.

3.4.3 DISTORTIONS OF THE TAX SYSTEM

The interactions between inflation and the tax system can be complicated. However, one clear way in which inflation imposes a cost to society is in countries such as Australia where tax rates are not indexed to the rate of inflation. The problem arises because the calculation made by the government of how much tax is to be paid is usually based on nominal magnitudes. This is known as a non-indexed tax system. Where taxes are based on real magnitudes, such as in the United States, the tax system is said to be indexed.

Income taxes are a good example of the problems caused by the interaction of inflation with a non-indexed tax system. In most countries, people with higher incomes pay a higher percentage of their income in taxes. Without indexing, an inflation that raises people's nominal incomes would force them to pay an increasing percentage of their income in taxes as they move into higher tax brackets, even though their real incomes may not have increased. For example, the marginal tax rate faced by people who earn more than $40 000 annually may be higher than for those earning less than $40 000. An individual, originally earning $39 999, and who then received a wage increase to compensate for an increase in the general level of prices, will now be in a higher tax bracket, and will pay a greater proportion of their income as taxes than previously, even though their higher nominal income simply reflects the prevailing rate of inflation. This is sometimes known as bracket creep and results in a loss of real purchasing power. If taxes are indexed, a family whose nominal income is rising at the same rate as inflation does not have to pay a higher percentage of income in taxes.

3.4.4 UNEXPECTED REDISTRIBUTION OF WEALTH

Yet another concern about inflation is that it may redistribute wealth from one group to another, arbitrarily creating winners and losers. Consider a group of union workers who signed a contract setting their wages for the next three years. If those wages are not indexed to inflation, the workers will be vulnerable to upsurges in the price level. Suppose, for example, that inflation is much higher than expected over the three years of the contract. In that case, the buying power of the workers' wages—their real wages—will be less than anticipated when they signed the contract.

From society's point of view, is the buying power that workers lose to inflation really 'lost'? The answer is no; the loss in their buying power is exactly matched by an unanticipated gain in the employer's buying power because the real cost of paying the workers is less than anticipated. In other words, the effect of the inflation is not to destroy purchasing power but to redistribute it, in this case from the workers to the employer. If inflation had been lower than expected, the workers would have enjoyed greater purchasing power than they anticipated, and the employer would have been the loser.

Another example of the redistribution caused by inflation takes place between borrowers (debtors) and lenders (creditors). Suppose one of the authors of this book wants to buy a house and borrows $150 000 from the bank to pay for it. Shortly after signing the mortgage agreement he learns that inflation is likely to be much higher than expected. How should he react to the news? Perhaps as a public-spirited macroeconomist, the author should be saddened to hear that inflation is rising, but as a consumer, he should be pleased. In real terms, the dollars with which he will repay his loan in the future will be worth much less than expected. The loan officer should be distraught, because the dollars the bank will receive from the author will be worth less, in purchasing power terms, than expected at contract signing. Once again, no real wealth is 'lost' to the inflation; rather, the borrower's gain is just offset by the lender's loss. In general, unexpectedly high inflation rates help borrowers at the expense of lenders, because borrowers are able to repay their loans in less valuable dollars. Unexpectedly low inflation rates, in contrast, help lenders and hurt borrowers by forcing borrowers to repay in dollars that are worth more than expected when the loan was made.

Although redistributions caused by inflation do not directly destroy wealth but only transfer it from one group to another, they are still bad for the economy. Our economic system is based on incentives. For the economy to work well people must know that if they work hard, save some of their income and make wise financial investments, they will be rewarded in the long run with greater real wealth and a better standard of living. Some observers have compared a high-inflation economy to a casino, in which wealth is distributed largely by luck—that is, by random fluctuations in the inflation rate. In the long run, a 'casino economy' is likely to perform poorly, as its unpredictability discourages people from working and saving. (Why bother if inflation can take away your savings overnight?) Rather, a high-inflation economy encourages people to use up resources in trying to anticipate inflation and protect themselves against it.

3.4.5 INTERFERENCE WITH LONG-RUN PLANNING

The fifth cost of inflation is its tendency to interfere with the long-run planning of households and firms. Many economic decisions take place within a long time horizon. Planning for retirement, for example, may begin when workers are in their twenties or thirties. And firms develop long-run investment and business strategies that look decades into the future.

Clearly, high and erratic inflation can make long-term planning difficult. Suppose, for example, that you want to enjoy a certain standard of living when you retire. How much of your income do you need to save to make your dreams a reality? That depends on what the goods and services you plan to buy will cost 30 or 40 years from now. With high and erratic inflation, even guessing what your chosen lifestyle will cost by the time you retire is extremely difficult. You may end up saving too little and having to compromise on your retirement plans; or you may save too much, sacrificing more than you need to during your working years. Either way, inflation will have proved costly.

3.4.6 MENU COSTS

The sixth and final cost of inflation we will describe takes account of the fact that the act of changing prices itself can impose significant costs. Think of a restaurant that lists its dishes and prices on a printed menu. Every time the restaurateur wishes to change the price of a meal they would need to have new menus printed. This is costly. Imagine if inflation is running at 10 or 20 per cent. This might require new menus to be printed on a weekly basis—there is, of course, an opportunity cost associated with this. Although this problem is not confined to restaurants—any firm that publicly lists its prices in some form will incur costs when those prices are changed—economists refer to this using the generic term ‘menu costs’.

In summary, inflation damages the economy in a variety of ways. Some of its effects are difficult to quantify and are therefore controversial. But most economists agree that a low and stable inflation rate is instrumental in maintaining a healthy economy.

THINKING AS AN ECONOMIST 3.1

How costly is high inflation?

Economic theory suggests that high inflation rates reduce economic efficiency and growth. Most economists believe that the economic costs associated with high inflation are significant, yet we have often seen episodes of high inflation throughout the world. In reality, how costly are high inflation rates?

Economists Stanley Fischer, Ratna Sahay and Carlos A. Végh (2002) examined the economic performance of 133 market economies over the period 1960–96 and uncovered 45 episodes of high inflation (12-month inflation rates greater than 100%) among 25 different countries. They found that, while uncommon, episodes of high inflation impose significant economic costs on the countries experiencing them. During periods of high inflation these countries saw real GDP per person fall by an average of 1.6 per cent per year, real consumption per person fall by an average of 1.3 per cent per year and real investment per person fall by an average of 3.3 per cent per year. During low-inflation years these same countries experienced positive growth in each of these variables. In addition, during periods of high inflation these countries' trade and government budget deficits were larger than during low-inflation years.

Falling output and consumption levels caused by high inflation reduce the economic wellbeing of households and firms, and have a disproportionate effect on poor workers, who are least likely to have their wages indexed to the inflation rate and thus avoid a real loss in purchasing power. As pointed out in the preceding section, high inflation rates also distort relative prices in the marketplace, leading to a misallocation of resources that can have long-term economic consequences. Falling investment in new capital caused by high inflation, for example, leads not only to a slowdown in current economic activity but also to reduced growth rates of future output. Because of these adverse economic effects, policymakers have an incentive to keep inflation rates low.

THINKING AS AN ECONOMIST 3.2

Does recorded inflation overstate the true cost of living? The quality effect

One of the difficulties in obtaining a true measure of the cost of living occurs when the quality of goods and services being offered changes, something that is very difficult to capture in official statistics on prices. For example, according to the official measures, over recent decades the prices of medical services have tended to rise much more rapidly than the prices of other goods and services. Given for many households, health expenditures are a significant component of the annual budget, what would be the implication of this inflation in the healthcare sector?

Some economists have argued that reported rates greatly overstate the true rate of inflation in that sector. The reason, claim critics, is the quality adjustment bias. Healthcare is a dynamic sector of the economy, in which ongoing technological change has significantly improved the quality of care. To the extent that official data fail to account for improvements in the quality of medical care, inflation in the healthcare sector will be overstated.

Doctor Irving Shapiro and economists Matthew Shapiro and David Wilcox illustrated the problem with the example of changes in the treatment of cataracts, a cloudiness in the lens of the eye that impairs vision (Shapiro, Shapiro & Wilcox 1999, pp. 333–7). The lens must still be removed surgically, but there have been important improvements in the procedure over the past 30 years. First, surgeons can now replace the defective lens with an artificial one, which improves the patient’s vision considerably without contact lenses or thick glasses. Second, the techniques for making and closing the surgical incision have been substantially improved. Besides reducing complications and therefore follow-up visits, the new techniques can be performed in the physician’s office, with no hospital stay (older techniques frequently required three nights in the hospital). Thus the new technologies have both improved patient outcomes and reduced the number of hours that doctors and nurses spend on the procedure.

Shapiro *et al*. point out that official measures of healthcare inflation are based primarily on data such as the doctor's hourly rate or the cost of a night in the hospital. They do not take into account either the reduction in a doctor's time or the shorter hospital stay now needed for procedures such as cataract surgery. Furthermore, Shapiro *et al*. argue, official measures do not take adequate account of improvements in patient outcomes, such as the improved vision cataract patients now enjoy. Because of the failure to adjust for improvements in the quality of procedures, including increased productivity of medical personnel, official measures may significantly overstate inflation in the healthcare sector.

3.4.7 HYPERINFLATION

Although there is some disagreement about whether an inflation rate of, say, 5 per cent per year imposes important costs on an economy, few economists would question the fact that an inflation rate of 500 per cent or 1000 per cent per year disrupts economic performance. A situation in which the inflation rate is extremely high is called **hyperinflation**. Although there is no official threshold above which inflation becomes hyperinflation, inflation rates in the range of 500 to 1000 per cent per year would surely qualify.

In the past few decades, episodes of hyperinflation have occurred in Israel (400% inflation in 1985); Nicaragua (33 000% inflation in

1988); several South American countries, including Bolivia, Argentina, Brazil and most recently Venezuela (1000% inflation in 2017); and several countries attempting to make the transition from communism to capitalism, including Russia. Zimbabwe has recently experienced a severe episode of hyperinflation, and in early 2009, the Zimbabwean government issued a Z$100 trillion bill—that is 100 000 000 000 000 Zimbabwean dollars! Perhaps the most well-known episode occurred in Germany in 1923 when inflation was 102 000 000 per cent. In the German hyperinflation, prices rose so rapidly that for a time, workers were paid twice each day so their families could buy food before the afternoon price increases, and many people's life savings became worthless. But the most extreme hyperinflation ever recorded was in Hungary in 1945, at the end of World War II, when inflation peaked at 3.8×10^{27} per cent.

Hyperinflation greatly magnifies the costs of inflation. For example, shoe-leather costs—a relatively minor consideration in times of low inflation—become quite important during hyperinflation. In this type of environment, people may visit the bank two or three times per day to hold money for as short a time as possible. With prices changing daily or even hourly, markets work quite poorly, slowing economic growth. Massive redistributions of wealth take place, impoverishing many and enriching only a few. Not surprisingly, episodes of hyperinflation rarely last more than a few years; they are so disruptive that they quickly lead to public outcry for relief.

▹▹ RECAP

The public sometimes confuses changes in relative prices (such as the price of oil) with inflation, which is a change in the overall level of prices. This confusion can cause problems because the remedies for undesired changes in relative prices and for inflation are different.

There are a number of true costs of inflation, which together tend to reduce economic growth and efficiency. Hyperinflation—a situation in which the inflation rate is extremely high—greatly magnifies these costs. They include:

- 'Noise' in the price system, which occurs when general inflation makes it difficult for market participants to interpret the information conveyed by prices.
- Distortions of the tax system (e.g. when provisions of the tax code are not indexed).
- 'Shoe-leather' costs, or the costs of economising on cash (e.g. by making more frequent trips to the bank or installing a computerised cash management system).
- Unexpected redistributions of wealth, as when higher-than-expected inflation hurts wage earners to the benefit of employers or hurts creditors to the benefit of debtors.
- Interference with long-term planning, arising because people find it difficult to forecast prices over long periods.

3.5 INFLATION AND INTEREST RATES

LO 3.5

So far, we have focused on the measurement and economic costs of inflation. Another important aspect of inflation is its close relationship to other key macroeconomic variables. One of these is the level of interest rates in the economy. Interest rates are among the most important variables in the economy. As we will see later in the book, interest rates are an important means by which the economy is managed, in this case, by the Reserve Bank of Australia, the central bank. This is because whether interest rates are high or low affects a wide range of economic decisions. Whether you borrow money to buy a car, for example, is a decision that might hinge on the rate of interest the bank would charge on such a loan. Are you better off spending that extra $1000 you received as a present from your grandparents or should you save that money? Again, the rate of interest available to you, this time as a depositor of funds, will feature largely in your decision-making. Business firms also are affected by interest rates. Should a firm borrow the $10 million it needs to install a brand new computer system that will allow it to manage its stock better? Most likely, the firm will have to borrow the funds to purchase the system, in which case the interest it will be charged could be the difference between buying the system now or going without.

Economists have long observed that during periods of high inflation interest rates tend to be high as well, although, as you will see, the reality turns out to be somewhat more complicated. We will now look at the relationship between inflation and interest rates and an important, related, concept—the *real interest rate*.

3.5.1 THE REAL INTEREST RATE

Suppose that there are two neighbouring countries, Alpha and Beta. In Alpha, whose currency is called the alphan, the inflation rate is zero and is expected to remain at zero. In Beta, where the currency is the betan, the inflation rate is 10 per cent and is expected to remain at that level. Bank deposits pay 2 per cent annual interest in Alpha and 10 per cent annual interest in Beta. In which countries are bank depositors getting a better deal?

You may answer 'Beta', since interest rates on deposits are higher in that country. But if you think about the effects of inflation you will recognise that Alpha, not Beta, offers the better deal to depositors. To see why, think about the change over a year in the real purchasing power of deposits in the two countries. In Alpha, someone who deposits 100 alphans in the bank on 1 January will have 102 alphans on 31 December. Because there is no inflation in Alpha, on average prices are the same at the end of the year as they were at the beginning. Thus the 102 alphans the depositor can withdraw represent a 2 per cent increase in buying power.

In Beta, the depositor who deposits 100 betans on 1 January will have 110 betans by the end of the year—10 per cent more than they started with. But the prices of goods and services in Beta, we have assumed, will also rise by 10 per cent. Thus the Beta depositor can afford to buy precisely the same amount of goods and services at the end of the year as they could at the beginning; they get no increase in buying power. So the Alpha depositor has the better deal, after all.

Economists refer to the annual percentage increase in the real purchasing power of a financial asset as the **real interest rate**, or the real rate of return, on that asset. In our example, the real purchasing power of deposits rises by 2 per cent per year in Alpha and by 0 per cent per year in Beta. So the real interest rate on deposits is 2 per cent in Alpha and 0 per cent in Beta. The real interest rate should be distinguished from the more familiar market interest rate, also called the **nominal interest rate**. The nominal interest rate is the annual percentage increase in the nominal, or dollar, value of an asset.

As the example of Alpha and Beta illustrates, we can calculate the *ex post* real interest rate for any financial asset, from a cheque account to a government bond, by subtracting the rate of inflation from the market or nominal interest rate on that asset; we use the term *ex post* here because we are considering the actual real rate of return at the *end* of the period under consideration. So in Alpha the real interest rate on deposits equals the nominal interest rate (2%) minus the inflation rate (0%), or 2 per cent. Likewise in Beta, the real interest rate equals the nominal interest rate (10%) minus the inflation rate (10%), or 0 per cent.

We can write this definition of the real interest rate in mathematical terms:

Equation 3.1

$$r = i - \pi$$

$$\begin{aligned} \text{where} \quad r &= \text{the real interest rate} \\ i &= \text{the nominal, or market, interest rate} \\ \pi &= \text{the inflation rate} \end{aligned}$$

Irving Fisher, a very famous American economist of the early twentieth century, wrote extensively about the implications of this equation. His view was that the real rate of interest was set by fundamental forces in the economy relating to the willingness of people to save and invest. His belief was that these forces would change only slowly, meaning that over reasonable periods of time we would expect to see little change to the economy's real rate of interest. If Fisher's argument was correct we would expect to see a one-to-one correspondence between the rate of inflation and the nominal interest rate. In effect, lenders would protect themselves from the reduction in real purchasing power caused by inflation by factoring into the nominal interest rate an allowance for the inflation rate.

As you work through Example 3.5, think about Fisher's argument. Would you say there was strong support for the notion that high inflation periods in Australia's history have also been periods of high nominal interest rates?

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EXAMPLE 3.5 – REAL INTEREST RATES IN THE 1970S, 1980S, 1990S, 2000S AND 2010S

Presented below are interest rates on 10-year government bonds for selected years in the 1970s, 1980s, 1990s, 2000s and 2010s. In which of these years did the financial investors who bought government bonds get the best deal? The worst deal?

YEAR	INTEREST RATE (%)	INFLATION RATE (%)
1970	6.65	3.09
1975	9.74	16.09
1980	11.65	10.13
1985	13.95	4.99
1990	13.18	7.74
1995	9.21	3.58
2000	6.31	3.05
2005	5.34	2.54
2010	5.37	2.48
2015	2.71	2.49

Source: Derived from Reserve Bank of Australia Statistical Bulletin, various issues, and Organization for Economic Co-operation and Development, 'Long-term government bond yields: 10-year: main (including benchmark) for Australia', retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/IRLTLT01AUA156N, accessed 27 September 2018.

Financial investors and lenders do best when the real (not the nominal) interest rate is high since the real interest rate measures the increase in their purchasing power. We can calculate the real interest rate for each year by subtracting the inflation rate from the nominal interest rate. The results are 3.56 per cent for 1970, –6.35 per cent for 1975, 1.52 per cent for 1980, 8.96 per cent for 1985, 5.44 per cent for 1990, 5.63 per cent for 1995, 3.26 per cent for 2000, 2.80 per cent for 2005, 2.89 per cent for 2010 and 0.22 per cent for 2015. For purchasers of government bonds, the best of these years was 1985, when they enjoyed a real return of 8.96 per cent. The worst year was 1975 when their real return was negative. In other words, despite receiving 9.50 per cent nominal interest, financial investors ended up losing buying power in 1975, as the inflation rate exceeded the interest rate earned by their investments.

3.6 DEFLATION

Although comparatively rare, **deflation**, a situation where there is a sustained fall in the general level of prices, has been a feature of some economies such as Hong Kong and Japan, most recently in the wake of the Global Financial Crisis, though both economies experienced prolonged deflations in the late 1990s extending into the 2000s (see Figure 3.3).

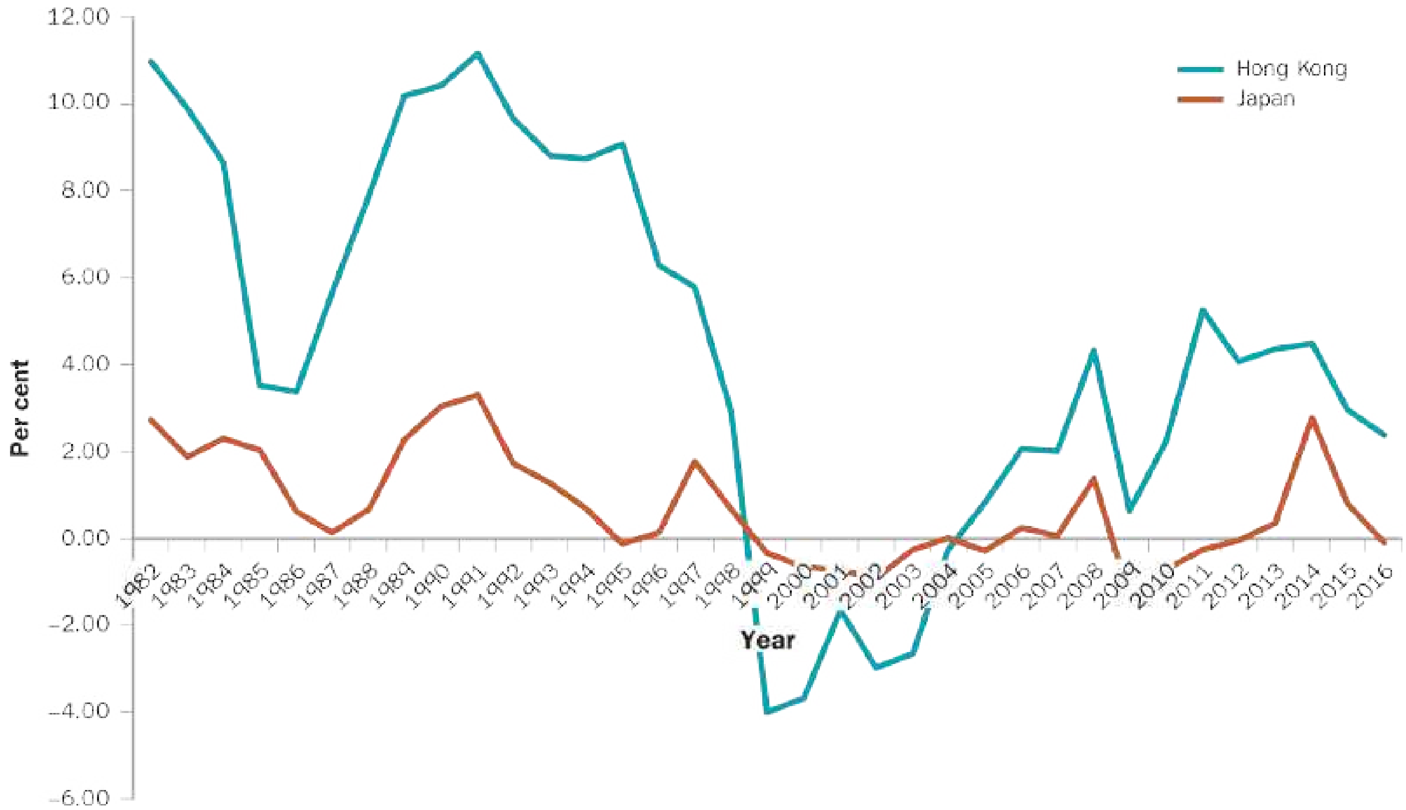

Figure 3.3 **Inflation in Hong Kong and Japan**

Source: World Bank, 'Inflation, consumer prices for Hong Kong', retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/FPCPITOTLZGHKG, accessed 10 September 2018; and World Bank, 'Inflation, consumer prices for Japan', retrieved from FRED, https://fred.stlouisfed.org/series/FPCPITOTLZGJPN, 10 September 2018.

Deflation, like inflation, has implications for the distribution of wealth, although it is now creditors who gain at debtors' expense. This is because any loan will have to be repaid in dollars worth more in real terms than when the debt was originally incurred.

However, it is deflation's effect on the real interest rate that gives policymakers greatest concern. Later in the text, we will see how the real interest rate is an important consideration in many expenditure decisions in the economy. For the moment, we note that a high real interest rate can cause problems for the economy, as this tends to discourage various important types of expenditure such as firms' investment in plant and equipment.

The reason why deflation impacts on the real interest rate are because of a particular characteristic of money. This is that money, unlike other financial assets, pays no nominal rate of interest. This makes money distinct from financial assets such as commercial bills or government bonds that do pay positive nominal interest rates. We discussed previously, based on Equation 3.1, the argument that the inflation rate may be reflected in the nominal interest rate. This will also be true for deflation. If the price level is falling at a rate of, say, 2 per cent per year, and if the real interest rate is unchanged, we would expect that over the course of the year the nominal interest rate will be 2 per cent lower than the real interest rate.

What happens when the rate of deflation matches the real interest rate (e.g. what if the real interest rate and the rate of deflation were both 2%)? According to Equation 3.1, in that case, the nominal rate of interest will be zero per cent. Why would anyone wish to hold a financial asset that pays a rate of interest of zero per cent? One could do equally as well by holding money, which also pays a zero rate of nominal interest but has the advantage over other financial assets of being readily accepted as payment for goods and services. Now, suppose that the rate of deflation increases, for example, prices begin to fall at a rate of 3 per cent a year. According to our previous argument, based on Equation 3.1, we should see the nominal interest rate fall to –1 per cent. But why would anyone lend money (or purchase a commercial bill or a government bond) at a negative rate of interest? If they did, they would be paid back a smaller amount of money than was originally lent. Better under those circumstances simply to hold one's wealth in the form of money and make no loans. For this reason, people often speak of zero as the lower limit to which nominal interest rates can fall; it is extremely unlikely that anyone would offer to lend money at a negative rate of nominal interest.

But this still leaves Equation 3.1—remember, we are talking about a situation in which the rate of deflation is 3 per cent and the real interest rate is 2 per cent. If the nominal interest rate does not fall below zero, Equation 3.1 could only hold in this circumstance if the real rate of interest increased to 3 per cent to match the rate of deflation. And this is the problem with deflation. If the nominal interest rate hits its lower limit of zero per cent, any increase in deflation will be matched by a higher real rate of interest. This has the undesirable effect of discouraging expenditure in the economy. It also makes certain types of government policy—in particular, monetary policy—much harder to implement. We will return to that theme later in the text. Governments, therefore, can justifiably be worried about the possibility of deflation.

One final point. To economists' initial surprise, there have been recent instances of small, negative nominal interest rates being offered, for example in Switzerland, Denmark and Sweden. This suggests that under some circumstances, it may still be convenient for people or businesses to hold financial assets, even with an interest rate below zero, rather than go to the trouble of converting financial wealth into cash (see World Economic Forum 2016). Does this mean the theory outlined above is incorrect? Probably not, though some modification is certainly required—economists would now argue that there must be a negative rate of interest at which holding wealth in the form of cash is always preferred to holding financial assets. Whereas we once thought this point was reached at a zero nominal rate, experience now shows us that for small negative nominal rates, there may still be some demand for financial assets.

CONCEPT CHECK 3.3

The table following shows Japanese data on the rate of inflation and one measure of the nominal interest rate, the prime lending rate. Based on these data, what do you conclude about the effects of deflation on Japan's real interest rate?

YEAR	PRIME LENDING RATE (%)	INFLATION RATE (%)
2006	1.63	0.242
2007	1.88	0.059
2008	1.68	1.379
2009	1.48	−1.345

SUMMARY

- The CPI is a measure of how the average prices faced by a typical household change through time. An extensive national survey is used to establish which goods are bought by a typical family and in what quantities. By tracking what happens to the prices of those goods in subsequent periods, and weighting those prices according to how important each commodity is in the typical household's budget, a series for the CPI can be constructed that shows how the average price level in the economy has changed.
- The inflation rate is measured as the percentage change in the CPI over a particular period of time. It is an indication of how rapidly the general level of prices is rising in an economy.
- Inflation, particularly if it is high and in place for a long period of time, can impose significant costs upon the economy. These costs are incurred because inflation interferes with the market mechanism's ability to allocate resources efficiently and can lead to unexpected redistributions of income and wealth.
- The real interest rate is a measure of the real return received by people who lend money and the real cost faced by those who borrow money. It is calculated by subtracting the inflation rate from the nominal interest rate. The rationale for this calculation is that we expect the inflation rate to be factored into the nominal rate of interest as lenders seek to preserve the real value of the money that they lend.

- The CPI cannot always be relied upon to give an accurate measure of the true rate of inflation. This is because (1) the quality of commodities changes over time and this is not captured in the CPI and (2) the CPI does not capture the effects of substitution between commodities as a result of relative price changes.
- Deflation is a situation in which the general level of prices falls over time. Although comparatively rare, economies such as Japan and Hong Kong have recently experienced very severe deflations. Deflation is costly as it creates unexpected redistributions of wealth. However, the main cost of deflation is to force the real rate of interest to be higher than it otherwise would be. This acts to discourage certain types of important expenditure in the economy, most notably firms' investment expenditure.

KEY TERMS

consumer price index (CPI) 50

deflating 53

deflation 65

hyperinflation 63

indexing 53

Laspeyres price index 51

nominal interest rate 64

nominal quantity 54

quality adjustment bias 56

rate of inflation 51

real interest rate 64

real quantity 54

real wage 55

relative price 53

substitution bias 57

REVIEW QUESTIONS

1. Explain why changes in the cost of living for any particular individual or family may differ from changes in the official cost-of-living index, the CPI. LO 3.1 **EASY**
2. What is the difference between the *price level* and the *rate of inflation* in an economy? LO 3.1 **EASY**
3. Why is it important to adjust for inflation when comparing nominal quantities (e.g. workers' average wages) at different points in time? What is the basic method for adjusting for inflation? LO 3.2 **EASY**
4. Describe how indexation might be used to guarantee that the purchasing power of the wage agreed to in a multiyear labour contract will not be eroded by inflation. LO 3.2 **EASY**
5. Give two reasons the official inflation rate may understate the 'true' rate of inflation. Illustrate by examples. LO 3.3 **MEDIUM**
6. 'It's true that unexpected inflation redistributes wealth, from creditors to debtors, for example. But what one side of the bargain loses, the other side gains. So from the perspective of the society as a whole, there is no real cost.' Do you agree? Discuss. LO 3.4 **HARD**
7. How does inflation affect the real return on holding cash? LO 3.5 **EASY**
8. True or false: If both the potential lender and the potential

borrower correctly anticipate the rate of inflation, inflation will not redistribute wealth from the creditor to the debtor. Explain.
LO 3.5 **MEDIUM**

PROBLEMS

1. Government survey-takers determine that typical family expenditures each month in the year designated as the base year are as follows:

- 20 pizzas, $10 each
- rent of apartment, $600 per month
- petrol and car maintenance, $100
- phone service (basic service plus 10 international calls), $50.

In the year following the base year, the survey-takers determine that pizzas have risen to $11 each, apartment rent is $640, petrol and maintenance have risen to $120, and phone service has dropped in price to $40. LO 3.1 **MEDIUM**

a) Find the CPI in the subsequent year and the rate of inflation between the base year and the subsequent year.

b) The family's nominal income rose by 5 per cent between the base year and the subsequent year. Are they worse off or better off in terms of what their income is able to buy?

2. Here are values of the CPI (multiplied by 100) for each year from 1990 to 2000. For each year beginning with 1991, calculate the rate of inflation from the previous year. What happened to inflation rates over the 1990s? LO 3.1 **EASY**

1990	130.7
1991	136.2
1992	140.3
1993	144.5
1994	148.2
1995	152.4
1996	156.9
1997	160.5
1998	163.0
1999	166.6
2000	172.2

3. Refer to the CPI data given in Problem 2. A report found that the real entry-level wage for university graduates declined by 8 per cent between 1990 and 1997. The nominal entry-level wage in 1997 was $13.65 per hour. LO 3.2 **MEDIUM**

a) What was the real entry-level wage in 1997?

b) What was the real entry-level wage in 1990?

c) What was the nominal entry-level wage in 1990?

4. Consider the following table. It shows a hypothetical income tax schedule, expressed in nominal terms, for the year 2014.

FAMILY INCOME	TAXES DUE (PER CENT OF INCOME)
≤$20 000	10
$20 001–$30 000	12
$30 001–$50 000	15
$50 001–$80 000	20
>$80 000	25

The government wants to ensure that families with a given real income are not pushed up into higher tax brackets by inflation. The CPI (times 100) is 175 in 2014 and 185 in 2016. How should the income tax schedule above be adjusted for the year 2016 to meet the government's goal? LO 3.2 **MEDIUM**

5. According to the US Census Bureau (www.census.gov), nominal income for the typical family of four in the United States (median income) was $23 618 in 1985, $34 076 in 1995, $46 326 in 2005, and $49 276 in 2010. In purchasing power terms, how did family income compare in each of those four years? You will need to know that the CPI (multiplied by 100, 1982–84 = 100) was 107.6 in 1985, 152.4 in 1995, 195.3 in 2005, and 218.1 in 2010. LO 3.2 **MEDIUM**
6. The typical consumer's food basket in the base year 2015 is as

follows:

- 30 chickens at $3.00 each
- 10 hams at $6.00 each
- 10 steaks at $8.00 each.

A chicken feed shortage causes the price of chickens to rise to $5.00 each in the year 2016. Hams rise to $7.00 each, and the price of steaks is unchanged. LO 3.1 LO 3.3 **MEDIUM**

a) Calculate the change in the 'cost-of-eating' index between 2015 and 2016.

b) Suppose that consumers are completely indifferent between two chickens and one ham. For this example, how large is the substitution bias in the official 'cost-of-eating' index?

7. The following table lists the per-litre prices for unleaded regular petrol for June of each year between 1978 and 1986, together with the values of the CPIs for those years. For each year from 1979 to 1986, find the CPI inflation rate and the change in the real price of petrol, both from the previous year. Would it be fair to say that most of the changes in petrol prices during this period were due to general inflation, or were factors specific to the oil market playing a role as well? LO 3.1 LO 3.4 **MEDIUM**

YEAR	PETROL PRICE ($/LITRE)	CPI (1982–84 = 1.00)
1978	0.663	0.652
1979	0.901	0.726
1980	1.269	0.824
1981	1.391	0.909
1982	1.309	0.965
1983	1.277	0.996
1984	1.229	1.039
1985	1.241	1.076
1986	0.955	1.136

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8. On 1 January 2012, Albert invested $1000 at 6 per cent interest per year for three years. The CPI on 1 January 2012 stood at 100. On 1 January 2013, the CPI (times 100) was 105; on 1 January 2014, it was 110; and on 1 January 2015, the day Albert's investment matured, the CPI was 118. Find the real rate of interest earned by Albert in each of the three years and his total real return over the three-year period. Assume that interest earnings are

reinvested each year and themselves earn interest. LO 3.5
MEDIUM

9. Frank is lending $1000 to Sarah for two years. Frank and Sarah agree that Frank should earn a 2 per cent real return per year. LO 3.5 **MEDIUM**
   - **a)** The CPI (times 100) is 100 at the time that Frank makes the loan. It is expected to be 110 in one year and 121 in two years. What nominal rate of interest should Frank charge Sarah?
   - **b)** Suppose Frank and Sarah are unsure about what the CPI will be in two years. Show how Frank and Sarah could index Sarah's annual repayments to ensure that Frank gets an annual 2 per cent real rate of return.

10. The Bureau of Statistics has found that the base-year expenditures of the typical consumer break down as follows:

Food and beverages	17.8%
Housing	42.8%
Apparel and upkeep	6.3%
Transportation	17.2%
Medical care	5.7%
Entertainment	4.4%
Other goods, services	5.8%
Total	100.0%

Suppose that since the base year, the prices of food and beverages have increased by 10 per cent, the price of housing has increased by 5 per cent, and the price of medical care has increased by 10 per cent. Other prices are unchanged. Find the CPI for the current year.
LO 3.5 **EASY**

REFERENCES

Australian Bureau of Statistics (ABS) 2012, ‘Year book Australia 2012’, Cat. no. 1301.0.

Australian Bureau of Statistics (ABS) 2018, ‘Consumer price index’, March 2018, www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6401.0Mar%202018?OpenDocument.

Australian Bureau of Statistics, ‘Average weekly earnings, Australia and Organization for Economic Co-operation and Development, Consumer price index of all items in Australia’ Cat. no. 6302.0, retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/AUSCPIALLQINMEI, accessed 13 September 2018.

Federal Reserve Economic Data 2018, https://fred.stlouisfed.org/series/AUSCPIBLS#0.

Fischer S, Sahay R, Végh CA 2002, ‘Modern hyper and high inflations’, *Journal of Economic Literature*, Vol. 11, September, pp. 837–80.

OECD 2018, ‘Consumer price index of all items in Australia’, retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/AUSCPIALLQINMEI, accessed 13 September 2018.

Reserve Bank of Australia Statistical Bulletin, various issues, and Organization for Economic Co-operation and Development, 'Long-term government bond yields: 10-year: main (including benchmark) for Australia', retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/IRLTLT01AUA156N, accessed 27 September 2018.

Shapiro I, Shapiro M, Wilcox DW 1999, 'Quality improvement in health care a framework for price and output measurement', *American Economic Review*, Vol. 89, No. 2, May, pp. 333–7.

World Bank, 'Inflation, consumer prices for Hong Kong', retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/FPCPITOTLZGHKG, accessed 10 September 2018.

World Bank, 'Inflation, consumer prices for Japan', retrieved from FRED, https://fred.stlouisfed.org/series/FPCPITOTLZGJPN, 10 September 2018.

World Economic Forum 2016, 'Negative interest rates: absolutely everything you need to know', https://www.weforum.org/agenda/2016/11/negative-interest-rates-absolutely-everything-you-need-to-know/.

CHAPTER 4

Saving, investment and wealth

After reading this chapter, you should be able to answer the following questions.

- 4.1 What is the relation between saving and wealth?
  - a) How are stocks and flows related?
- 4.2 For what reasons do people save?
- 4.3 What has happened to the household saving ratio in Australia?
- 4.4 What does national saving mean?
  - a) What has happened to the components of national saving in Australia?
  - b) How is the government's budget related to national saving?
  - c) Is a low rate of household saving necessarily a problem?
- 4.5 How are investment and capital formation related?
- 4.6 What role does the real interest rate play in determining saving and investment?
  - a) How does technological change affect the market for saving and investment?
  - b) How does government's budget affect the market for saving and investment?

SETTING THE SCENE

There are few economic relationships that have as much influence on a nation's macroeconomic performance as that between saving and investment. As you will see throughout this book, in explaining both short-run fluctuations in the economy (contractions and expansions) and the economy's long-term growth performance, saving and investment (and the relation between them) play fundamental roles.

Alan Greenspan, who was Chair of the US Federal Reserve from 1987 to 2006, years that saw the emergence of factors that led ultimately to the Great Recession, placed the saving–investment relation at the heart of what went wrong. In testimony he made to the US Financial Crisis Inquiry (Greenspan 2010), he highlighted the incredible growth in saving in the developing world, especially China. As you will see, resources made available through saving are used by firms for the purposes of investment. Such was the growth of saving in China, there was an excess of saving, which one of the authors of this book famously referred to as a 'global saving glut'. With insufficient investment opportunities in China, and with global financial markets much more free than once was the case, a lot of those resources made their way to the United States and other developed countries, fuelling a dramatic rise in asset prices, and in particular in the price of housing. Mr Greenspan explained what happened as follows:

> *It was the global proliferation of securitized U.S. subprime mortgages that was the immediate trigger of the current crisis. But its roots reach back, as best I can judge, to 1989, when the fall of the Berlin Wall exposed the economic ruin produced by the Soviet system. Central planning, in one form or another, was discredited and widely displaced by competitive markets.*
>
> *China, in particular, replicated the successful economic export-oriented model of the so-called Asian Tigers, and by 2005, according to the IMF, 800 million members of the world's labor force were engaged in export-oriented, and therefore competitive, markets, an increase of 500 million workers since 1990. Additional hundreds of millions became subject to domestic competitive forces, especially in Eastern Europe. As a consequence, between 2000 and 2007, the rate of growth in real GDP of the developing world was more than double that of the developed world.*
>
> *The developing world's consumption restrained by culture and inadequate consumer finance could not keep up with the surge of income and, as a consequence, the savings rate of the developing world soared from 24% of nominal GDP in 1999 to 34% by 2007, far outstripping its investment rate.*
>
> *Whether it was a glut of excess intended saving, or a shortfall of investment intentions, the result was the same: a fall in global real long-term interest rates and their associated capitalization rates. Asset prices, particularly house prices, in nearly two dozen countries accordingly moved dramatically higher.*

The passing of the Global Financial Crisis does not mean the relation between saving and investment has lost any of its relevance. As Reserve Bank of Australia Governor Philip Lowe (2018) said:

> *At the collective level, the financial choices that the 25 million of us make about how much we spend, save and borrow can have a*

major bearing on the health of the overall economy. If enough of us make risky or bad choices, the whole community can eventually feel the effects.

To understand what those effects might be, we need to understand what factors lead people to save and what the incentives are for firms to invest. Along the way, we visit the concept of wealth and see how this is related to the decisions made every day by all individuals in the economy. We also see the important role the government plays in determining the nation's saving.

References

Greenspan A 2010, 'Testimony of Alan Greenspan', Financial Crisis Inquiry Commission, 7 April 2010, https://fcic-static.law.stanford.edu/cdn_media/fcic-testimony/2010-0407-Greenspan.pdf.

Lowe P 2018, 'Remarks at the breakfast event to launch ASIC's National Financial Capability Strategy 2018', https://www.rba.gov.au/speeches/2018/sp-gov-2018-08-21.html.

4.1 SAVING AND WEALTH

LO 4.1

Saving is important, both to individuals and to nations. People need to save to provide for their retirement and for other future needs, such as their children's education or a new home. An individual's or a family's saving can also provide a crucial buffer in the event of an economic emergency, such as the loss of a job or unexpected medical bills. At the national level, the production of new capital goods—factories, equipment and housing—is an important factor promoting economic growth and higher living standards. As we will see in this chapter, the resources necessary to produce new capital come primarily from a nation's collective saving.

In general, the **saving** of an economic unit—whether a household, a business, a university or a nation—may be defined as its *current income* minus its *spending on current needs*. For example, if Mary earns $600 per week, spends $520 weekly on living expenses such as rent, food, clothes and entertainment and deposits the remaining $80 in the bank, her saving is $80 per week. The **saving rate** of any economic unit is its saving divided by its income. Since Mary saves $80 of her weekly income of $600, her saving rate is $80/$600, or 13.3 per cent.

The saving of an economic unit is closely related to its wealth, or the value of its assets minus its liabilities. **Assets** are anything of value that one *owns*, either *financial* or *real*. Examples of financial assets that you or your family might own include cash, a cheque account, shares and bonds. Examples of real assets include a home or other real estate, jewellery, consumer durables like cars and valuable collectibles. **Liabilities**, on the other hand, are the debts one *owes*. Examples of liabilities are credit card balances, student loans and mortgages.

Accountants list the assets and liabilities of a family, a firm, a university or any other economic unit on a *balance sheet*. Comparing the values of the assets and liabilities helps them to determine the economic unit's **wealth**, also called its *net worth*.

EXAMPLE 4.1 – MARY CONSTRUCTS HER BALANCE SHEET

To take stock of her financial position Mary lists her assets and liabilities on a balance sheet. The result is shown in Table 4.1**. What is Mary's wealth?**

TABLE 4.1 **Mary’s balance sheet**

ASSETS		LIABILITIES	
Cash	$80	Student loan	$3000
Cheque account	$1200	Credit card balance	$250
Shares	$1000		
Car (market value)	$3500		
Furniture (market value)	$500		
Total	$6280	Total	$3250
		Net worth	$3030

Mary’s financial assets are the cash in her wallet, the balance in her cheque account and the current value of some shares her parents gave her. Together her financial assets are worth $2280. She also lists $4000 in real assets, the sum of the market values of her car and her furniture. Mary’s total assets, both financial and real, come to $6280. Her liabilities are the student loan she owes the bank and the balance due on her credit card, which total $3250. Mary’s wealth, or net worth, then, is the value of her assets ($6280) minus the value of her liabilities ($3250), or $3030.

BACKGROUND BRIEFING 4.1

Household saving in Australia

Like many issues in economics, saving involves a trade-off. In this case the trade-off involves the decision to postpone the current consumption of goods and services to provide resources for the future. What criteria should be used to determine the best amount of saving? The optimal amount of saving will be where the opportunity cost, in terms of forgone consumption in the present, is balanced against the gains that can be achieved in the future by having more resources available. In Australia and in many other countries there has been a long-standing concern that the optimal balance between the present and the future has not been obtained. It has often been said that countries like Australia and the United States have poor saving records and are not leaving enough of a legacy for future generations.

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The evidence that is usually cited to back up this view is provided in Figure 4.1, which shows the household sector's net saving as a proportion of households' after-tax income. Net saving adjusts overall saving for any depreciation of assets that households might own. It gives an indication of households' ability to hold back some income from the current consumption of goods and services in order to increase wealth. As Figure 4.1 indicates, there was a significant change in the preparedness of Australian households to save around 1975. In that year, the proportion of after-tax income saved by Australian households began to decline. This decline lasted some 25 years, and in the financial year 2002–03 households' net saving in Australia became negative for the first time. This meant that the total of the household sector's debts exceeded the total of households' income, a sign of continuing strong growth in consumption at a time when growth in household income was slowing. Recently, household saving has again become positive. and although the increase has been significant, the saving rate is still well below the rates of the early 1970s, and shows signs of once again falling.

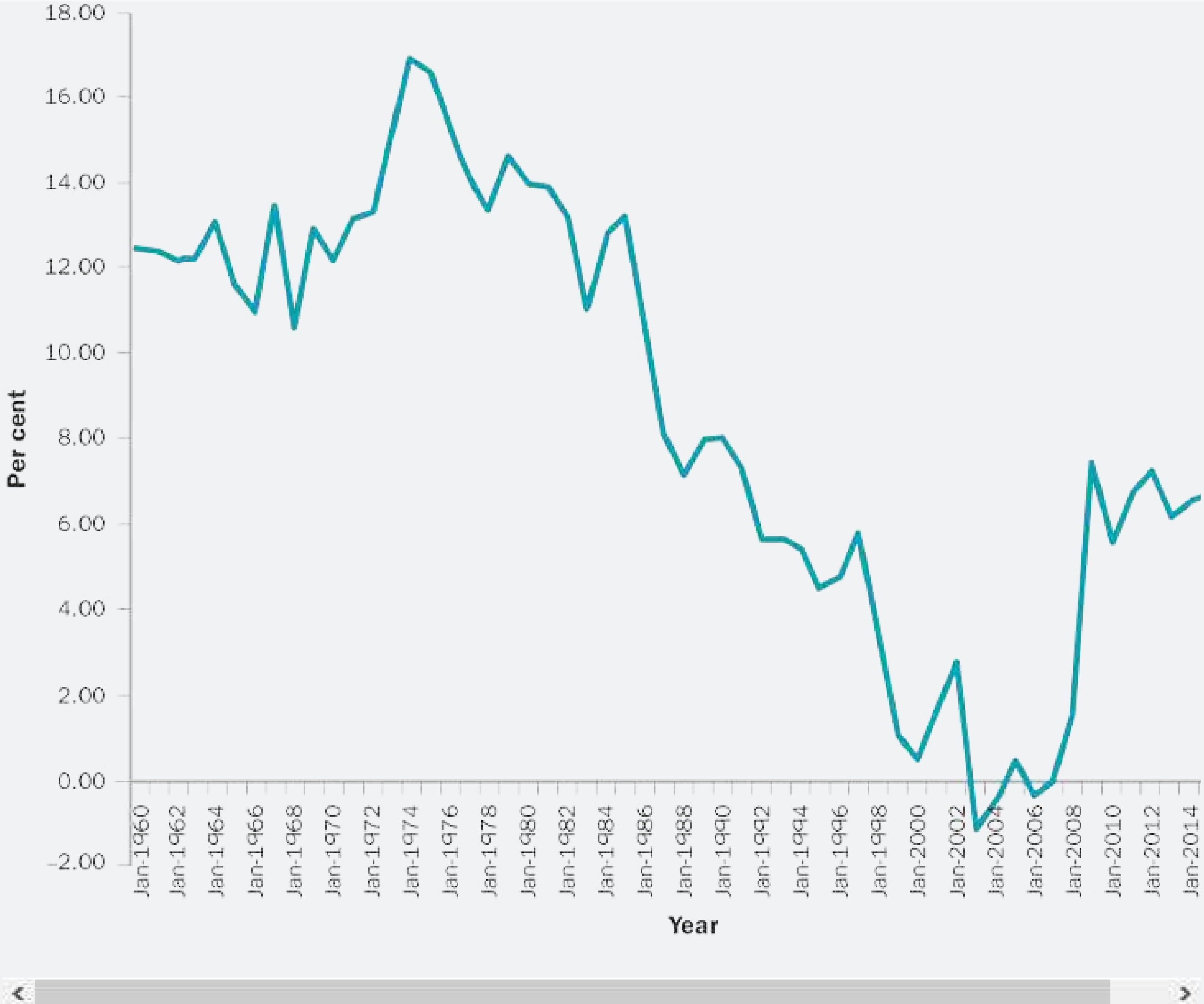

Figure 4.1 **Household saving rate in Australia, September 1959 to December 2017**

Note: The household saving rate, declining since the late 1970s, became negative in 2002 but is now again positive.

Source: Based on Australian Bureau of Statistics 2017, 'Australian system of national accounts [net household savings as a proportion of disposable household income]', Cat. no. 5204.0.

What is the significance of a decline in household saving?

Alarmists see it as evidence of poor saving habits, and a threat to future prosperity. The reality, as we will see, is more complex. Many Australian families, even today, do save very little, a choice that may exact a toll on their economic wellbeing in the long run. On the other hand, household saving is only one part of the total saving of the economy, as businesses and governments also save. This means that a decline in household saving need not mean that aggregate saving in the economy also declines. It would depend on what is happening to saving in the rest of the economy.

CONCEPT CHECK 4.1

What would Mary's net worth be if her student loan were for $6500 rather than $3000? Construct a new balance sheet for her.

Saving and wealth are related, because saving contributes to wealth. To understand this relationship better we must distinguish between *stocks* and *flows*.

4.1.1 STOCKS AND FLOWS

Saving is an example of a **flow**, a measure that is defined *per unit of time*. For example, Mary's saving is $20 *per week*. Wealth, in contrast, is a **stock**, a measure that is defined *at a point in time*. Mary's wealth of $3030, for example, is her wealth on a particular date, say, 1 January 2018.

To visualise the difference between stocks and flows, think of water running into a bathtub. The amount of water in the bathtub at any specific moment—for example, 40 litres at 7.15 pm—is a stock because it is measured at a specific point in time. The rate at which the water flows into the tub—for example, 2 litres per minute—is a flow, because it is measured per unit of time. In many cases, a flow is the *rate of change* in a stock: if we know that there are 40 litres of water in the tub at 7.15 pm, for example, and that water is flowing in at 2 litres per minute, we can easily determine that the stock of water will be changing at the rate of 2 litres per minute and will equal 42 litres at 7.16 pm, 44 litres at 7.17 pm and so on, until the bathtub overflows.

CONCEPT CHECK 4.2

Continuing the example of the bathtub, if there are 40 litres of water in the tub at 7.15 pm and water is being drained at the rate of 3 litres per minute, what will be the stock and flow at 7.16 pm? At 7.17 pm? Does the flow still equal the rate of change in the stock?

The relationship between saving (a flow) and wealth (a stock) is similar to the relationship between the *flow* of water into a bathtub and the *stock* of water in the tub in that the flow of saving causes the stock of wealth to change at the same rate. Indeed, as Example 4.2 illustrates, every dollar that a person saves adds a dollar to their wealth.

EXAMPLE 4.2 – THE LINK BETWEEN SAVING AND WEALTH

Mary saves $80 per week. How does this saving affect her wealth? Does the change in her wealth depend on whether Mary uses her saving to accumulate assets or to pay down her liabilities?

Mary could use the $80 she saved this week to increase her assets—for example, by adding the $80 to her cheque account—or to reduce her liabilities—for example, by paying down her credit card balance. Suppose she adds the $80 to her cheque account, increasing her assets by $80. Since her liabilities are unchanged, her wealth also increases by $80, to $3110 (see Table 4.1).

If Mary decides to use the $80 she saved this week to pay down her credit card balance, she reduces it from $250 to $170. That action would reduce her liabilities by $80, leaving her assets unchanged. Since wealth equals assets minus liabilities, reducing her liabilities by $80 increases her wealth by $80, to $3110. Thus, saving $80 per week raises Mary's stock of wealth by $80 a week, regardless of whether she uses her saving to increase her assets or reduce her liabilities.

The close relationship between saving and wealth explains why saving is so important to an economy. Higher rates of saving today lead to faster accumulation of wealth, and the wealthier a nation is, in general the higher its standard of living. Thus, a high rate of saving today contributes to an improved standard of living in the future.

4.1.2 CAPITAL GAINS AND LOSSES

Though saving increases wealth, it is not the only factor that determines wealth. Wealth can also change because of changes in the values of the real or financial assets one owns. Suppose Mary's shares rise in value, from $1000 to $1500. This increase in the value of Mary's shares raises her total assets by $500 without affecting her liabilities. As a result, Mary's wealth rises by $500, from $3030 to $3530 (see Table 4.2).

TABLE 4.2 Mary’s balance sheet after an increase in the value of her shares

ASSETS		LIABILITIES	
Cash	$80	Student loan	$3000
Cheque account	$1200	Credit card balance	$250
Shares	$1500		
Car (market value)	$3500		
Furniture (market value)	$500		
Total	$6780		$3250
		Net worth	$3530

Changes in the value of existing assets are called **capital gains** when an asset’s value increases and **capital losses** when an asset’s value decreases. Just as capital gains increase wealth, capital losses decrease wealth. Capital gains and losses are not counted as part of saving, however. Instead, the change in a person’s wealth during any period equals the saving done during the period plus capital gains or minus capital losses during that period. In terms of an equation:

Change in wealth = Saving + Capital gains + Capital losses

CONCEPT CHECK 4.3

How would each of the following actions or events affect Mary's saving and her wealth?

a) Mary deposits $80 in the bank at the end of the week as usual. She also charges $50 on her credit card, raising her credit card balance to $300.

b) Mary uses $300 from her cheque account to pay off her credit card bill.

c) Mary's old car is recognised as a classic. Its market value rises from $3500 to $4000.

d) Mary's furniture is damaged and as a result falls in value from $500 to $200.

Capital gains and losses can have a major effect on one's overall wealth, as Thinking as an economist 4.1 illustrates.

THINKING AS AN ECONOMIST 4.1

What explains recent trends in Australia's wealth?

On the whole, Australians felt increasingly prosperous during the 1990s and throughout most of the 2000s; measures of household wealth during this period showed enormous gains. Figure 4.2 shows some recent estimates of household wealth calculated by the Australian Bureau of Statistics. These figures show that the household sector increased its overall net worth by 600 per cent over the period 1989 to 2017. How did Australian households increase their wealth over this period? And why, as Figure 4.2 shows, did the growth in wealth slow during the Global Financial Crisis?

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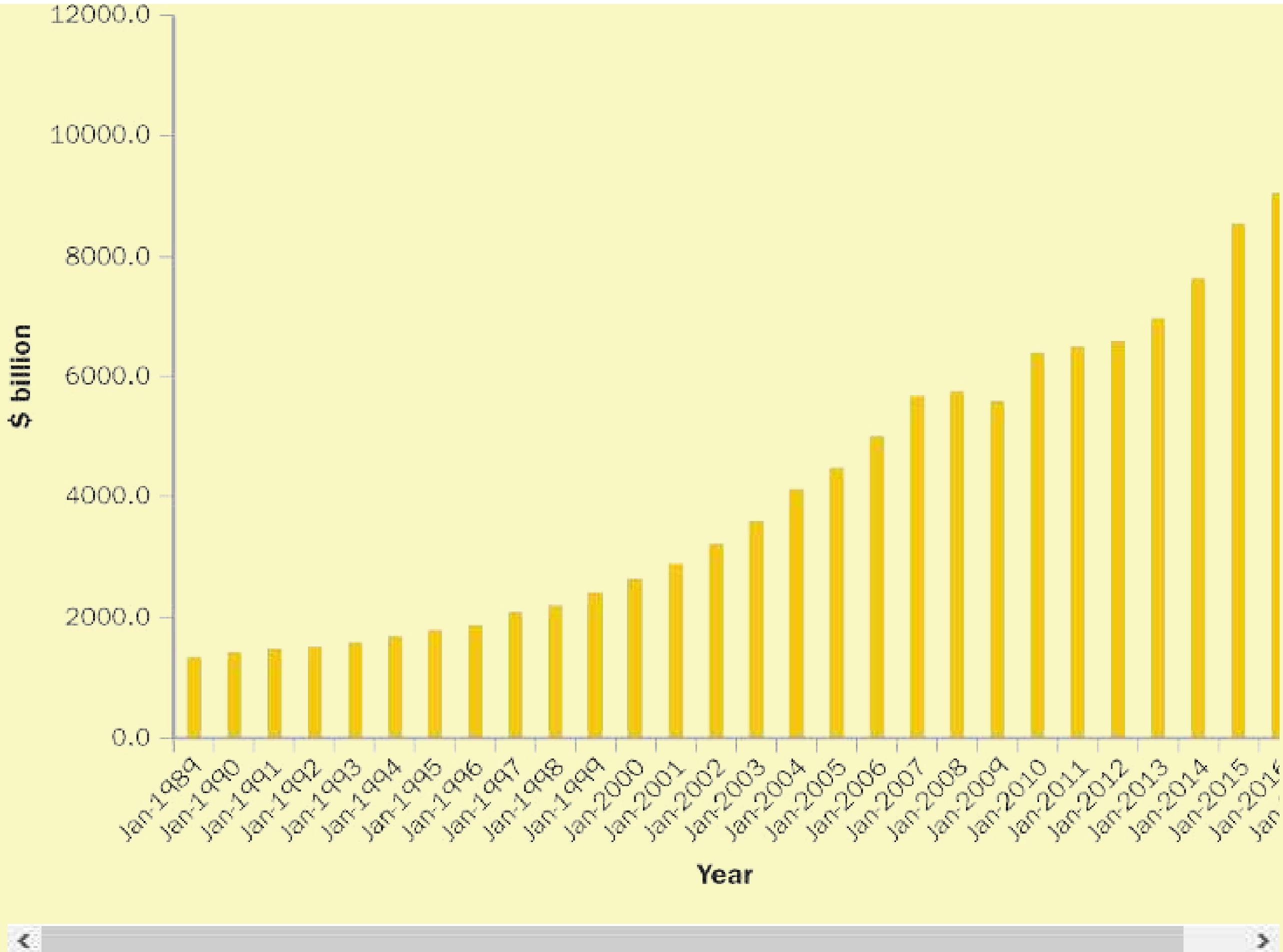

Figure 4.2 **Household wealth, Australia**

Note: Household wealth in Australia grew over the 1990s and 2000s but the growth halted in the wake of the Global Financial Crisis.

Source: Based on Australian Bureau of Statistics 2016–17, 'Australian system of national accounts', Cat. no. 5204.0, Table 41, Household balance sheet, current prices—as at 30 June.

Let's consider the growth period first. One way that wealth increased in this period was through the share market. During the 1990s and 2000s an increasing number of Australians acquired shares, either directly through their own purchases or indirectly through their superannuation funds. At the same time, share prices rose relatively rapidly (see Figure 4.3). The strongly rising ‘bull market’, which increased the prices of most shares, enabled many Australians to enjoy significant capital gains and increased wealth without saving much, if anything. Indeed, some economists argued that the low household saving rate of the 1990s and 2000s is partially explained by the bull market; because capital gains increased household wealth by so much, many people saw no need to save.

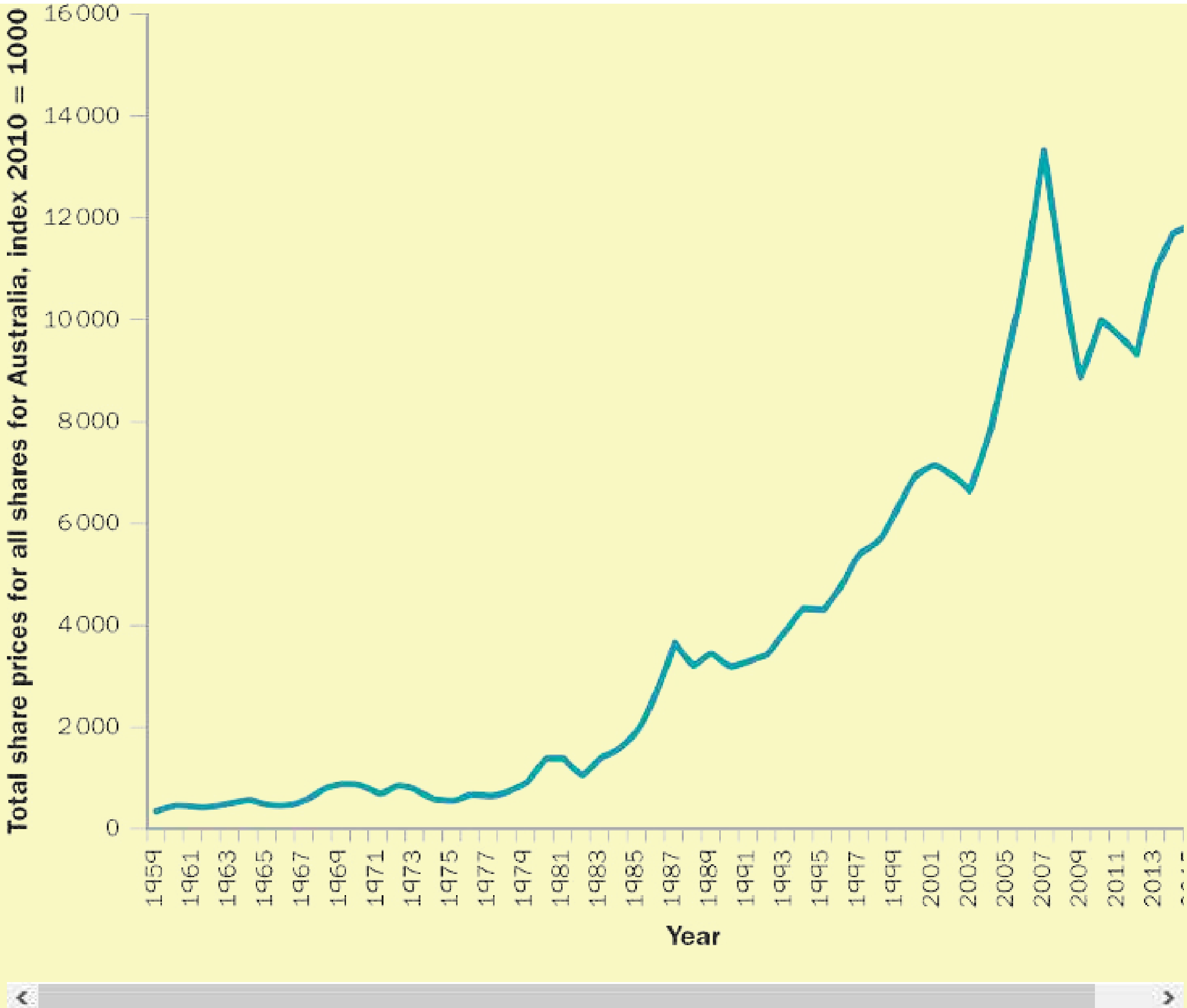

Figure 4.3 **Bull and bear markets**

Source: OECD, 'Total share prices for all shares for Australia [SPASTT01AUA661N]', retrieved from Federal Reserve Bank of St. Louis (FRED), https://fred.stlouisfed.org/series/SPASTT01AUA661N,10 September 2018.

It is now apparent that the growth of wealth in Australia was checked after the Global Financial Crisis. The bear market conditions associated with shares had a significant negative impact on wealth. Fortunately for Australian households, the value of their housing stock continued to grow (see Figure 4.4), albeit at a slower rate than before; because housing is such an important component of wealth, this was sufficient to ensure that wealth continued to grow. In countries such as the United States, where the Global Financial Crisis was associated with significant falls in the value of the housing stock, as well as bear market conditions in the share market, household wealth fell significantly (see US Government n.d.).

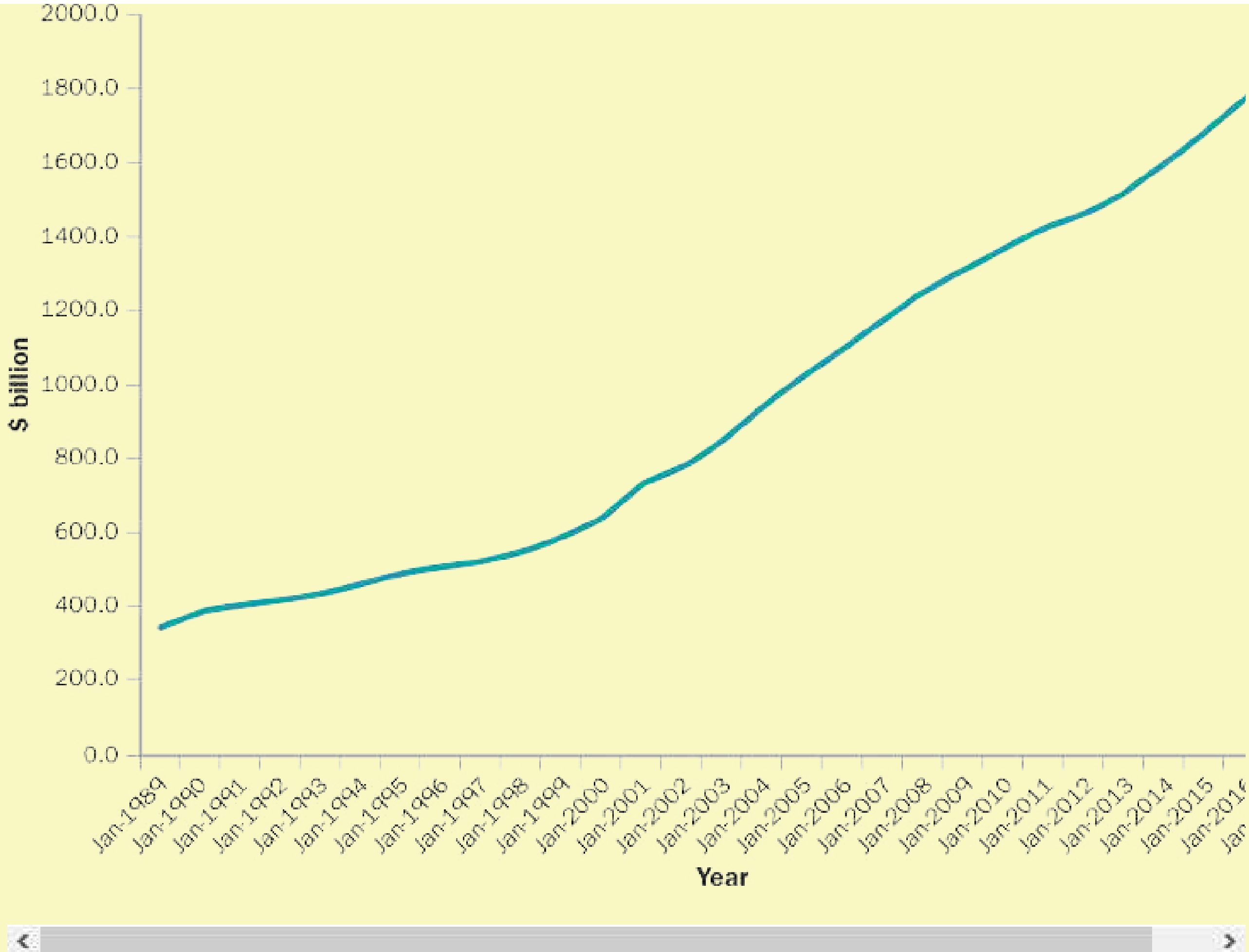

Figure 4.4 **Value of the housing stock**

Source: Based on Australian Bureau of Statistics 2016–17, 'Australian system of national accounts', Table 41, Cat. no. 5204.0, Household balance sheet, current prices—as at 30 June.

We have seen that saving is related to the accumulation of wealth. To understand why people choose to save, however, we need to examine their motives for saving.

▹▹ RECAP

Saving is defined as what is left over from income after expenditure has been made on current needs. All agents in the economy—households, the government and firms—can potentially save. Wealth refers to the value of assets less the value of any liabilities.

A stock is the amount of something that has been accumulated over time. Stocks are measured at a particular point in time. A flow is either an addition or subtraction from a stock that occurs over a period of time. An individual's wealth, for example, is a stock. The individual's savings are a flow that affects the level of the stock.

An individual's wealth can change not only because of changes in flows but also because of changes in the value of assets and liabilities. For example, an increase in the value of shares held is a capital gain and leads to an increase in wealth. A fall in house prices is a capital loss and would lead to a fall in the value of wealth.

4.2 WHY DO PEOPLE SAVE?

LO 4.2

Why do people save part of their income instead of spending everything they earn? Economists have identified at least three broad reasons for saving. First, people save to meet certain long-term objectives, such as a comfortable retirement. By putting away part of their income during their working years they can live better after retirement than they would if they had to rely solely on social welfare payments and their accumulated superannuation funds. Other long-term objectives might include university tuition for their children and the purchase of a new home or car. Since many of these needs occur at fairly predictable stages in people's lives, economists call this type of saving **lifecycle saving**. Another example of lifecycle saving involves university students who often go into debt while studying. Students often do this knowing that higher income after graduation will allow saving to take place that can be used to pay off that debt.

A second reason to save is to protect oneself and one's family against unexpected setbacks—the loss of a job, for example, or a costly health problem. Personal financial advisers typically suggest that families maintain an emergency reserve (a 'rainy-day fund') equal to three to six months' worth of income. Saving for protection against potential emergencies is called **precautionary saving**.

A third reason to save is to accumulate an estate to leave to one's heirs—usually one's children, but possibly a favourite charity or other worthy cause. Saving for the purpose of leaving an inheritance, or bequest, is called **bequest saving**. Bequest saving is done primarily by people at the higher end of the income ladder. However, because these people control a large share of the nation's wealth, bequest saving is an important part of overall saving.

People usually do not mentally separate their saving into these three categories; rather, all three reasons for saving motivate most savers to varying degrees. Thinking as an economist 4.2 shows how the three reasons for saving can explain the rate of household saving in Japan.

Although most people are usually motivated to save for at least one of the three reasons we have discussed, the amount they choose to save may depend on the economic environment. One economic variable that is quite significant in saving decisions is the real interest rate.

4.2.1 SAVING AND THE REAL INTEREST RATE

Most people do not save by putting cash in a mattress. Instead, they make financial investments that they hope will provide a good return on their saving. For example, a saving deposit account may pay interest on the account balance. More sophisticated financial investments, such as government bonds or shares of stock in a corporation, also pay returns in the form of interest payments, dividends or capital gains. High returns are desirable, of course, because the higher the return, the faster one's wealth will grow.

THINKING AS AN ECONOMIST 4.2

What explains trends in Japanese saving?

Japanese households used to save nearly 20 per cent of their income, an unusually high rate by international standards. However, Japan's saving rate has declined significantly since the early 1990s (see Figure 4.5). What explains these trends?

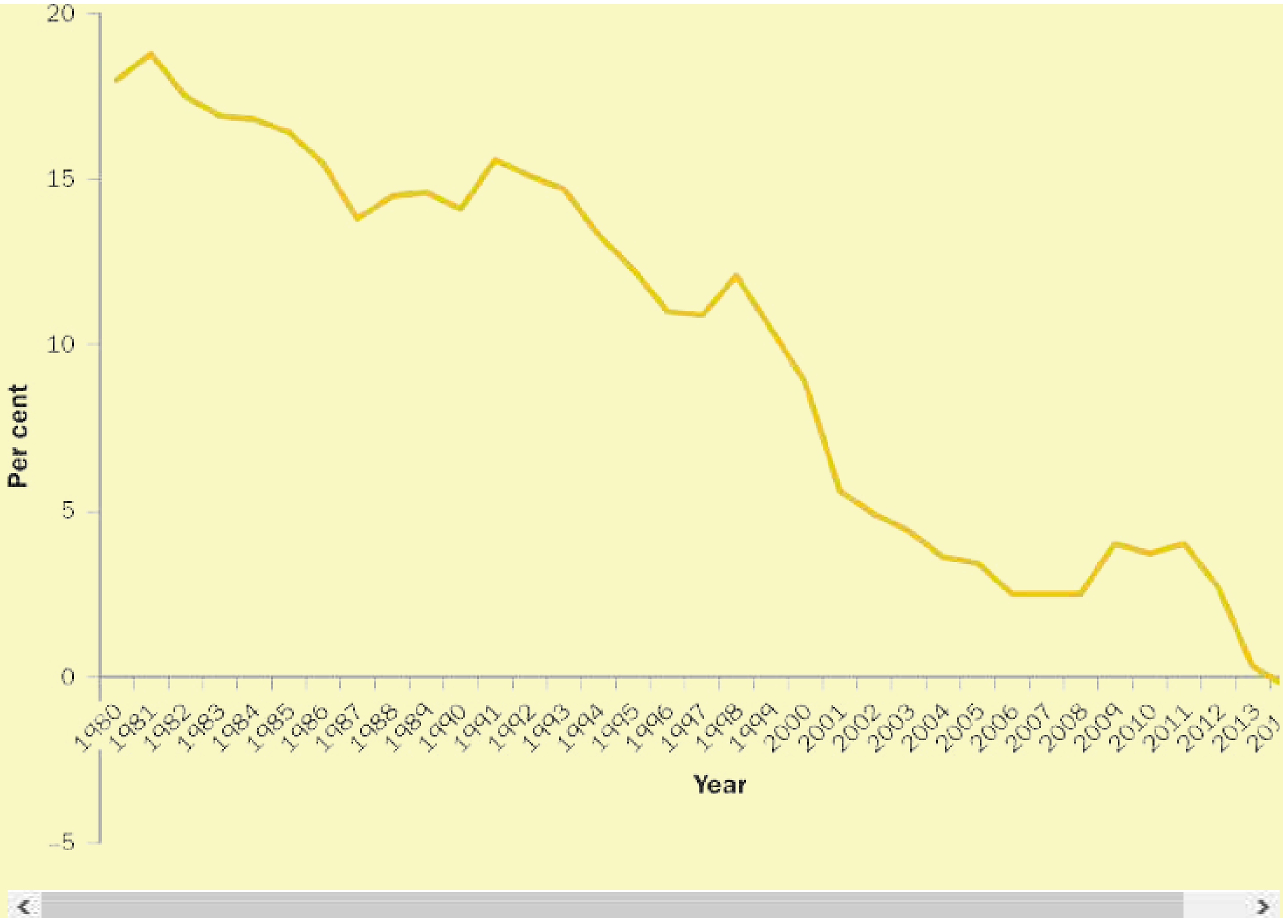

Figure 4.5 **Japan’s net saving rate**

Source: Based on European Commission Economic and Financial Affairs data, http://ec.europa.eu/economy_finance/ameco/user/serie/ResultSerie.cfm,accessed 28 September 2018.

Among the reasons for saving we discussed, lifecycle reasons are clearly important in Japan. The Japanese have long life expectancies, and many retire relatively early. With a long period of retirement to finance, Japanese families need to save a great deal during their working years. This explains why the saving rate of Japanese households was high by international standards throughout the 1970s and 1980s, when a large proportion of Japan’s adult population was in employment.

When people finish working and retire, they begin to draw on their accumulated saving. This appears to explain the recent fall in Japanese saving. The ratio of elderly to the total population in Japan became the highest of all the developed nations (see Katayama 2006). Research by Maika Koga of the Bank of Japan found this aspect of Japan’s demography to be the main factor underlying the fall in Japanese savings (Koga 2006). More recently, as shown in Figure 4.5, the Global Financial Crisis had a devastating effect on Japanese savings. In the face of the severe downturn in the economy, it would appear that many Japanese households had little choice other than to draw on their savings in order to finance their purchases of goods and services.

The rate of return that is most relevant to saving decisions is the *real interest rate*, denoted r. Recall from Chapter 3 that the real interest rate is the rate at which the real purchasing power of a financial asset increases over time. The real interest rate equals the market, or nominal, interest rate (i) minus the inflation rate (π).

The real interest rate is relevant to savers because it is the ‘reward’ for saving. Suppose you are thinking of increasing your saving by $1000 this year, which you can do if you give up your habit of eating out once a week. If the real interest rate is 5 per cent, then in a year your extra saving will give you extra purchasing power of $1050, measured in today's dollars. But if the real interest rate were 10 per cent, your sacrifice of $1000 this year would be rewarded by $1100 in purchasing power next year. Obviously, all else being equal, you would be more willing to save today if you knew the reward next year would be greater. In either case the *cost* of the extra saving—giving up your weekly night out—is the same. But the *benefit* of the extra saving, in terms of increased purchasing power next year, is higher if the real interest rate is 10 per cent rather than 5 per cent.

EXAMPLE 4.3 – BY HOW MUCH DOES A HIGH SAVING RATE ENHANCE A FAMILY'S FUTURE LIVING STANDARD?

The Spends and the Thrifts are similar families, except that the Spends save 5 per cent of their income each year and the Thrifts save 20 per cent. The two families began to save in 1990 and plan to continue until retirement in the year 2025. Both families earn $40 000 a year in real terms in the labour market, and both put their saving in a mutual fund that has yielded a real return of 8 per cent per year, a return they expect to continue into the future. Compare the amount that the two families consume in each year from 1990 to 2025, and compare the families' wealth at retirement.

In the first year, 1990, the Spends saved $2000 (5 per cent of their $40 000 income) and consumed $38 000 (95 per cent of $40 000). The Thrifts saved $8000 in 1990 (20 per cent of $40 000) and hence consumed only $32 000 in that year—$6000 less than the Spends. In 1991 the Thrifts' income was $40 640, the extra $640 representing the 8 per cent return on their $8000 saving. The Spends saw their income grow by only $160 (8 per cent of their saving of $2000) in 1991. With an income of $40 640, the Thrifts consumed $32 512 in 1991 (80 per cent of $40 640) compared to $38 152 (95 per cent of $40 160) for the Spends. The consumption gap between the two families, which started out at $6000, thus fell to $5640 after one year.

Because of the more rapid increase in the Thrifts' wealth and hence interest income, each year the Thrifts' income grew faster than the Spends'; each year the Thrifts continued to save 20 per cent of their higher incomes compared to only 5 per cent for the Spends. Figure 4.6 shows the paths followed by the consumption spending of the two families. You can see that the Thrifts' consumption, though starting at a lower level, grows relatively more quickly. By 2005 the Thrifts had overtaken the Spends, and from that point onward the amount by which the Thrifts outspent the Spends grew with each passing year. Even though the Spends continued to consume 95 per cent of their income each year, their income grew so slowly that, by 2000, they were consuming nearly $3000 a year less than the Thrifts ($41 158 a year versus $43 957). And by the time the two families retire, in 2015, the Thrifts will be consuming more than $12 000 per year more than the Spends ($55 774 versus $43 698). Even more striking is the difference between the retirement nest eggs of the two families. Whereas the Spends will enter retirement with total accumulated saving of just over $77 000, the Thrifts will have more than $385 000—five times as much.

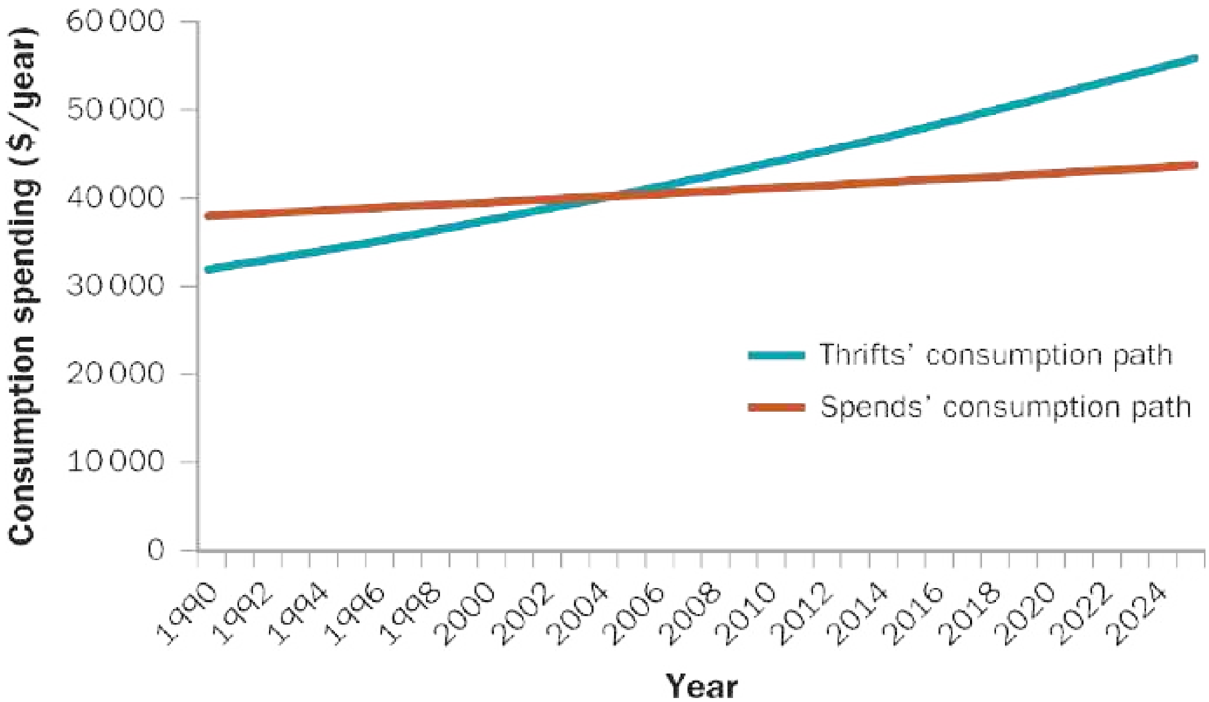

Figure 4.6 **Consumption trajectories of the Thrifts and the Spends**

These dramatic differences depend in part on the assumption that the real rate of return is 8 per cent—

lower than the actual return to mutual funds since 1990, but still a relatively high rate of return from a historical perspective. The Spends family in our example actually saves more than typical Australian households, many of which carry $5000 or more in credit card debt at high rates of interest and have no significant saving at all. The point of the example, which remains valid under alternative assumptions about the real interest rate and saving rates, is that, because of the power of compound interest, a high rate of saving pays off handsomely in the long run.

While a higher real interest rate increases the reward for saving, which tends to strengthen people's willingness to save, another force counteracts that extra incentive. Recall that a major reason for saving is to attain specific goals: a comfortable retirement, a university education or a first home. If the goal is a specific amount—say, $25 000 for a down payment on a home—then a higher rate of return means that households can save less and still reach their goal, because funds that are put aside will grow more quickly. For example, to accumulate $25 000 at the end of five years, at a 5 per cent interest rate, a person would have to save about $4309 per year. At a 10 per cent interest rate, reaching the $25 000 goal would require saving only about $3723 per year. To the extent that people are *target savers* who save to reach a specific goal, higher interest rates decrease the amount they need to save.

In sum, a higher real interest rate has both positive and negative effects on saving—a positive effect because it increases the reward for saving and a negative effect because it reduces the amount people need to save each year to reach a given target. Economists call these positive and negative effects, respectively, the substitution and income effects.

4.2.2 SAVING, SELF-CONTROL AND DEMONSTRATION EFFECTS

The reasons for saving we just discussed are based on the notion that people are rational decision-makers who will choose their saving rates to maximise their welfare over the long run. Yet many psychologists, and some economists, have argued instead that people's saving behaviour is based as much on psychological as on economic factors. For example, psychologists stress that many people lack the *self-control* to do what they know is in their own best interest. People smoke or eat greasy food, despite the known long-term health risks. Similarly, they may have good intentions about saving but lack the self-control to put aside as much as they ought to each month (see McDonald 2008 for an introduction to a branch of economics, behavioural economics, that explicitly considers these psychological factors).

One way to strengthen self-control is to remove temptations from the immediate environment. A person who is trying to stop smoking will make a point of not having cigarettes in the house, and a person with a weight problem will avoid going to a cake shop. Similarly, a person who is not saving enough might arrange to use a payroll saving plan, through which a predetermined amount is deducted from each pay and set aside in a special account from which withdrawals are not permitted until retirement. Making saving automatic and withdrawals difficult eliminates the temptation to spend all current earnings or squander accumulated saving. Payroll saving plans have helped many people to increase the amount that they save for retirement or other purposes.

An implication of the self-control hypothesis is that consumer credit arrangements that make borrowing and spending easier may reduce the amount that people save. For example, in recent years banks have encouraged people to borrow against the *equity* in their homes, that is, the value of the home less the value of the outstanding mortgage. Such financial innovations, by increasing the temptation to spend, may have reduced the household saving rate. The increased availability of credit cards with high borrowing limits is another temptation.

Downward pressure on the saving rate may also occur when additional spending by some consumers stimulates additional spending by others. Such *demonstration effects* arise when people use the spending of others as a yardstick by which to measure the adequacy of their own living standards. For example, a family in an upper-middle-class suburb in which the average house has 300 square metres of living space might regard a 150-square-metre house as being uncomfortably small—too cramped, for example, to entertain friends in the manner to which community members have become accustomed. In contrast, a similar family living in a low-income neighbourhood might find the very same house luxuriously large.

The implication of demonstration effects for saving is that families who live among others who consume more than they do may be strongly motivated to increase their own consumption spending. When satisfaction depends in part on *relative* living standards, an upward spiral may result in which household spending is higher, and saving lower, than would be best for either the individual families involved or for the economy.

THINKING AS AN ECONOMIST 4.3

What explains recent trends in Australian households' saving?

Household saving in Australia, which has always been comparatively low, has fallen even further in the past decade, albeit with an increase being observed during the Global Financial Crisis (Figure 4.1). Surveys show that a significant fraction of Australian households, especially those on low incomes, save nothing at all (see Harris, Loundes & Webster 2002). Why have Australian households, in general, saved so little?

Economists do not agree on the reasons for low household saving in Australia, although many hypotheses have been suggested.

One possible reason for low saving is the availability of government assistance to the elderly. From a *lifecycle* perspective, an important motivation for saving is to provide for retirement. To the extent that Australians believe that the government will ensure them an adequate living standard in retirement, however, their incentive to save for the future is reduced.

Another important lifecycle objective is buying a home. In Australia, with its highly developed financial system, people can buy homes with down payments of 10 per cent or sometimes even 5 per cent of the purchase price. The ready availability of mortgages with low down payments reduces the need to save for the purchase of a home.

What about *precautionary saving*? Unlike Japan and Europe, which had to rebuild after World War II, Australia has not known sustained economic hardship since the Great Depression of the 1930s (which fewer and fewer Australians are alive to remember). Perhaps the nation's prosperous past led Australians to be more confident about the future and hence less inclined to save for economic emergencies than other people. Nevertheless, the saving ratio did increase from mid-2008. Was this perhaps precautionary saving caused by the uncertainty about economic prospects in the wake of the Global Financial Crisis?

Psychological factors may also explain Australians' saving behaviour. For example, unlike in many countries, Australian homeowners can easily borrow against their home equity. This ability, made possible by the highly developed financial markets, may exacerbate *self-control* problems by increasing the temptation to spend. Finally, *demonstration effects* may have depressed saving in recent decades. In Chapter 5 we discuss the phenomenon of increasing wage inequality, which has improved the relative position of more skilled and educated workers. Increased spending by households at the top of the earnings scale on houses, cars and other consumption goods may have led those just below them to spend more as well, and so on. Middle-class families that were once content with medium-priced cars may now feel they need Volvos and BMWs to keep up with community standards. To the extent that demonstration effects lead families to spend beyond their means, they reduce their saving rate.

▹▹ RECAP

People save for a variety of reasons. Three of these are:

1. lifecycle saving—where different stages of people's lives call for different amounts of saving
2. precautionary saving—resources put aside to allow people to meet unexpected setbacks

3. bequest saving—resources put aside usually for future generations.

The real interest rate, since it subtracts the rate of inflation from the nominal or market interest rate, represents the real return that people get from their saving. The real interest rate has a theoretically ambiguous effect on people’s willingness to save. On the one hand, an increase in the real interest rate increases the opportunity cost of not saving and would therefore be expected to increase people’s willingness to save. On the other hand, people often save up to a particular target, and an increase in the real interest rate means that less savings need to be set aside to meet that target. Empirical evidence suggests that the real interest rate has a small positive effect on saving.

Since changes to financial markets and an increased preparedness by financial institutions to lend money make it easier for people to borrow money, there is a possibility that people will respond by saving less. When combined with demonstration effects—the desire to keep up with a perceived social norm of consumption—the end result will be a decline in the overall level of saving in the community.

4.3 NATIONAL SAVING AND ITS COMPONENTS

LO 4.3

Thus far we have been examining the concepts of saving and wealth from the household's perspective. But macroeconomists are interested primarily in saving and wealth for the country as a whole. In this section we will study **national saving**, or the aggregate saving of the economy. National saving includes the saving of business firms and the government, as well as that of households. Later in the chapter we will examine the close link between national saving and the rate of capital formation in an economy.

4.3.1 THE MEASUREMENT OF NATIONAL SAVING

To define the saving rate of a country as a whole, we will start with the general notion that saving represents current income less spending on current needs. Let us apply this idea to the three sectors of the economy that earn income: firms, households and the government.

Firms' income is derived from the sale of goods and services. From this income, the current needs that must be met are the payment of wages and other costs such as raw materials, interest, rent, dividends and taxation. What is left after these current needs are met is called *business saving*. Note that conventionally, this is split across two components. The first is an allowance for depreciation, that is, firms hold back some of their sales receipts in order to finance the replacement of worn-out plant and equipment. The second component is retained earnings.

The household sector receives income in the form of wages, interest, rent and dividends. A proportion of this income is used for consumption or as depreciation (remembering that some proportion of household consumption is on household durable commodities such as white goods, which wear out over time). The proportion of income not used for consumption is either used to pay taxes or set aside as household saving.

The government sector's income is derived from the taxes paid by the firm and household sectors. From this income, the government finances its expenditure. Should the government's expenditure be less than the tax income it receives over a period, the government is said to be running a budget surplus. This represents positive saving by the government sector. However, for a variety of reasons, governments often run budget deficits, that is, periods in which government expenditure exceeds tax income (the difference must be made up by government borrowing from the private sector, something we look at in more detail in Chapter 6).

We summarise these income, expenditure and saving flows in Figure 4.7.

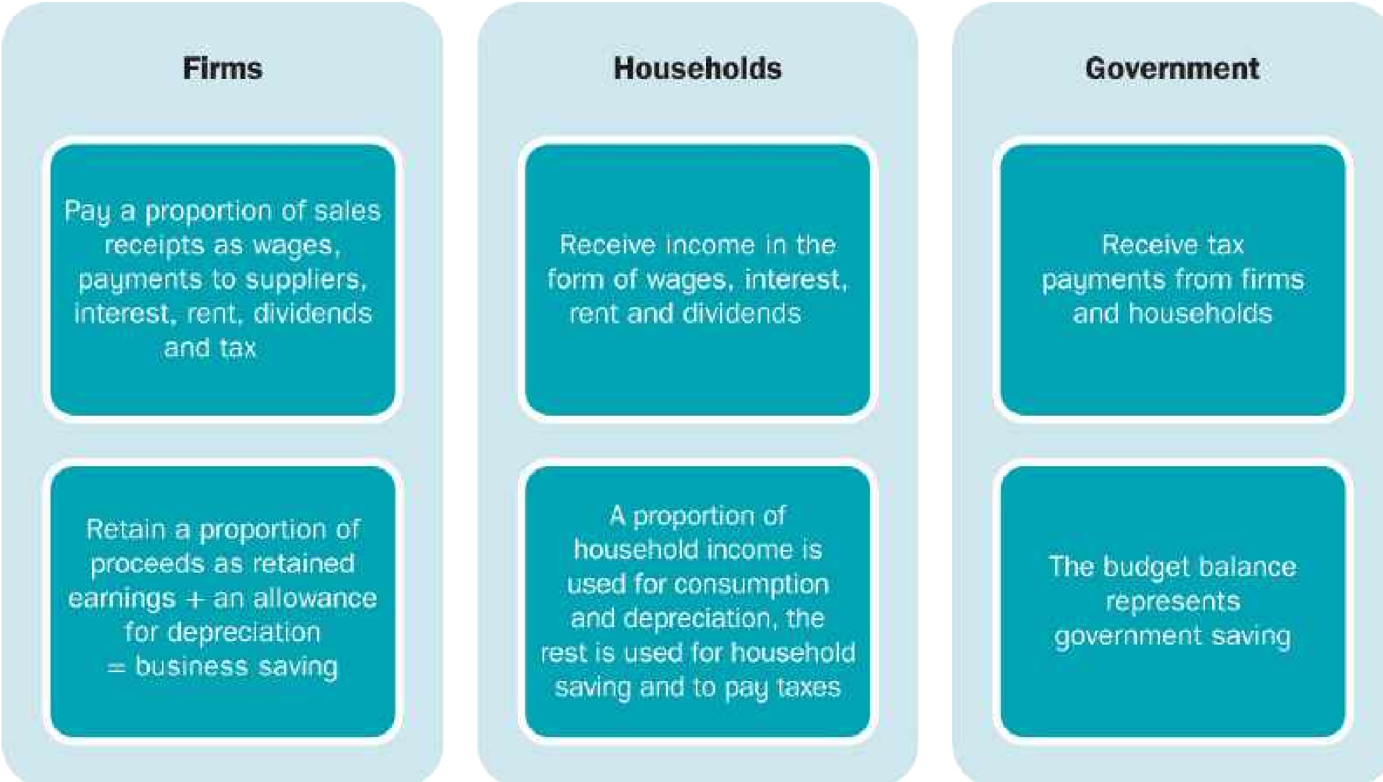

Figure 4.7 **Income and national saving**

Note: Each of these three sectors in the economy receives an income flow each period. After meeting their current needs, what is left over from this income flow represents saving. The combined saving of the three sectors is *national saving*.

To explore the concept of national saving in more detail, we will use the national income accounting identity that was introduced in Chapter 2. According to this identity, for the economy as a whole, production (or income) must equal total expenditure. In symbols, the identity is:

$$Y = C + I + G + NX$$

where Y stands for either production or aggregate income (which must be equal), C equals consumption expenditure, I equals investment spending, G equals government purchases of goods and services and NX equals net exports.

For now, let's assume that net exports (NX) are equal to zero, which would be the case if a country did not trade at all with other countries or if its exports and imports were always balanced. With net exports set at zero, the condition that output equals expenditure becomes:

$$Y = C + I + G$$

Identifying the part of total expenditure that corresponds to the nation's spending on current needs is more difficult than identifying the nation's income. The component of aggregate spending that is easiest to classify is investment spending, I. We know that investment spending—the acquisition of new factories, equipment and other capital goods, as well as residential construction—is done to expand the economy's future productive capacity or provide more housing for the future, not to satisfy current needs. So investment spending clearly is *not* part of spending on current needs.

Deciding how much of consumption spending by households, C, and government purchases of goods and services, G, should be counted as spending on current needs is less straightforward. Most consumption spending by households—on food, clothing, utilities, entertainment and so on—is for current needs. But consumption spending also includes purchases of long-lived *consumer durables* such as cars, furniture and appliances.

Consumer durables are only partially used up during the current year; they may continue to provide service, in fact, for years after their purchase. So, household spending on consumer durables is a combination of spending on current needs and spending on future needs.

As with consumption spending, most government purchases of goods and services are intended to provide for current needs. However, like household purchases, a portion of government purchases is devoted to the acquisition or construction of long-lived capital goods, such as roads, bridges, schools, government buildings and military hardware. And, like consumer durables, these forms of *public capital* are only partially used up during the current year; most will provide useful services far into the future. So, like consumption spending, government purchases are in fact a mixture of spending on current needs and spending on future needs.

Although in reality not all spending by households and the government is for current needs, in practice determining precisely how much of such spending is for current needs and how much is for future needs is extremely difficult. For this reason, for a long time government statistics have treated *all* of both consumption expenditures (C) and government purchases (G) as spending on current needs. For simplicity's sake, in this book we will follow the same practice. But keep in mind that, because consumption spending and government purchases do in fact include some spending for future rather than current needs, treating all of C and G as spending on current needs will understate the true amount of national saving.

If we treat all consumption spending and government purchases as spending on current needs, then the nation's saving is its income, Y, less its spending on current needs, $C + G$. So, we can define national saving, S, as:

$$S = Y - C - G$$

Figure 4.8 shows Australia's national saving rate (national saving as a proportion of disposable income) for the years 1959 to 2017. (The measure of national saving shown in Figure 4.8 is known as *net* national saving. This means that depreciation of fixed assets has been subtracted from these figures. An alternative measure of national saving, gross national saving, includes depreciation. In theory, net national saving, which would be less than gross national saving, gives a measure of how wealth has changed.) Net national saving has varied quite a lot over the past 50 years, although, as we have seen, since at least the mid-1970s this has been a period in which the contribution of the household sector to national saving has been largely declining. As we will see next, the reason for these differences between the behaviour of national saving and household saving is that saving is also done by business firms and the government. This raises the possibility that a decline in household saving need not mean a decline in national saving if business and government savings are trending upwards.

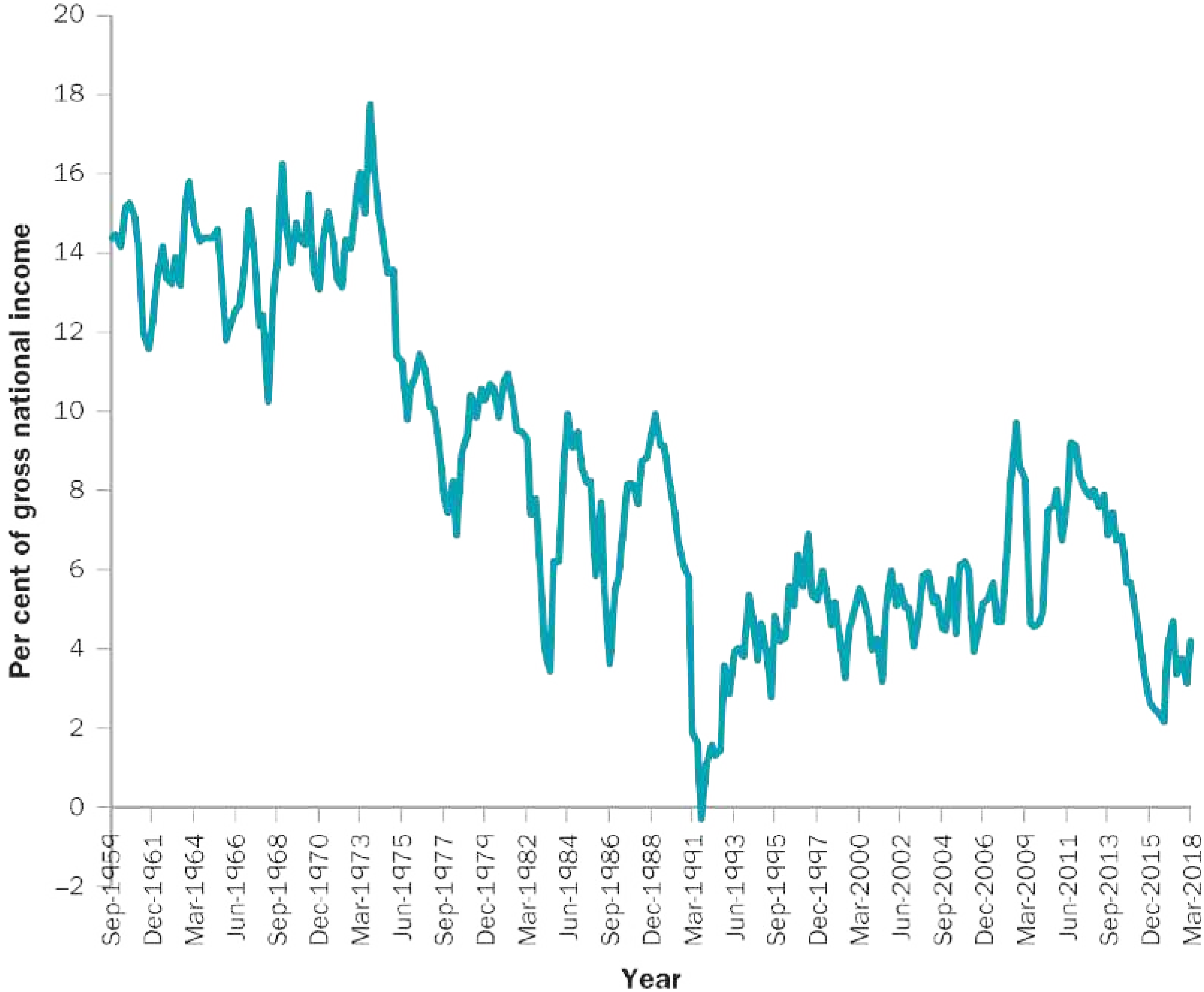

Figure 4.8 **Australia's net national saving rate**

Source: Australian Bureau of Statistics 2018, 'Australian national accounts: National income, expenditure and product', Cat. no. 5206.0.

4.3.2 PRIVATE AND PUBLIC COMPONENTS OF NATIONAL SAVING

To understand national saving better we will divide it into two major components: private saving, which is saving done by households and businesses, and public saving, which is saving done by the government.

To see how national saving breaks down into public and private saving, we work with the definition of national saving, $S = Y - C - G$. To distinguish private sector income from public sector income, we must expand this equation to incorporate taxes as well as payments made by the government to the private sector. Government payments to the private sector include both *transfers* and *interest* paid to individuals and institutions which hold government bonds. **Transfer payments** are payments the government makes to the public for which it receives no current goods or services in return. Welfare payments are examples of transfer payments.

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Let T stand for taxes paid by the private sector to the government *less* transfer payments and interest payments made by the government to the private sector. Since T equals private sector tax payments minus the various benefits and interest payments the private sector receives from the government, we can think of T as net taxes. If we add and then subtract T from the definition of national saving, $S = Y - C - G$, we get:

$$S = Y - C - G + T - T$$

Rearranging this equation and grouping terms we obtain:

$$S = (Y - T - C) + (T - G)$$

This equation splits national saving, S, into two parts, *private saving*, or $Y - T - C$, and *public saving*, $T - G$.

Private saving, $Y - T - C$, is the saving of the private sector of the economy. Why is $Y - T - C$ a reasonable definition of private saving? Remember that saving equals current income minus spending on current needs. The income of the private (non-government) sector of the economy is the economy's total income, Y, less net taxes paid to the government, T. The private sector's spending on current needs is its consumption expenditures, C. So private sector saving, equal to private sector income less spending on current needs, is $Y - T - C$. Letting $S_{private}$ stand for private saving, we can write the definition of private saving as:

$$S_{private} = Y - T - C$$

Private saving can be further broken down into saving done by households and business.

Public saving, $T - G$, is the saving of the government sector, including state and local governments as well as the federal government. Net taxes, T, are the income of the government. Government purchases, G, represent the government's spending on current needs (remember that, for the sake of simplicity, we are ignoring the investment portion of government purchases). Thus $T - G$ fits our definition of saving, in this case by the public sector.

Letting S_{public} stand for public saving, we can write out the definition of public saving as:

$$S_{public} = T - G$$

Using S = (Y – T – C) + (T – G) and the definitions of private and public saving, we can rewrite national saving as:

$$S = S_{private} + S_{public}$$

This equation confirms that national saving is the sum of private saving and public saving. Since private saving can be broken down in turn into household and business saving, we see that national saving is made up of the saving of three groups: households, businesses and the government.

4.3.3 PUBLIC SAVING AND THE GOVERNMENT BUDGET

Although the idea that households and businesses can save is familiar to most people, the fact that the government can also save is less widely understood. Public saving is closely linked to the government's decisions about spending and taxing. Governments finance the bulk of their spending by taxing the private sector. If taxes and spending in a given year are equal, the government is said to have a *balanced budget*. If in any given year the government's spending exceeds its tax collections, the difference is called the

government budget deficit. If the government runs a deficit, it must make up the difference by borrowing from the public through issuance of government bonds. Algebraically, the government budget deficit can be written as $G - T$, or government purchases minus net tax collections.

In some years the government may spend less than it collects in taxes. The excess of tax collections over government spending is called the **government budget surplus**. When a government has a surplus, it uses the extra funds to pay down its outstanding debt to the public. Algebraically, the government budget surplus may be written as $T - G$, or net tax collections less government purchases.

The algebraic expression for the government budget surplus, $T - G$, corresponds to the definition of public or government saving, as we saw earlier in Figure 4.7. Thus, *public saving is identical to the government budget surplus*. In other words, when the government collects more in taxes than it spends, public saving will be positive. When the government spends more than it collects in taxes so that it runs a deficit, public saving will be negative.

BACKGROUND BRIEFING 4.2

Public saving and public debt in Australia

How does the government decide on the level of public saving that it undertakes? This is the key question in the study of fiscal policy, the name economists give to the government's decisions about its expenditure and taxation policies. There are many considerations that the government takes into account when setting its fiscal policy. One is the state of the business cycle, and as we shall see in Chapter 8, governments sometimes use their fiscal policy to try to smooth out the business cycle. Another concerns the need for the government to provide public goods; these are goods and services which the private sector is unwilling to supply but which benefit the whole community. The public provision of such goods involves expenditure by the government, which must be financed (either from taxation or from public borrowing). Finally, there is the management of the stock of public debt. This is the amount owing by the government to the private sector as a result of past borrowing. These borrowings occur whenever the government runs a budget deficit. The deficit must be financed in some way. Typically, this is done through the government borrowing money from the private sector. As with all borrowing, this means that a stock of debt is incurred that must be repaid plus interest.

On the other hand, budget surpluses allow the government to pay off the debts accumulated from past budget deficits. A string of budget surpluses starting in 1997–98 in Australia, combined with the proceeds from the sale of public assets, saw the elimination of the Australian Government's net debt in 2005–06 (by way of comparison, in 1995–96 the government's net debt represented 19% of GDP) (see Figure 4.9). This went against the trend in many other OECD countries; at the same time, the average net debt to GDP ratio in the OECD was around 48 per cent (see Australian Government 2006).

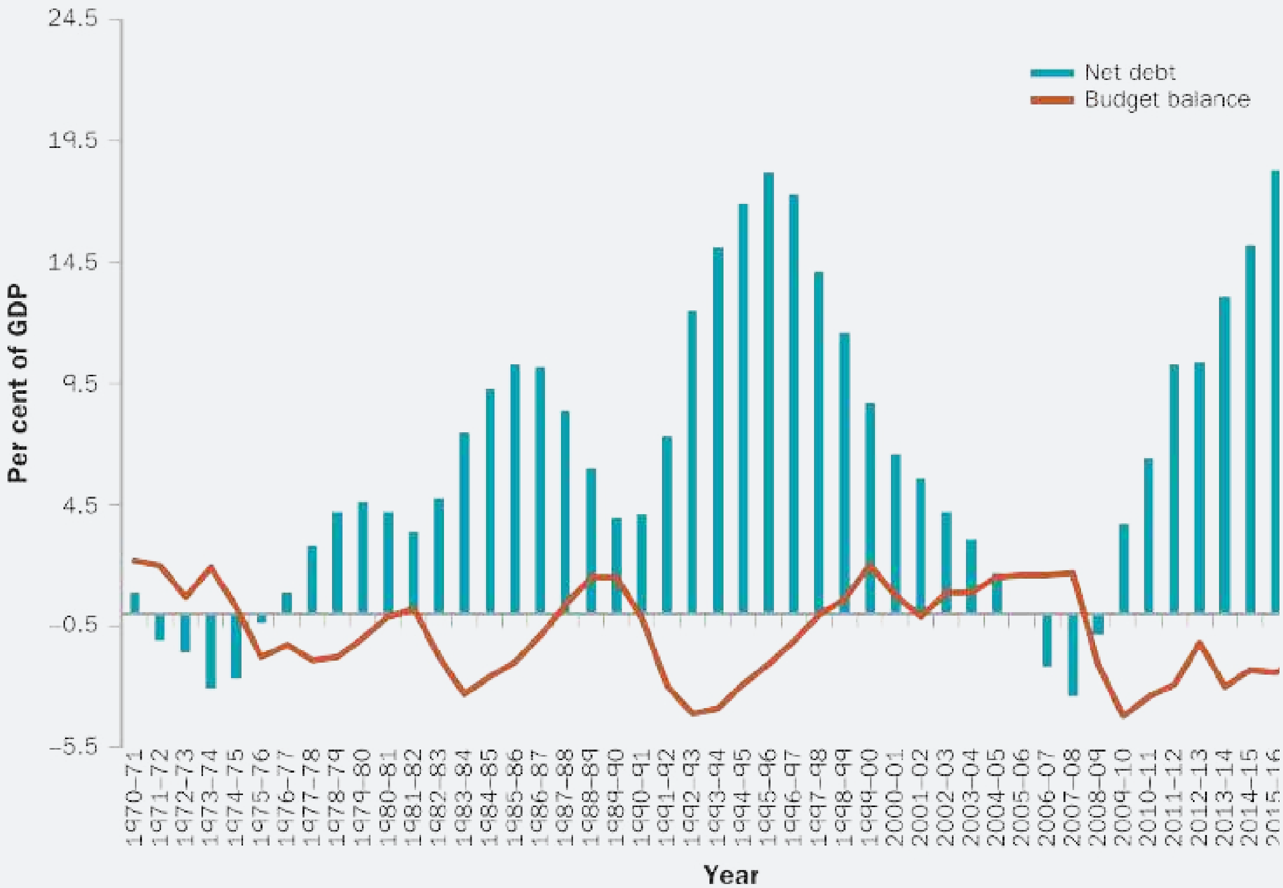

Figure 4.9 **Australia's net public debt and the budget balance**

Source: Australian Government, 'Budget 2017–18, Paper No. 1, Budget Strategy and Outlook 2017–18, Statement 110: Historical Australian Government Data'.

The Global Financial Crisis quickly moved the budget into deficit as the Australian Government sought to strengthen the economy through its various economic stimulus packages. You can see the effects of the move to budget deficits associated with the stimulus packages in Figure 4.9, net debt again becoming positive.

There is a long-standing debate in economics about the effects, positive or negative, of public debt. It is a complicated issue. On the one hand, there are equity considerations. Any borrowing undertaken by the government has to be repaid, plus interest, at some time in the future. As such, government debt imposes a commitment on future generations to repay that debt, usually in the form of higher taxes. This means that the government's debt represents a transfer of wealth towards those who enjoy the benefits of the government expenditure in the present from those who meet the cost of that expenditure, that is, taxpayers, in the future. Those who are swayed by this argument favour a reduction in government debt, as it relieves future taxpayers of the burden of paying for expenditure benefits that they themselves may not have experienced. The counter-argument is that the benefits from government expenditure often only become apparent after several years; for example, it may take time for an increase in funding for education to produce increased educational attainment and contribute to economic growth and higher living standards. Therefore, it is by no means obvious that taxpayers in the future are somehow insulated from the benefits accruing from government expenditure incurred at some time in the past.

There is also the question of the government's ability to take advantage of low interest rates. If the rate of economic growth is sufficiently high, tax revenues may increase automatically by at least as much, if not more, than what is required to meet the repayment obligations associated with the government's debt. (A useful rule of thumb is that if the interest rate on the government's debt is less than the rate at which the economy is growing, it should be possible for the government to meet its interest obligations from the extra tax revenue associated with rising incomes.) Proponents of this argument point out that it is not the level of government debt itself that may be problematic, but the nation's ability to generate enough income to service that debt. Low interest rates, combined with a reasonable rate of economic growth, might mean that Australia could easily manage to live with a positive level of debt. (Government expenditure, financed by the debt, may also actively contribute to that economic growth when put to productive uses.)

Example 4.4 illustrates the relationships between public saving, the government budget surplus and national saving.

EXAMPLE 4.4 – GOVERNMENT SAVING

Following are data on the Australian Government's revenues and expenditures for the financial year 2004–05, in billions of dollars. Find (a) the government's budget surplus or deficit and (b) the contribution of the government to national saving.

AUSTRALIAN GOVERNMENT	$ BILLION
Receipts	206.6
Expenditures	195.7

Source: Compiled from Australian Government, '2006–07 budget overview', www.budget.gov.au/2006-07/overview/html/overview_29.htm.

The federal government's receipts minus its expenditures were 206.6 − 195.7 = 10.9, so the government ran a budget surplus of $10.9 billion in 2004–05. Thus, the contribution of the Australian Government to Australia's national saving in 2004–05 was $10.9 billion.

CONCEPT CHECK 4.4

Continuing Example 4.4, here are the analogous data on the Australian Government's revenues and expenditures for 1993–94, in billions of dollars. Again, find (a) the government's budget surplus or deficit and (b) the contribution of the government to national saving.

AUSTRALIAN GOVERNMENT	$ BILLION
Receipts	100.7
Expenditures	117.8

Source: Compiled from Australian Government budget papers, www.budget.gov.au.

If you did Concept Check 4.4 correctly you found that the government sector's contribution to national saving in 1993–94 was *negative*. The reason is that the Australian Government ran a budget deficit in that year, reducing national saving by the amount of the budget deficit.

Figure 4.10 shows the behaviour since 1960 of the three components of national saving: household saving, business saving and public saving, each measured as a percentage of total gross income. Note that business saving has played an increasingly major role in total national saving in recent years, while the role of household saving has been relatively modest until very recently.

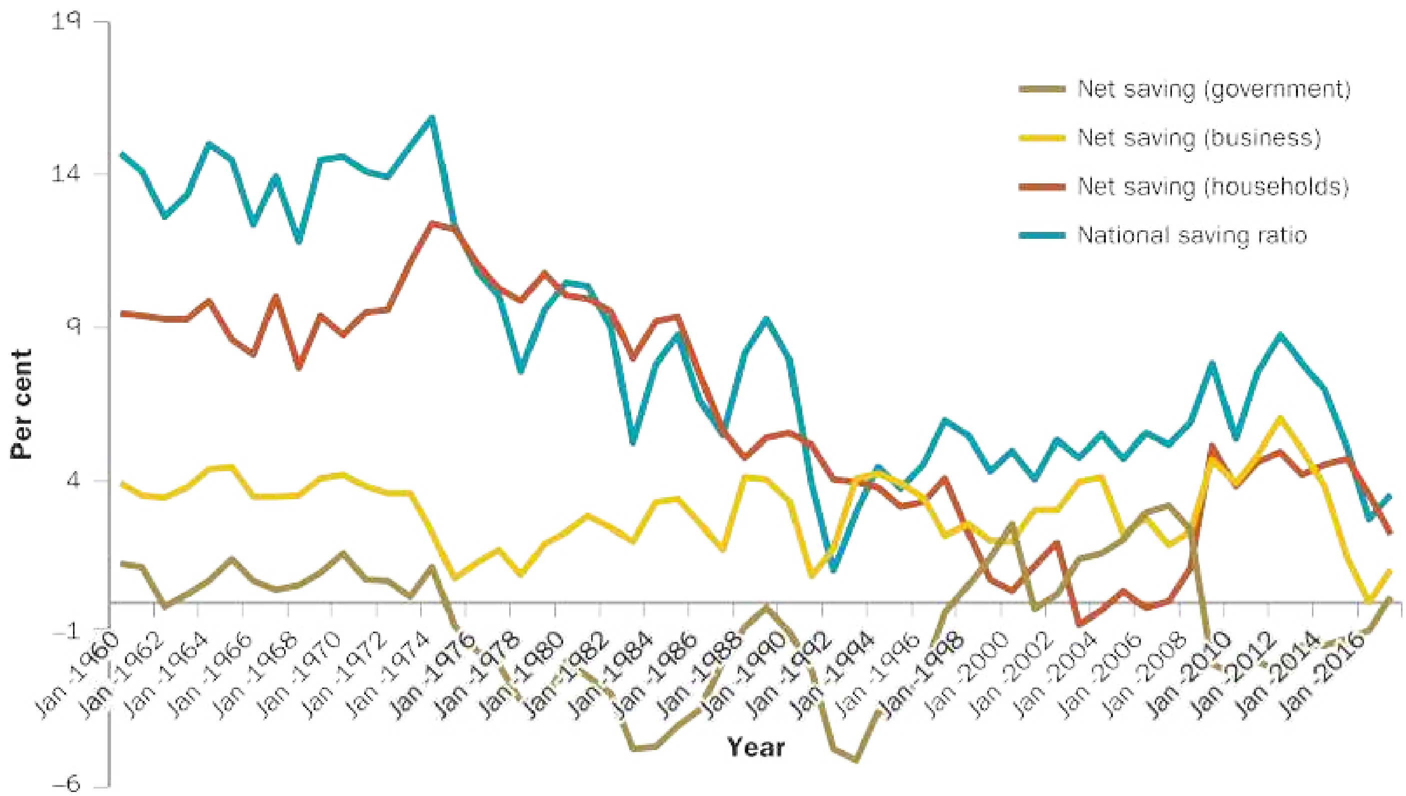

Figure 4.10 **Australia's net national saving as a proportion of gross national income**

Source: Based on Australian Bureau of Statistics 2018, 'Australian national accounts: National income, expenditure and product', Cat. no. 5206.0, Table 384, National income account, current prices, annual.

The contribution of public saving has varied considerably over time. Until about the early 1970s the national, state and local governments typically ran a combined surplus, making a positive contribution to national saving. But by the late 1970s public saving had turned negative, reflecting large budget deficits. Until the late 1980s the government was a net drain on national saving. During the late 1980s, however, government budgets moved temporarily into surplus, though deficits soon returned. More recently, governments in Australia achieved budget surpluses again and, until the outbreak of the Global Financial Crisis, these surpluses were projected to continue into the near future. However, government spending programs in response to the crisis reversed the trend towards budget surpluses.

▹▹ RECAP

National saving comprises the total saving of the household, business and government sectors. Following on from our definition of saving as income less spending on current needs, national saving can be calculated by subtracting consumption and government expenditure from the economy's available income.

National saving can be broken down into two components. The first represents saving undertaken by the private (non-government) sector and represents saving made by households and by businesses. The second is saving made by all levels of government.

The government sector makes a contribution to national saving through the balance on its budget. Should the government take in more taxes than it spends, the budget is in surplus, and this is a positive contributor to national saving. If the government spends more than it takes in as taxes, the budget is in deficit, and this reduces national saving.

4.4 IS LOW HOUSEHOLD SAVING A PROBLEM?

LO 4.4

Figure 4.1 showed that saving by Australian households, never high by international standards, fell substantially during the 1990s, albeit recovering somewhat in recent years, but still well down on its previous peak. This decline in the household saving rate often receives much attention from the news media. Is Australia's relatively low household saving rate a problem?

From a macroeconomic perspective the problem posed by low household saving is probably overstated. The key fact often overlooked is that national saving, not household saving, is the key determinant of the economy's capacity to invest in new capital goods and to achieve continued improvement in living standards. Although household saving may be low, saving by business firms is often significant (see Figure 4.10).

4.5 INVESTMENT AND CAPITAL FORMATION

LO 4.5

From the point of view of the economy, the importance of national saving is that it provides the resources needed for investment. Investment—the creation of new capital goods and housing—is critical to increasing productivity and improving standards of living. This is especially the case if the economy does not borrow funds from other countries. As we will see later, in Chapter 18, national saving can be supplemented by drawing on the saving of other countries. To the extent that this occurs, investment need not be constrained by the level of domestic saving. We leave these open economy issues for later.

What factors determine whether and how much firms choose to invest? The answer is the cost–benefit principle. Firms' willingness to acquire new factories and machines depends on the expected *cost* of using them and the expected *benefit*, equal to the value of the extra (marginal) product that they will provide. Example 4.5 highlights the real-world considerations that are important when a firm, in this case a firm operated by one person, is deciding on whether to invest in a piece of capital equipment. It is from real-world examples such as this that economists generalise about the factors that are likely to be of most importance across the whole spectrum of investment decisions in the economy.

EXAMPLE 4.5 – SHOULD PATRICK BUY A RIDE-ON LAWN MOWER (PART 1)?

Patrick is thinking of going into the lawn care business. He can buy a $4000 ride-on mower by taking out a loan at 6 per cent annual interest. With this mower and his own labour, Patrick can net $6000 per summer, after the deduction of costs such as petrol and maintenance. Of the $6000 net revenues, 20 per cent must be paid to the government in taxes. Assume that Patrick could earn $4400 after taxes by working in an alternative job. Assume also that the lawn mower can always be resold for its original purchase price of $4000. Should Patrick buy the lawn mower?

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To decide whether to invest in the capital good (the lawn mower), Patrick should compare the financial benefits and costs. With the mower, he can earn revenue of $6000, net of petrol and maintenance costs. However, 20 per cent of that, or $1200, must be paid in taxes, leaving Patrick with $4800. Patrick could earn $4400 after taxes by working at an alternative job, so the financial benefit to Patrick of buying the mower is the difference between $4800 and $4400, or $400; $400 is the value of the marginal product of the lawn mower.

Since the mower does not lose value over time and since petrol and maintenance costs have already been deducted, the only remaining cost Patrick should consider is the interest on the loan for the mower. Patrick must pay 6 per cent interest on $4000, or $240 per year. Since this financial cost is less than the financial benefit of $400, the value of the mower's marginal product, Patrick should buy the mower.

Patrick's decision might change if the costs and benefits of his investment in the mower change, as Example 4.6 shows.

EXAMPLE 4.6 – SHOULD PATRICK BUY A RIDE-ON LAWN MOWER (PART 2)?

With all other assumptions the same as in Example 4.5, decide whether Patrick should buy the mower:

a) **if the interest rate is 12 per cent rather than 6 per cent**
b) **if the purchase price of the mower is $7000 rather than $4000**
c) **if the tax rate on Patrick's net revenues is 25 per cent rather than 20 per cent**
d) **if the mower is less efficient than Patrick originally**

thought so that his net revenues will be $5500 rather than $6000.

In each case, Patrick must compare the financial costs and benefits of buying the mower.

a) If the interest rate is 12 per cent, then the interest cost will be 12 per cent of $4000, or $480, which exceeds the value of the mower's marginal product ($400). Patrick should not buy the mower.
b) If the cost of the mower is $7000, then Patrick must borrow $7000 instead of $4000. At 6 per cent interest, his interest cost will be $420—too high to justify the purchase, since the value of the mower's marginal product is $400.
c) If the tax rate on net revenues is 25 per cent, then Patrick must pay 25 per cent of his $6000 net revenues, or $1500, in taxes. After taxes, his revenues from mowing will be $4500, which is only $100 more than he could make working at an alternative job. Furthermore, the $100 will not cover the $240 in interest that Patrick would have to pay. So, again, Patrick should not buy the mower.
d) If the mower is less efficient than originally expected, so that Patrick can earn net revenues of only $5500, Patrick will be left with only $4400 after taxes—the same amount he could earn by working at another job. So, in this case, the value of the mower's marginal product is zero. At any

interest rate greater than zero, Patrick should not buy the mower.

CONCEPT CHECK 4.5

Repeat Example 4.5 but assume that, over the course of the year, wear and tear reduces the resale value of the lawn mower from $4000 to $3800. Should Patrick buy the mower?

The examples involving Patrick and the lawn mower illustrate the main factors firms must consider when deciding whether to invest in new capital goods. On the cost side, two important factors are the *price of capital goods* and the *real interest rate*. Clearly, the more expensive new capital goods are, the more reluctant firms will be to invest in them. Buying the mower was profitable for Patrick when its price was $4000, but not when its price was $7000.

Why is the real interest rate an important factor in investment decisions? The most straightforward case is when a firm must borrow (as Patrick did) to purchase its new capital. The real interest rate then determines the real cost to the firm of paying back its debt. Since financing costs are a major part of the total cost of owning and operating a piece of capital—much as mortgage payments are a major part of the cost of owning a home—increases in the real interest rate make the purchase of capital goods less attractive to firms, all else being equal.

Even if a firm does not need to borrow to buy new capital—say, because it has accumulated enough profits to buy the capital outright—the real interest rate remains an important determinant of the desirability of an investment. If a firm does not use its profits to acquire new capital, it will most likely use those profits to acquire financial assets such as bonds, which will earn the firm the real rate of interest. If the firm uses its profits to buy capital rather than to purchase a bond, it forgoes the opportunity to earn the real rate of interest on its funds. Thus, the real rate of interest measures the *opportunity cost* of a capital investment. Since an increase in the real interest rate raises the opportunity cost of investing in new capital, it lowers the willingness of firms to invest, even if they do not literally need to borrow to finance new machines or equipment.

On the benefit side, the key factor in determining business investment is the *value of the marginal product* of the new capital, the value obtained from selling the additional output produced by the new capital, which should be calculated net of both operating and maintenance expenses and taxes paid on the revenues the capital generates. The value of the marginal product is affected by several factors. For example, a technological advance that allows a piece of capital to produce more goods and services would increase the value of its marginal product, as would lower taxes on the revenues produced by the new capital. An increase in the relative price of the good or service that the capital is used to produce will also increase the value of the marginal product and, hence, the desirability of the investment. For example, if the going price for lawn-mowing services were to rise then, all else being equal, investing in the mower would become more profitable for Patrick.

THINKING AS AN ECONOMIST 4.4

Why has investment in computers increased so much in recent decades?

Since around the mid-1990s the stock of computer systems owned by Australian firms has risen sharply. Figure 4.11 charts the growth in the size of the net stock of computers and computer peripherals over the past 50 years. What explains the trends shown in the graph?

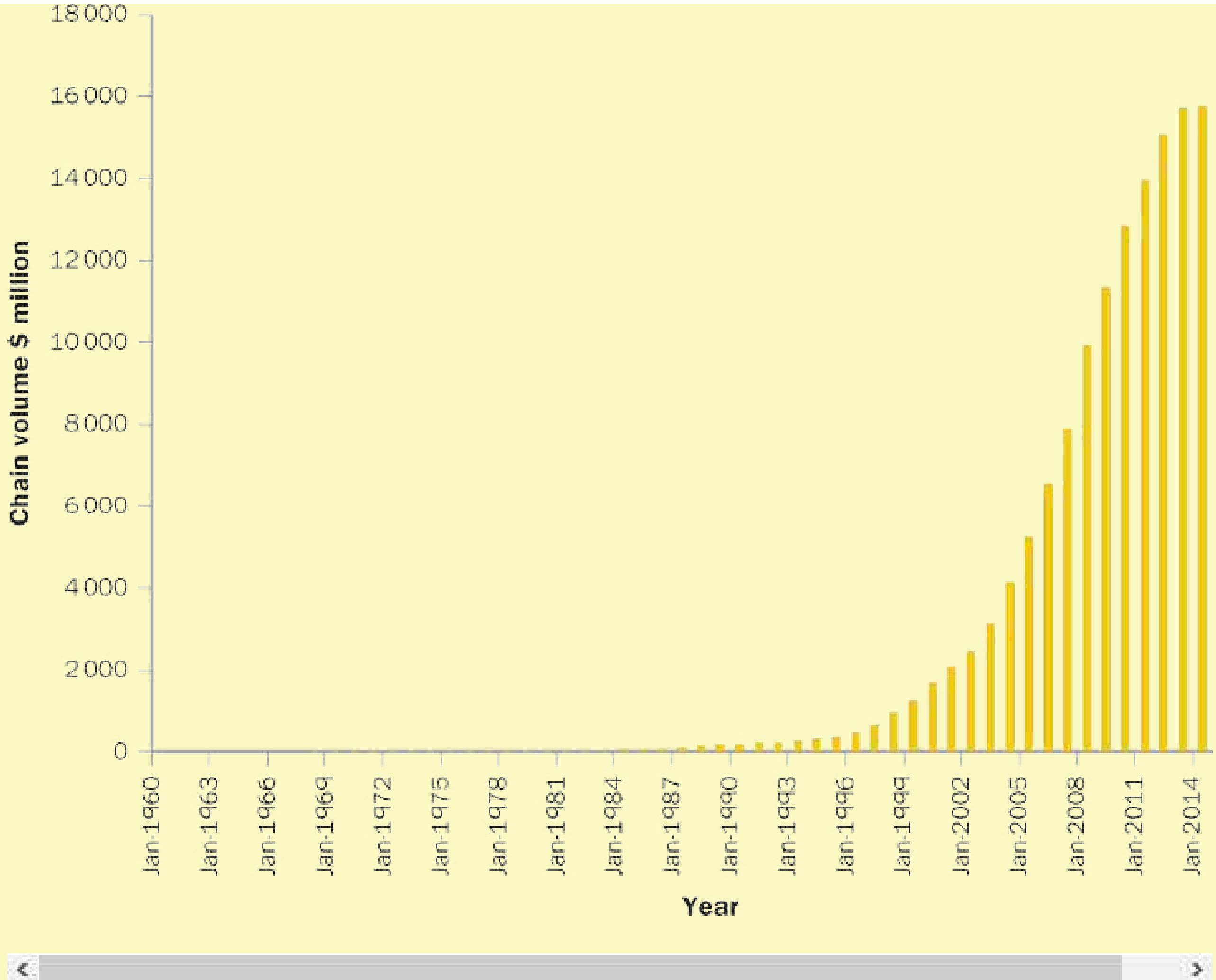

Figure 4.11 **Net stock of computers and computer peripherals, Australia**

Source: Based on Australian Bureau of Statistics 2018, 'Australian system of national accounts', Cat. no. 5204.0, Table 69, Information technology net capital stock, selected items by industry.

Investment in computers has increased by much more than other types of investment. Hence, the factors that affect all types of investment (such as the real interest rate and the tax rate) are not likely to be responsible for the boom. The two main causes of increased investment in computers appear to be the declining price of computing power and the increase in the value of the marginal product of computers. In recent years, the price of computing power has fallen at a precipitous rate. An industry rule of thumb is that the amount of computing power that is obtainable at a given price doubles every 18 months. As the price of computing power falls, an investment in computers becomes more and more likely to pass the cost–benefit test.

On the benefit side, for some years after the beginning of the computer boom, economists were unable to associate the technology with significant productivity gains. Defenders of investment in computer systems argued that the improvements in goods and services computers create are particularly hard to measure. How does one quantify the value to consumers of 24-hour-a-day access to their bank accounts or of the ability to make airline reservations online? Critics responded that the expected benefits of the computer revolution may have proved illusory because of problems such as user-unfriendly software and poor technical training. However, productivity has increased noticeably in recent years, and many people are now crediting the improvement to investment in computers and computer-related technologies like the internet. As more firms become convinced that computers do add significantly to productivity and profits, the boom in computer investment can be expected to continue.

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Perhaps surprisingly, in light of these arguments, the net stock of IT equipment has fallen in recent years. One explanation might be the tremendous growth in outsourcing that has occurred. In line with trends elsewhere, Australian firms now locate an increasing proportion of their IT activities in other countries. This would raise the net stock of IT capital in those countries and lead to a smaller Australian net capital stock. It is not that Australian firms are using less technology—globalisation has meant that firms' operations need not be located in the same place.

BACKGROUND BRIEFING 4.3

The mining boom

The accelerated pace of economic development in nations such as China and India had enormous impact on resource-rich countries such as Australia. This was most noticeable in the years after 2005. Increasing industrialisation and mass internal migrations to urban centres, particularly in China, raised global demand for resources such as coal, oil, gas and iron ore. Consequently, global prices for these commodities boomed; a study by the Reserve Bank of Australia (Caputo, Robinson & Wang 2013) found prices of iron ore and coking coal increased by 400 per cent relative to the early 2000s. As these particular commodities comprised around 25 per cent of Australia's exports, this boost to prices had significant implications for the economy. Indeed, the term 'mining boom' seemed particularly apt as a description of these developments in the Australian economy.

The nature of Australia's mining boom can be summarised by its implications for investment expenditure. The establishment of new mines, by definition, requires large amounts of investment expenditure. Figure 4.12 shows data for investment broken down across three sectors: mining, manufacturing and other. The data are shown for each sector as a proportion of total GDP. The rapid increase in investment in mining during the years of the mining boom (roughly from 2005 to 2011) is very apparent in these data. Indeed, the share of GDP accounted for by mining investment has never been higher in Australia's history.

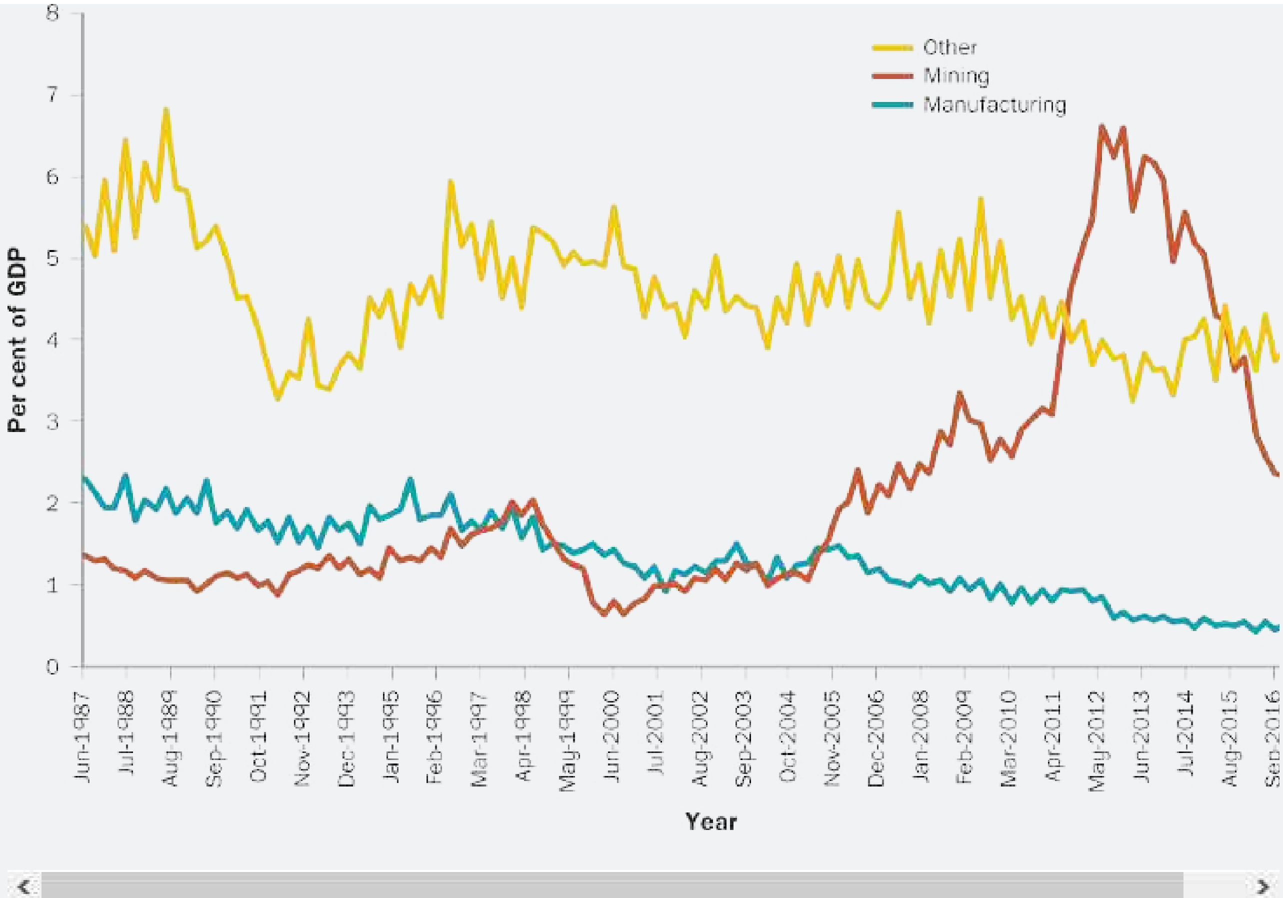

Figure 4.12 **Investment as a share of GDP, Australia**

Source: Authors' calculations based on Australian Bureau of Statistics 2013, 'Australian national accounts: National income, expenditure and product, June', Cat. no. 5206.0 and 'Private new capital expenditure and expected expenditure, Australia, June', Cat. no. 5625.0.

A development such as this, whereby a major component of aggregate expenditure in the economy undergoes such a significant change, had implications for almost every sector in the economy. First, and most obviously, workers and shareholders in firms directly associated with mining benefited through increased numbers of jobs, higher wages and, assuming that the mining is profitable once production begins, higher dividend payments. Second, firms indirectly associated with mining also benefited; suppliers of inputs to mining and the associated financial services required by mining exporters are two such cases. Third, the workers and shareholders of mining and associated firms will spend their higher incomes; the recipients of that spending, other firms and their workers and shareholders, will benefit. Fourth, the government benefited through the higher taxes paid by mining firms.

Reference

Caputo M, Robinson T, Wang H 2013, ‘The relationship between bulk commodity and Chinese steel prices’, www.rba.gov.au/publications/bulletin/2013/sep/bu-0913-2a.html.

There were costs as well. Look again at Figure 4.12. Note the decline in manufacturing investment. Although this is a long-term trend that predates the mining boom, the data show acceleration in the rate of decline once the boom took hold. Is this a coincidence? In Chapters 16 and 17 of this text, you will learn how an expansion of one industry in the economy, where that industry is relatively efficient in its production, draws resources away from other, less productive industries. A mining boom, such as that experienced in Australia, invariably results in a shake-up of the economy’s structure, with some traditionally strong areas of productive activity, such as manufacturing, losing ground to newly expanding areas, in this instance mining.

Does the massive fall in mining investment from 2011 apparent in Figure 4.12 signify an end to the mining boom? The answer is no, though it does indicate the mining boom moved into a different, more mature phase. Recall the distinction between stock and flows. Investment expenditure is a flow of expenditure, which acts to expand the capital stock. In this case, the investment in mining involved the establishment of the mines and infrastructure needed to support increased extraction of natural resources. Once established, there is no longer a need for ongoing net investment (there will be some ongoing investment to maintain the mines, of course, but this is typically relatively small). A significant fall in mining investment is therefore not unexpected, nor does it point to any reduction in the importance that mining has for the Australian economy. It shows, however, that mining production, rather than investment, is how the mining boom is now being experienced.

▹▹ RECAP

In deciding whether to invest, firms compare the cost of using newly acquired capital equipment against the benefits. Two important costs are the purchase price of the equipment and the real interest rate. The latter is important either because the firm has had to borrow funds to buy the equipment or because the firm could use the funds earmarked for the purchase of the equipment to buy an interest-earning financial asset. The benefits involve the value of the marginal product, essentially, the extra revenue that will be generated from the output that will be forthcoming from the new capital equipment.

4.6 SAVING, INVESTMENT AND FINANCIAL MARKETS

LO 4.6

Saving and investment are determined by different forces. Ultimately, though, in an economy without international borrowing and lending, national saving must equal investment. The supply of saving (by households, firms and the government) and the demand for saving (by firms that want to purchase or construct new capital) are equalised through the workings of *financial markets*. Figure 4.13 illustrates this process. Flows of national saving and investment are measured on the horizontal axis; the real interest rate is shown on the vertical axis. As we will see, in the market for saving and investment, the real interest rate functions as the ‘price’.

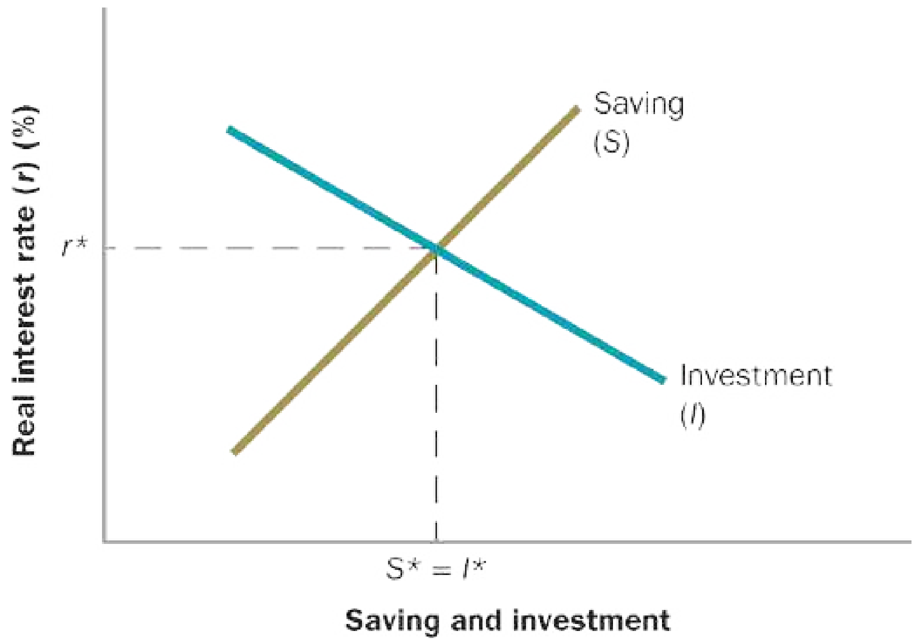

Figure 4.13 **The supply of and demand for saving**

Saving is supplied by households, firms and the government, and demanded by borrowers wishing to invest in new capital goods. The supply of saving (*S*) increases with the real interest rate, and the demand for saving by investors (*I*) decreases with the real interest rate. In financial market equilibrium, the real interest rate takes the value that equates the quantity of saving supplied and demanded.

In the figure, the supply of saving is shown by the upward-sloping curve marked *S*. This curve shows the quantity of national saving that households, firms and the government are willing to supply at each value of the real interest rate. The saving curve is assumed to be upward sloping because empirical evidence suggests that increases in the real interest rate stimulate saving, holding all else equal. The demand for saving is given by the downward-sloping curve marked *I*. This curve shows the flows of investment in new capital that firms would choose and hence the amount they would need to borrow in financial markets, at each value of the real interest rate. As with the saving curve, this relationship holds under the assumption that all else that might affect the investment decisions of firms remains constant. Because higher real interest rates raise the cost of borrowing and reduce firms' willingness to invest, the demand for saving curve is downward sloping.

Putting aside the possibility of borrowing from foreigners, a country can invest only those resources that its savers make available. In equilibrium, then, desired investment (the demand for saving) and desired national saving (the supply of saving) must be equal. As Figure 4.13 suggests, desired saving is equated with desired investment through adjustments in the real interest rate, which functions as the 'price' of saving. The movements of the real interest rate clear the market for saving in much the same way that the price of apples clears the market for apples. In Figure 4.13, the real interest rate that clears the market for saving is r^*, the real interest rate that corresponds to the intersection of the supply and demand curves.

The forces that push the real interest rate towards its equilibrium value are similar to the forces that lead to equilibrium in any other supply and demand situation. Suppose, for example, that the real interest rate exceeded r^*. At a higher real interest rate, savers would provide more funds than firms would want to invest. As lenders (savers) competed among themselves to attract borrowers (investors), the real interest rate would be bid down. The real interest rate would fall until it equalled r^*, the only interest rate at which both borrowers and lenders are satisfied. As an exercise, think about what would happen if the real interest rate were *lower* than r^*.

Changes in factors *other than the real interest rate* that affect the supply of or demand for saving will shift the curves, leading to a new equilibrium in the financial market. Changes in the real interest rate cannot shift the supply or demand curves, just as a change in the price of apples cannot shift the supply or demand curves for apples, because the effects of the real interest rate on saving are already incorporated in the slopes of the curves. A few examples will illustrate the use of the supply and demand model of financial markets.

Before proceeding to the examples, there is one final important point that needs to be made. The analysis we are discussing here is best thought of as describing the workings of a financial system in the absence of any interference or regulation from external agencies such as the government. Later, in Chapters 9 and 10, we will discuss the important role that the Reserve Bank of Australia has in influencing interest rates as a means of managing the macroeconomy. There, we will see that investment and saving adjust to the interest rate determined by the Reserve Bank; in other words, the I and S curves in Figure 4.13 adjust in line with the Reserve Bank's interest rate policy. But more of that later.

4.6.1 THE EFFECTS OF NEW

TECHNOLOGY

Exciting new technologies have been introduced in recent years, ranging from the internet to new applications of genetics. A number of these technologies appear to have great commercial potential. How does the introduction of new technologies affect saving, investment and the real interest rate, all else being equal?

The introduction of any new technology with the potential for commercial application creates profit opportunities for those who can bring the fruits of the technology to the public. In economists' language, the technical breakthrough raises the marginal product of new capital. Figure 4.14 shows the effects of a technological breakthrough, with a resulting increase in the marginal product of capital. At any given real interest rate, an increase in the marginal product of capital makes firms more eager to invest. Thus, the advent of the new technology causes the demand for saving (the investment schedule I), to shift upward and to the right, from I to I'.

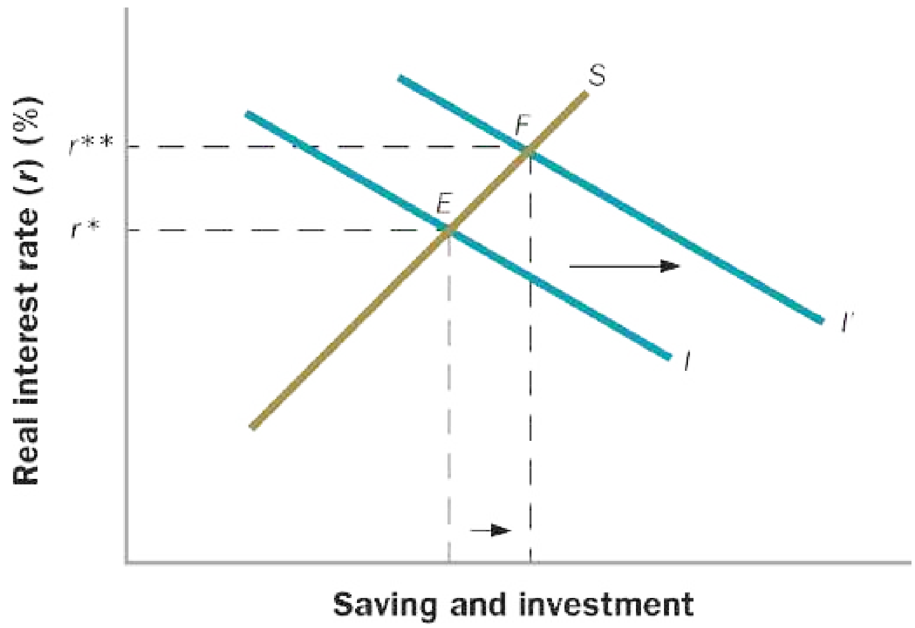

Figure 4.14 **The effects of a new technology on national saving and investment**

A technological breakthrough raises the marginal product of new capital goods, increasing desired investment and the demand for saving. The real interest rate rises, as do national saving and investment.

At the new equilibrium point *F*, investment and national saving are higher than before, as is the real interest rate, which rises from r^* to r^{**}. The rise in the real interest rate reflects the increased demand for funds by investors as they apply the new technologies. Because of the incentive of higher real returns, saving increases as well.

Example 4.7 examines the effect of changing fiscal policies on the market for saving.

EXAMPLE 4.7 – AN INCREASE IN THE GOVERNMENT BUDGET DEFICIT

Suppose the government increases its spending without raising taxes, thereby increasing its budget deficit (or reducing its budget surplus). How will this decision affect national saving, investment and the real interest rate, all else being equal?

National saving includes both private saving (saving by households and businesses) and public saving, which is equivalent to the government budget surplus. An increase in the government budget deficit (or a decline in the surplus) reduces public saving. If private saving does not change, the reduction in public saving will reduce national saving as well.

Figure 4.15 shows the effect of the increased government budget deficit on the market for saving and investment. At any real interest rate, a larger deficit reduces national saving, causing the saving curve to shift to the left, from S to S'. At the new equilibrium point F, the real interest rate is higher at r^{**}, and both national saving and investment are lower. In economic terms, the government has dipped further into the pool of private saving to borrow the funds to finance its budget deficit. The government's extra borrowing forces investors to compete for a smaller quantity of available saving, driving up the real interest rate. The higher real interest rate makes investment less attractive, assuring that investment will decrease along with national saving.

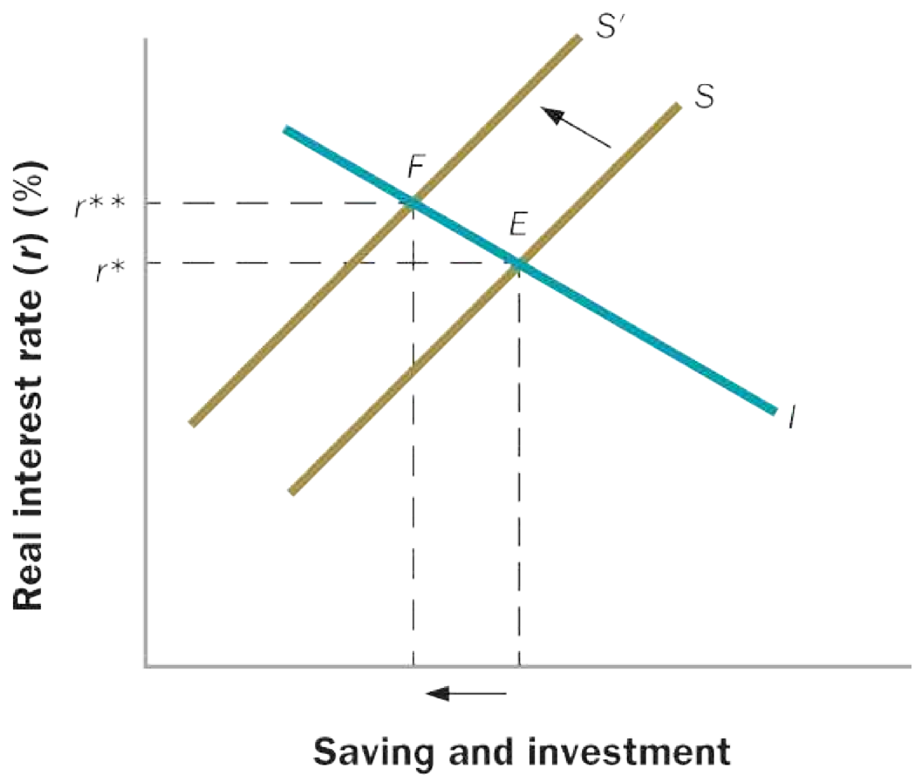

Figure 4.15 **The effects of an increase in the government budget deficit on national saving and investment**

Note: An increase in the government budget deficit reduces the supply of saving, raising the real interest rate and lowering investment. The tendency of increased government deficits to reduce investment in new capital is called crowding out.

The tendency of increased government deficits to reduce investment in new capital is called **crowding out**.

Reduced investment spending implies slower capital formation and thus lower economic growth. This adverse effect of budget deficits on economic growth, via crowding out, is perhaps the most important potential cost of deficits, and a major reason why economists often advise governments to minimise their deficits wherever possible. This is particularly the case when the economy is operating at close to maximum capacity, a time when competition between the private and government sectors for scarce resources could be fierce.

There is one other important caveat concerning crowding out. The analysis of Figure 4.15 assumes that borrowers of funds in the economy are restricted to those resources made available through national saving. In reality, the scope for borrowing today extends far beyond a nation's borders due to the increasing integration of the world's capital markets. It is now relatively easy to obtain financing from almost any country in the world that is willing to extend credit. This means that the degree of competition for resources between the government and private sectors that underlies the crowding out argument may not be as prevalent as suggested by the analysis of Figure 4.15. This implies that the link between a national government's budget position and the real interest rate may be less strong than that illustrated in Figure 4.15. We will return to this point in Chapter 18 when we consider international borrowing and lending in some detail.

CONCEPT CHECK 4.6

Suppose the public becomes less concerned about saving for the future. How will the change in public attitudes affect the country's rate of capital formation and economic growth?

▹▹ RECAP

Saving represents economic resources held back from current use to provide benefits in the future. Investment also comprises resources held back from current use to provide more output in the future. Without access to borrowing from other countries, saving and investment will be equal. The mechanism that brings this about involves changes in the real interest rate, which will adjust until saving and investment expenditures are equal. Therefore factors that shift either the supply of saving or the demand for investment schedules are likely to affect the real interest rate.

SUMMARY

- In general, *saving* equals current income minus spending on current needs; the *saving rate* is the percentage of income that is saved. *Wealth*, or net worth, equals the market value of assets (real or financial items of value) minus liabilities (debts). Saving is a *flow*, being measured in dollars per unit of time; wealth is a *stock*, measured in dollars at a point in time. As the amount of water in a bathtub changes according to the rate at which water flows in, the stock of wealth increases at the saving rate. Wealth also increases if the value of existing assets rises (*capital gains*) and decreases if the value of existing assets falls (*capital losses*).
- Individuals and households save for a variety of reasons, including *lifecycle* objectives, such as saving for retirement or a new home; the need to be prepared for an emergency (*precautionary saving*); and the desire to leave an inheritance (*bequest saving*). The amount people save is also affected by the real interest rate, which is the 'reward' for saving. Evidence suggests that higher real interest rates lead to modest increases in saving. Saving can also be affected by psychological factors, such as the degree of self-control and the desire to consume at the level of one's neighbours (*demonstration effects*).
- The saving of an entire country is *national saving*, S. National saving is defined by $S = Y - C - G$, where Y represents total output or income, C equals consumption spending and G equals

government purchases of goods and services. National saving can be broken up into private saving, or $Y - T - C$, and public saving, or $T - G$, where T stands for taxes paid to the government less transfer payments and interest paid by the government to the private sector. Private saving can be further broken down into household saving and business saving. In Australia, the bulk of private saving has often been done by businesses.

- Public saving is equivalent to the government budget surplus, $T - G$; if the government runs a budget deficit then public saving is negative.
- Investment is the purchase or construction of new capital goods, including housing. Firms will invest in new capital goods if the benefits of doing so outweigh the costs. Two factors that determine the cost of investment are the price of new capital goods and the real interest rate. The higher the real interest rate, the more expensive it is to borrow, and the less likely firms are to invest. The benefit of investment is the value of the marginal product of new capital, which depends on factors such as the productivity of new capital goods, the taxes levied on the revenues they generate and the relative price of the firm's output.
- In the absence of international borrowing or lending, the supply of, and demand for, national saving must be equal. The supply of national saving depends on the saving decisions of households and businesses and the fiscal policies of the government (which determine public saving). The demand for saving is the amount business firms want to invest in new capital. The real interest rate,

which is the ‘price’ of borrowed funds, changes to equate the supply of and demand for national saving. Factors that affect the supply of or demand for saving will change saving, investment and the equilibrium real interest rate. For example, an increase in the government budget deficit will reduce national saving and investment and raise the equilibrium real interest rate. The tendency of government budget deficits to reduce investment is called *crowding out*.

KEY TERMS

assets 73

bequest saving 79

capital gains 76

capital losses 76

crowding out 98

flow 75

government budget deficit 87

government budget surplus 87

liabilities 73

lifecycle saving 79

national saving 84

precautionary saving 79

private saving 87

public saving 87

saving 72

saving rate 73

stock 75

transfer payments 86

wealth 73

REVIEW QUESTIONS

1. Explain the relationship between saving and wealth, using the concepts of flows and stocks. Is saving the only means by which wealth can increase? Explain. LO 4.1 **EASY**
2. Give three basic motivations for saving. Illustrate each with an example. What other factors would psychologists cite as being possibly important for saving? LO 4.2 **EASY**
3. Define *national saving*, relating your definition to the general concept of saving. LO 4.2 **EASY**
4. Household saving rates in Australia are relatively low. Is this fact a problem for the Australian economy? Why or why not? LO 4.3 **MEDIUM**
5. Why do increases in real interest rates reduce the quantity of saving demanded? (*Hint*: Who are the 'demanders' of saving?) LO 4.6 **MEDIUM**
6. Name one factor that could increase the supply of saving and one that could increase the demand for saving. Show the effects of each on saving, investment and the real interest rate. LO 4.6 **MEDIUM**

PROBLEMS

1. **a)** Corey has a mountain bike worth \$600, a credit card debt of \$450, \$260 in cash, a Don Bradman autograph worth \$1000, \$1500 in a cheque account and an electricity bill due for \$550. Construct Corey's balance sheet and calculate his net worth. For each remaining part, explain how the event affects Corey's assets, liabilities and wealth. LO 4.1, LO 4.2 **EASY**

   b) Corey goes to a convention and finds out that his Don Bradman autograph is a worthless forgery.

   c) Corey uses \$150 from his pay to pay off his credit card balance. The remainder of his earnings is spent.

   d) Corey writes a \$450 cheque on his cheque account to pay off his credit card balance. Of the events in the previous three parts, which, if any, corresponds to saving on Corey's part? LO 4.1, LO 4.2

2. State whether each of the following is a stock or a flow, and explain why. LO 4.1 **EASY**

   a) Gross domestic product

   b) National saving

   c) The value of Australia's housing on 1 January 2012

   d) The amount of Australian currency in circulation as of this morning

   e) The government budget deficit

f) The quantity of outstanding government debt on 1 January 2012.

3. Ellie and Vince are a married couple, both with university degrees and jobs. How would you expect each of the following events to affect the amount they save each month? Explain your answers in terms of the basic motivations for saving. LO 4.2 **EASY**

a) Ellie learns she is pregnant.

b) Vince reads in the paper about possible lay-offs in his industry.

c) Vince had hoped that his parents would lend financial assistance towards the couple's planned purchase of a house, but he learns that they cannot afford it.

d) Ellie announces that she would like to go to law school in the next few years.

e) A boom in the stockmarket greatly increases the value of the couple's retirement funds.

f) Vince and Ellie agree that they would like to leave a substantial amount to local charities in their Wills.

4. In each part that follows, use the economic data given to find national saving, private saving, public saving and the national saving rate. LO 4.4 **HARD**

a) Household saving = 200

Business saving = 400

Government purchases of goods and services = 220

Government transfers and interest payments = 125

Tax collections = 225

GDP = 2800

b) GDP = 6300

Tax collections = 1725

Government transfers and interest payments = 400

Consumption expenditures = 4550

Government budget surplus = 100

c) Consumption expenditures = 4600

Investment = 1000

Government purchases = 1000

Net exports = 12

Tax collections = 1650

Government transfers and interest payments = 500

5. For each of the following scenarios, use supply and demand analysis to predict the resulting changes in the real interest rate, national saving and investment. Show all your diagrams. LO 4.5
HARD

a) Parliament passes a 10 per cent investment tax credit. Under this program, for every $100 that a firm spends on new capital equipment, it receives an extra $10 in tax refunds from the government.

b) A reduction in military spending moves the government's budget from deficit into surplus.

c) A new generation of computer-controlled machines becomes available. These machines produce manufactured goods much more quickly and with fewer defects.

d) The government raises its tax on corporate profits. Other tax changes are also made, such that the government's deficit remains unchanged.

e) Concerns about job security raise precautionary saving.

f) New environmental regulations increase firms' costs of operating capital. LO 4.6

REFERENCES

Australian Bureau of Statistics 2013, ‘Australian national accounts: National income, expenditure and product, June’, Cat. no. 5206.0.

Australian Bureau of Statistics 2013, ‘Private new capital expenditure and expected expenditure, Australia, June’, Cat. no. 5625.0.

Australian Bureau of Statistics 2016–17, ‘Australian system of national accounts’, Cat. no. 5204.0.

Australian Bureau of Statistics 2017, ‘Australian system of national accounts [net household savings as a proportion of disposable household income]’, Cat. no. 5204.0.

Australian Bureau of Statistics 2018, ‘Australian national accounts: National income, expenditure and product’, Cat. no. 5206.0.

Australian Government 2006, ‘Australian Government is now debt free’, www.budget.gov.au/2006-07/overview/html/overview_06.htm.

Australian Government, ‘2006–07 budget overview’, www.budget.gov.au/2006-07/overview/html/overview_29.htm.

Australian Government, ‘Budget 2017–18, Paper No. 1, Budget Strategy and Outlook 2017–18, Statement 110: Historical Australian Government Data’.

Caputo M, Robinson T, Wang H 2013, ‘The relationship between bulk commodity and Chinese steel prices’, www.rba.gov.au/publications/bulletin/2013/sep/bu-0913-2a.html.

European Commission Economic and Financial Affairs data, http://ec.europa.eu/economy_finance/ameco/user/serie/ResultSerie.cfm, accessed 28 September 2018.

Greenspan A 2010, ‘Testimony of Alan Greenspan’, Financial Crisis Inquiry Commission, 7 April 2010, https://fcic-static.law.stanford.edu/cdn_media/fcictestimony/2010-0407-Greenspan.pdf.

Harris MN, Loundes J, Webster E 2002, ‘Determinants of household saving in Australia’, *The Economic Record*, vol. 78, no. 241, June, pp. 207–23.

Katayama K 2006, ‘Why does Japan’s saving rate decline so rapidly?’, PRI Discussion Paper Series (no. 06A-30), www.mof.go.jp/jouhou/soken/kenkyu/ron164.pdf.

Koga M 2006, ‘The decline of Japan’s saving rate and demographic effects’, *Japanese Economic Review*, vol. 57, no. 2, pp. 312–21.

Lowe P 2018, ‘Remarks at the breakfast event to launch ASIC’s NationalFinancial Capability Strategy 2018’, https://www.rba.gov.au/speeches/2018/sp-gov-2018-08-21.html.

McDonald I 2008, ‘Behavioural economics’, *The Australian*

Economic Review, vol. 41, no. 2, pp. 222–8.

OECD, ‘Total share prices for all shares for Australia [SPASTT01AUA661N]’, retrieved from Federal Reserve Bank of St. Louis (FRED), https://fred.stlouisfed.org/series/SPASTT01AUA661N, 10 September 2018.

US Government n.d., ‘Economic report of the President’, 2009, Chapter 1, http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2009_erp&docid=f:erp_cl.pdf, pp. 37–9.

CHAPTER 5

Wages, employment and the labour market

After reading this chapter, you should be able to answer the following questions.

5.1 How can the perfectly competitive model be used to understand trends in the labour market?

5.2 What have been the five major trends in the labour market in the post-war era?

5.3 What factors influence firms’ demand for labour?

5.4 What factors influence workers’ supply of labour?

5.5 What are the three different types of unemployment?

5.6 For what reasons do some countries find it difficult to achieve full employment?

SETTING THE SCENE

One of the significant changes experienced by many economies in recent years is what is known as the ‘great wages slowdown’. A long period of unusually low growth in the average wages is not what most economists expected as countries’ economic performance improved following the worst of the Global Financial Crisis. Historically, times of economic improvement usually mean increased wages growth for workers as firms scramble to hire the extra workers needed as the economy’s performance picks up. Yet wage growth has been subdued for some time now, even as more and more workers have found jobs. To highlight the magnitude of the problem, which is particularly pronounced in the United States, *The New York Times* noted that an average American family is doing less well than was the case at the beginning of the twenty-first century, something that has not occurred since the Great Depression. Workers in other countries, including Australia, are facing something similar. Figure 5.1 shows nominal wages growth in Australia—the slowdown in wages growth is all too apparent.

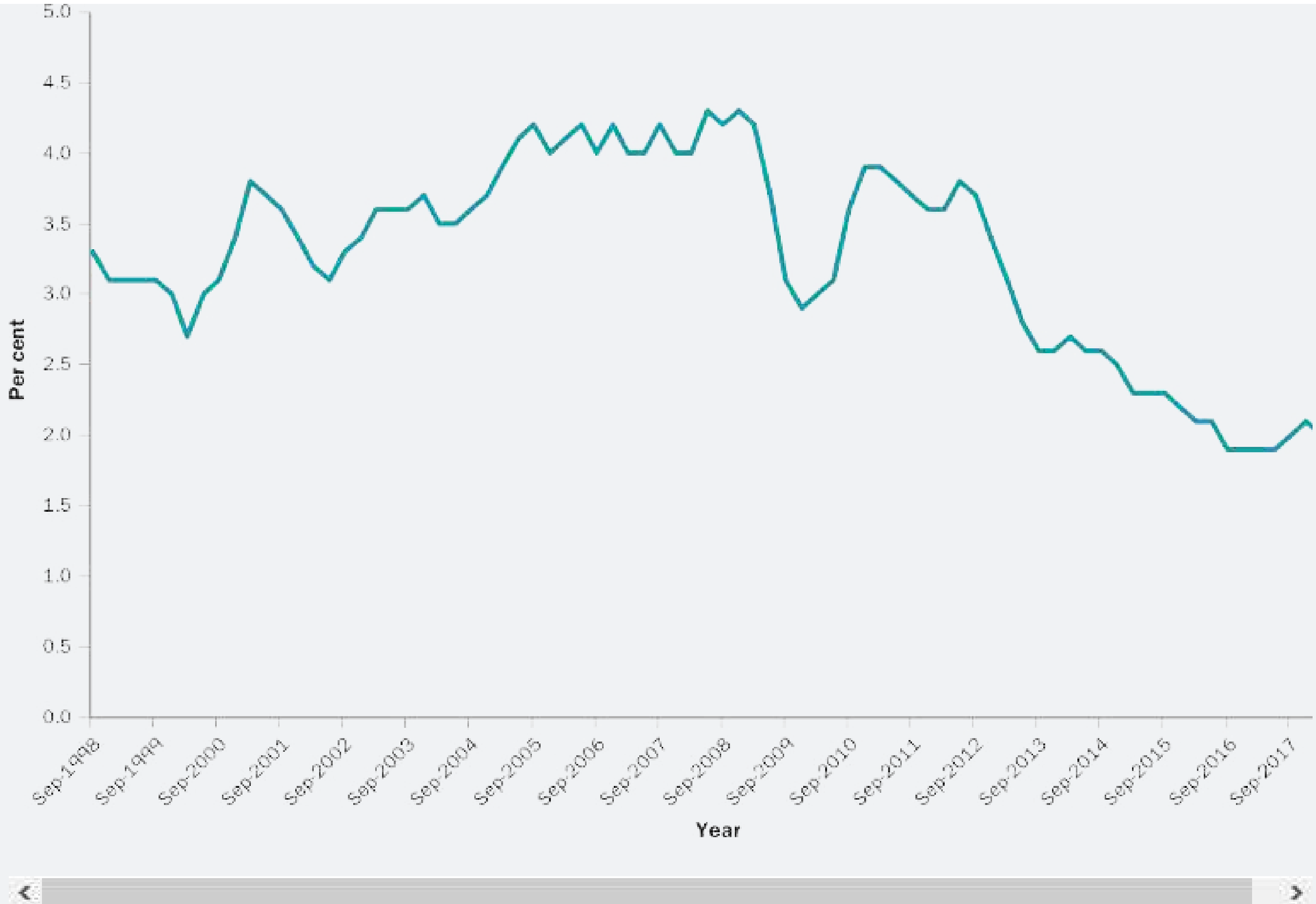

Figure 5.1 **Rate of nominal wage growth, Australia**

Source: Based on Australian Bureau of Statistics data, retrieved from Reserve Bank of Australia, www.rba.gov.au/statistics/tables, accessed 13 September 2018.

The reasons for the wages slowdown are a subject of much debate among economists, policymakers and commentators. Does the slowdown reflect an underlying weakness in the labour market that is somehow being masked by strong growth in the number of people with jobs? Are there significant structural changes in the nature of work such as an increased proportion of workers holding down casual jobs where pay increases are harder to come by? Does the fact that fewer workers belong to trade unions than was once the case mean their ability to bargain with employers for wage increases is less? Does a low rate of inflation mean that workers do not need large wage increases to maintain the real purchasing power of their wage? Are workers more concentrated now in industries where productivity gains are smaller, or just harder to measure, meaning firms are less willing to offer their workers pay increases?

These are all reasons that have been put forward to explain the wages slowdown. To understand why these, and perhaps other factors, are potential explanations for the slowdown in wages growth, in this chapter we look closely at the operation of labour markets. Economists often use supply and demand analysis to help understand the operation of labour markets. As you'll see, this is a very effective way of focusing on the key factors determining labour market outcomes, pointing the way to possible explanations for the wages slowdown, and helping us to understand other key features of the labour market.

Source: Leonhardt D 2014, 'The great wage slowdown of the 21st century', *The New York Times*, 7 October.

5.1 THE PERFECTLY COMPETITIVE MODEL OF THE LABOUR MARKET

LO 5.1, 5.4

From the study of microeconomics, we know how supply and demand analysis can be used to determine equilibrium prices and quantities for individual goods and services. The same approach can be equally useful for studying labour market conditions.

We are going to use the *perfectly competitive model of the labour market*. In this model we assume that firms cannot affect the price they receive for their product; firms are *price takers*, responding to the product price set by overall market conditions but unable to influence that price. We make a similar assumption for workers, namely that they are also price takers. In the market for labour, the 'price' we are referring to is the wage paid to workers in exchange for their services. The wage is expressed per unit of time—for example, per hour or per year. Individual workers are assumed to be unable to influence the wage on offer. Note that the 'quantity' in the perfectly competitive model is the amount of labour firms use, which in this book we generally measure by the number of workers employed. Alternatively, we could state the quantity of labour in terms of the number of hours worked; the choice of units is largely a matter of convenience.

Who are the demanders and suppliers in the labour market? Firms Page 105

and other employers demand labour in order to produce goods and services. Virtually all of us supply labour during some phase of our lives. Whenever people work for pay, they are supplying labour services at a price equal to the wage they receive. In this chapter, we discuss both the supply of and demand for labour, with an emphasis on the demand side of the labour market. Changes in the demand for labour turn out to be of key importance in explaining many aggregate trends in wages and employment.

The labour market is studied by microeconomists as well as macroeconomists, and both use the tools of supply and demand. However, microeconomists focus on issues such as the determination of wages for specific types of jobs or workers. In this chapter, we take the macroeconomic approach and examine factors that affect aggregate, or economy-wide, trends in employment and wages.

5.1.1 WAGES AND THE DEMAND FOR LABOUR

Let us start by thinking about what determines the number of workers employers want to hire at any given wage—that is, the demand for labour. As we will see, the demand for labour depends both on the productivity of labour and the price that the market sets on workers' output. The more productive workers are, or the more valuable the goods and services they produce, the greater the number of workers an employer will want to hire at any given wage, all else being equal.

Table 5.1 shows the relationship between output and the number of workers employed at the Banana Computer Company (BCC), which builds and sells computers. Column 1 of the table shows some different possibilities for the number of technicians BCC could employ in its plant.

TABLE 5.1 Production and marginal product for Banana Computer Company

(1) NUMBER OF WORKERS	(2) COMPUTERS PRODUCED PER YEAR	(3) MARGINAL PRODUCT	(4) VALUE OF MARGINAL PRODUCT (AT $3000/COMPUTER)
0	0		
1	25	25	$75 000
2	48	23	69 000
3	69	21	63 000
4	88	19	57 000
5	105	17	51 000
6	120	15	45 000
7	133	13	39 000
8	144	11	33 000

Column 2 shows how many computers the company can produce each year, depending on the number of workers employed: the more workers, the greater the number of computers BCC can produce. We will assume that the plant, equipment and materials the workers use to build computers are fixed quantities.

Column 3 shows the *marginal product* of each worker—the extra production that is gained by adding one more worker. Note that each additional worker adds less to total production than the previous worker did. The tendency for marginal product to decline as more and more workers are added is called *diminishing returns to labour*. The principle of **diminishing returns to labour** states that if the amount of capital and other inputs in use is held constant, then the greater the quantity of labour already employed, the less each additional worker adds to production.

BACKGROUND BRIEFING 5.1

Five important labour market trends

In recent decades at least five trends have characterised the labour markets of the industrialised world. We divide these trends into two groups: those affecting real wages and those affecting employment and unemployment.

TRENDS IN REAL WAGES

1. Throughout the twentieth century, all industrialised countries enjoyed substantial growth in real earnings.
2. The fastest rates of real wage increase occurred during the 1960s and early 1970s. The 1980s and 1990s were very different, with real wages growing at a much more modest rate, before recovering somewhat in the years leading to the Great Financial Crisis. However, as noted before, in recent years, the rate of wage growth has slowed significantly—the great wages slowdown.
3. Furthermore, recent decades have brought an increase in income inequality in many countries, including the United States and Australia. A growing gap in real wages between high-skilled and low-skilled workers, evidenced by the top decile of income earners increasing the gap between themselves and the middle- and lower-income earners, developed over the course of the 1990s in Australia (Harding & Greenwell 2001). Many observers worry about the existence of a 'two-tier' labour market: plenty of good jobs at good wages for the well-educated and highly skilled, but less and less opportunity for those without schooling or with poorly developed skills.

TRENDS IN EMPLOYMENT AND UNEMPLOYMENT

4. In Australia and other industrialised countries, the proportion of people with jobs has grown substantially in

recent decades. At the beginning of the 1950s, about 58 per cent of the over-15 population in Australia had jobs. By the late 1990s, this figure had increased to around 63 per cent (RBA 2018a). Jobs growth has since stabilised; in 2018, 65 per cent of the over-15 population in Australia is classified as being in the labour force (either employed or actively seeking work) (RBA 2018b).

5. Different countries have had different unemployment experiences. Western European countries, for example, have been suffering relatively high rates of unemployment compared to countries such as the United States or Australia for decades. In the eurozone, an average of 9.6 per cent of the workforce was unemployed over the period 1990–2017, compared to just 6.0 per cent in the United States and 6.7 per cent for Australia (OECD n.d.(a); USBLS n.d.; OECD n.d.(b)). Consistent with the high rates of unemployment, rates of job creation in Western Europe have been exceptionally weak. Given the trend towards increasing wage and income inequality in countries such as Australia and the United States and the persistence of high unemployment in Europe, we may conclude that a significant fraction of the industrial world's labour force has not been sharing in economic growth and prosperity. Whereas in Australia and the United States the problem takes the form of low and falling real wages for unskilled and low-skilled workers, in Europe work is often simply

unavailable for the unskilled and sometimes even for the skilled.

What explains these trends in employment and wages? In the remainder of the chapter, we will show that a supply and demand analysis of the labour market can help to explain many of these important developments.

References

Harding A, Greenwell H 2001, 'Trends in income and expenditure inequality in the 1980s and 1990s', Discussion paper no. 56, National Centre for Social and Economic Modelling, December.

Organization for Economic Co-operation and Development (OECD) n.d.(a), 'Harmonized unemployment rate: Total: All persons for the Euro area', retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/LRHUTTTTEZQ156S.

Organization for Economic Co-operation and Development (OECD) n.d.(b), 'Harmonized unemployment rate: Total: All persons for Australia', retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/LRHUTTTTAUA156N.

Reserve Bank of Australia (RBA) 2018a, 'Statistical tables: Labour force', www.rba.gov.au/statistics/tables.

Reserve Bank of Australia (RBA) 2018b, 'Statistical tables: Labour costs and productivity', www.rba.gov.au/statistics/tables.

US Bureau of Labor Statistics (USBLS) n.d., 'Civilian unemployment rate', retrieved from Federal Reserve Bank of St Louis (FRED). https://fred.stlouisfed.org/series/UNRATE.

The principle of diminishing returns to labour has its economic basis in the principle of increasing opportunity cost, sometimes also known as the low-hanging-fruit principle. A firm's managers want to use their available inputs in the most productive way possible. Hence, an employer who has one worker will assign that worker to the most productive job. If they hire a second worker, they will assign that worker to the second-most productive job. The third worker will be given the third-most productive job available, and so on. The greater the number of workers already employed, the lower the marginal product of adding another worker, as shown in Table 5.1. A second reason that helps explain diminishing returns to labour is the slowness with which the stock of productive capital can be changed. Suppose an employer takes on an additional worker, something that can be done usually very quickly. However, it often takes time to provide that worker with the additional capital equipment that might be needed to fulfil successfully the task for which the worker was employed. In such a situation there may have to be some sharing of the existing capital equipment. As a result, at least until the capital stock can be increased, we would still expect that the additional worker will add to the firm's output, but by not as much as did the previous worker who was hired. In other words, diminishing marginal returns can result from an expanding workforce operating with a fixed stock of capital.

If BCC computers sell for $3000 each, then column 4 of Table 5.1 shows the *value of the marginal product* of each worker. The value of a worker's marginal product is the amount of extra revenue that the worker generates for the firm. Specifically, the value of the marginal product of each BCC worker is that worker's marginal product stated in terms of the number of additional computers produced, multiplied by the price of output—here $3000 per computer. We now have all the information necessary to find BCC's demand for workers.

EXAMPLE 5.1 – BCC'S DEMAND FOR LABOUR

Suppose that the going wage for computer technicians is $60 000 per year. BCC managers know that this is the wage being offered by all their competitors, so they cannot hire qualified workers for less. How many technicians will BCC hire? What would the answer be if the wage were $50 000 per year?

BCC will hire an extra worker if and only if the value of that worker's marginal product (which equals the extra revenue the worker creates for the firm) exceeds the wage BCC must pay. The going wage for computer technicians, which BCC takes as given, is $60 000 per year. Table 5.1 shows that the value of the marginal product of the first, second and third workers each exceeds $60 000. Hiring these workers will be profitable for BCC because the extra revenue each generates exceeds the wage that BCC must pay. However, the fourth worker's marginal product is worth only $57 000. If BCC's managers hired the fourth worker they would be paying $60 000 in extra wages for additional output that is worth only $57 000. Since hiring the fourth worker is a money-losing proposition, BCC will hire only three workers. Thus the quantity of labour BCC demands when the going wage is $60 000 per year is three technicians.

If the market wage for computer technicians were $50 000 per year instead of $60 000, the fourth technician would be worth hiring, since the value of their marginal product—$57 000—would be $7000 more than their wages. The fifth technician would also be worth hiring since the fifth worker's marginal product is worth $51 000—$1000 more than the going wage. The value of the marginal product of a sixth technician, however, is only $45 000, so hiring a sixth worker would not be profitable. When wages are $50 000 per year, then, BCC's labour demand is five technicians.

CONCEPT CHECK 5.1

How many workers will BCC hire if the going wage for technicians is $35 000 per year?

In a perfectly competitive labour market, the lower the wage a firm must pay, the more workers it will hire. Thus the demand for labour is like the demand for other goods or services, in that the quantity demanded rises as the price (in this case, the wage) falls. Figure 5.2 shows a hypothetical labour demand curve for a firm or industry, with the wage on the vertical axis and employment on the horizontal axis. All else being equal, the higher the wage, the fewer workers a firm or industry will demand.

Figure 5.2 **The demand curve for labour**

Note: The demand curve for labour is downward sloping. The higher the wage, the fewer workers employers will hire.

In our example thus far, we have discussed how labour demand depends on the *nominal*, or dollar, wage and the *nominal* price of workers' output. (In symbols, and referring back to Table 5.1, we can write this more formally as follows: a firm i, will hire workers up to the point at which $W_i^n = P_i \times MP_{L_i}$, where the nominal wage paid to workers by firm i is W_i^n, the price paid for the product of firm i is P_i and the marginal product of workers (L_i) employed by firm i is MP_{L_i}.) Equivalently, we could have expressed the wage and the price of output in *real* terms, that is, measured relative to the average price of goods and services. The wage measured relative to the general price level is the *real wage*—the real wage expresses the wage in terms of its purchasing power. The price of a specific good or service measured relative to the general price level is called the *relative price* of that good or service. (This can be expressed as follows: a firm *i*, will hire workers up to the point at which $\frac{W_i^n}{P} = \frac{P_i}{P} \times MP_{L_i}$, where *P* is the average price level.) Because our main interest is in real rather than nominal wages, from this point on we will analyse the demand for labour in terms of the real wage and the relative price of workers' output, rather than in terms of nominal variables.

5.1.2 SHIFTS IN THE DEMAND FOR LABOUR

The number of workers that BCC will employ at any given real wage depends on the value of their marginal product, as shown in column 4 of Table 5.1.
Changes in the economy that increase the value of the workers' marginal product will increase the value of extra workers to BCC, and thus increase BCC's demand for labour at any given real wage. In other words, any factor that raises the value of the marginal product of BCC's workers will shift BCC's labour demand curve to the right.

Two main factors could increase BCC's labour demand:

1. an increase in the relative price of the company's output (computers)

2. an increase in the productivity of BCC's workers. Example 5.2 illustrates the first of these possibilities while Example 5.3 illustrates the second.

EXAMPLE 5.2 – THE RELATIVE PRICE OF COMPUTERS AND BCC'S DEMAND FOR LABOUR

Suppose an increase in the demand for BCC's computers raises the relative price of its computers to $5000 each. How many technicians will BCC hire now, if the real wage is $60 000 per year? If the real wage is $50 000?

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The effect of the increase in computer prices is shown in Table 5.2. Columns 1 to 3 of the table are the same as in Table 5.1. The number of computers a given number of technicians can build (column 2) has not changed; hence the marginal product of particular technicians (column 3) is the same. But, because computers can now be sold for $5000 each instead of $3000, the *value* of each worker's marginal product has increased by two-thirds (compare column 4 of Table 5.2 with column 4 of Table 5.1).

TABLE 5.2 **Production and marginal product for BCC after an increase in computer prices**

(1) NUMBER OF WORKERS	(2) COMPUTERS PRODUCED PER YEAR	(3) MARGINAL PRODUCT	(4) VALUE OF MARGINAL PRODUCT (AT $5000/COMPUTER
0	0		
1	25	25	$125 000
2	48	23	115 000
3	69	21	105 000
4	88	19	95 000
5	105	17	85 000
6	120	15	75 000
7	133	13	65 000
8	144	11	55 000

How does the increase in the relative price of computers affect BCC's demand for labour? Recall from Example 5.1 that, when the price of computers was $3000 and the going wage for technicians was $60 000, BCC's demand for labour was three workers. But now, with computers selling for $5000 each, the value of the marginal product of each of the first seven workers exceeds $60 000 (Table 5.2). So, if the real wage of computer technicians is still $60 000, BCC would increase its demand from three workers to seven.

Suppose instead that the going real wage for technicians is $50 000. In Example 5.1, when the price of computers was $3000 and the wage was $50 000, BCC demanded five workers. But, if computers sell for $5000, we can see from column 4 of Table 5.2 that the value of the marginal product of even the eighth worker exceeds the wage of $50 000. So, if the real wage is $50 000, the increase in computer prices raises BCC's demand for labour from five workers to eight.

CONCEPT CHECK 5.2

How many workers will BCC hire if the going real wage for technicians is $100 000 per year and the relative price of computers is $5000? Compare your answer to the demand for technicians at a wage of $100 000 when the price of computers is $3000.

The general conclusion to be drawn from Example 5.2 is that *an increase in the relative price of workers' output increases the demand for labour*, shifting the labour demand curve to the right, as shown in Figure 5.3. A higher relative price for workers' output makes workers more valuable, leading employers to demand more workers at any given real wage.

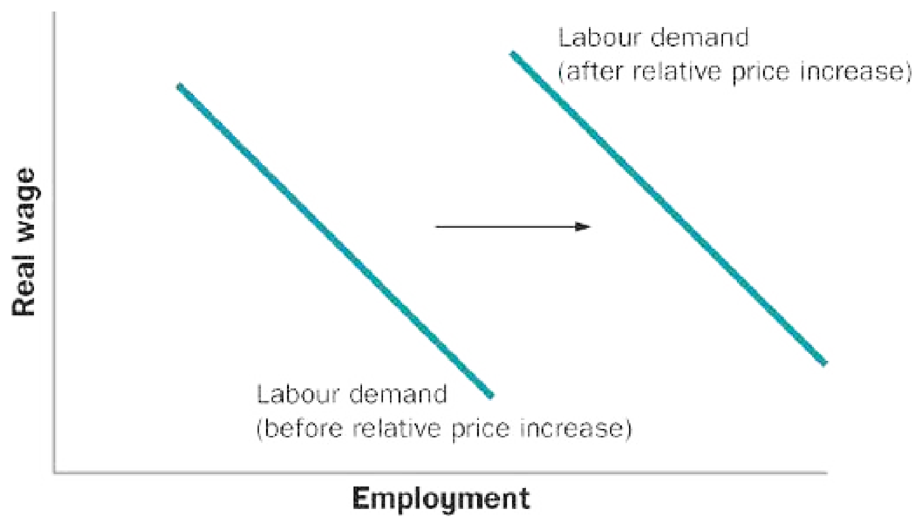

Figure 5.3 **A higher relative price of output increases the demand for labour**

An increase in the relative price of workers' output increases the value of their marginal product, shifting the labour demand curve to the right.

The second factor that affects the demand for labour is worker productivity. Since an increase in productivity increases the value of a worker's marginal product, it also increases the demand for labour, as Example 5.3 shows.

EXAMPLE 5.3 – WORKER PRODUCTIVITY AND BCC'S DEMAND FOR LABOUR

Suppose BCC adopts a new technology that reduces the number of components to be assembled, permitting each technician to build 50 per cent more machines per year. Assume that the relative price of computers is $3000 per machine. How many technicians will BCC hire if the real wage is $60 000 per year?

Table 5.3 shows workers' marginal products and the value of their marginal products after the 50 per cent increase in productivity, assuming that computers sell for $3000 each.

TABLE 5.3 **Production and marginal product for BCC after an increase in worker productivity**

(1) NUMBER	(2) COMPUTERS PRODUCED	(3) MARGINAL PRODUCT	(4) VALUE OF MARGINAL PRODUCT (AT $3000/COMPUTER)
0	0		
1	37.5	37.5	$112 500
2	72	34.5	103 500
3	103.5	31.5	94 500
4	132	28.5	85 500
5	157.5	25.5	76 500
6	180	22.5	67 500
7	199.5	19.5	58 500
8	216	16.5	49 500

Before the productivity increase, BCC would have demanded three workers at a wage of $60 000 (Table 5.1). After the productivity increase, however, the value of the marginal product of the first six workers exceeds $60 000 (see Table 5.3, column 4). So, at a wage of $60 000, BCC's demand for labour increases from three workers to six.

CONCEPT CHECK 5.3

How many workers will BCC hire after the 50 per cent increase in productivity if the going real wage for technicians is $50 000 per year? Compare this figure to the demand for workers at a $50 000 wage before the increase in productivity.

In general, an increase in worker productivity increases the demand for labour, shifting the labour demand curve to the right, as in Figure 5.4.

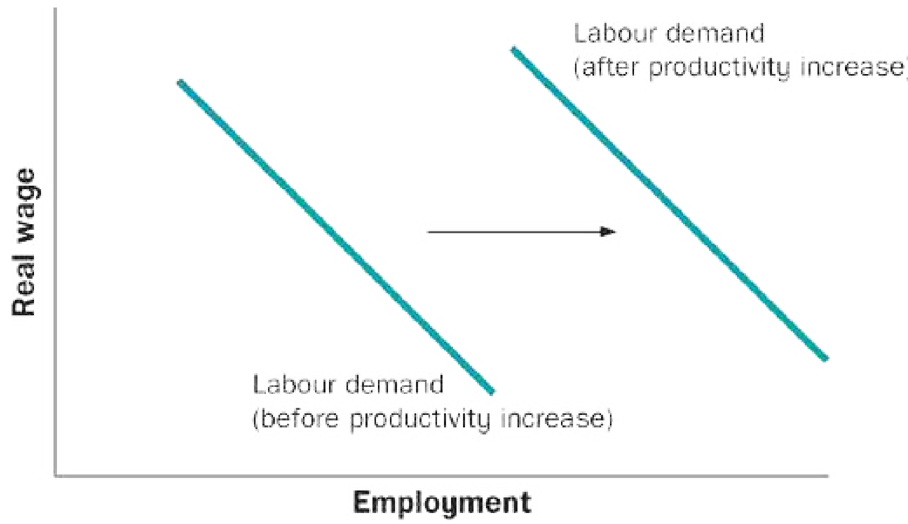

Figure 5.4 **Higher productivity increases the demand for labour**

An increase in productivity raises workers' marginal product and—assuming no change in the price of output—the value of their marginal product. Since a productivity increase raises the value of the marginal product, employers will hire more workers at any given real wage, shifting the labour demand curve to the right.

5.1.3 THE SUPPLY OF LABOUR

We have discussed the demand for labour by employers; to complete the story we need to consider the supply of labour. The suppliers of labour are workers and potential workers. At any given real wage, potential suppliers of labour must decide if they are willing to work. The total number of people who are willing to work at each real wage is the supply of labour. Remember, this is a model of perfect competition—workers are assumed to be unable to affect the wage on offer through their own actions; for example, whether a single individual decides whether or not to accept a job on offer makes no difference to the wage firms are willing to pay, in general.

EXAMPLE 5.4 – WILL YOU TIDY YOUR NEIGHBOUR'S BACKYARD OR GO TO THE BEACH?

You were planning to go to the beach today but your neighbour asks you to clean out his backyard. You like the beach a lot more than fighting weeds. Do you take the job?

Unless you are motivated primarily by neighbourliness, your answer to this job offer would probably be, 'It depends on how much my neighbour will pay'. You would probably not be willing to take the job for $10 or $20 unless you have a severe and immediate need for cash. But if your neighbour were wealthy and eccentric enough to offer you $500 (to take an extreme example), you would very likely say yes. Somewhere between $20 and the unrealistic figure of $500 is the minimum payment you would be willing to accept to tackle the untidy backyard. This minimum payment, the *reservation price* you set for your labour, is the compensation level that leaves you just indifferent between working and not working.

In economic terms, deciding whether to work at any given wage is a straightforward application of the *cost–benefit principle*. The cost to you of tidying the backyard is the opportunity cost of your time (you would rather be surfing) plus the cost you place on having to work in unpleasant conditions. You can measure this total cost in dollars simply by asking yourself, ‘What is the minimum amount of money I would take to tidy the backyard instead of going to the beach?’ The minimum payment that you would accept is the same as your reservation price. The benefit of taking the job is measured by the pay you receive, which will go towards that new television you want. You should take the job only if the promised pay (the benefit of working) exceeds your reservation price (the cost of working).

In this example, your willingness to supply labour is greater the higher the wage. In general, the same is true for the population as a whole. Certainly, people work for many reasons, including personal satisfaction, the opportunity to develop skills and talents and the chance to socialise with co-workers. Still, for most people income is one of the principal benefits of working, so the higher the real wage the more willing they are to sacrifice other possible uses of their time. The fact that people are more willing to work when the wage they are offered is higher is captured on the upward slope of the supply curve of labour (see Figure 5.5).

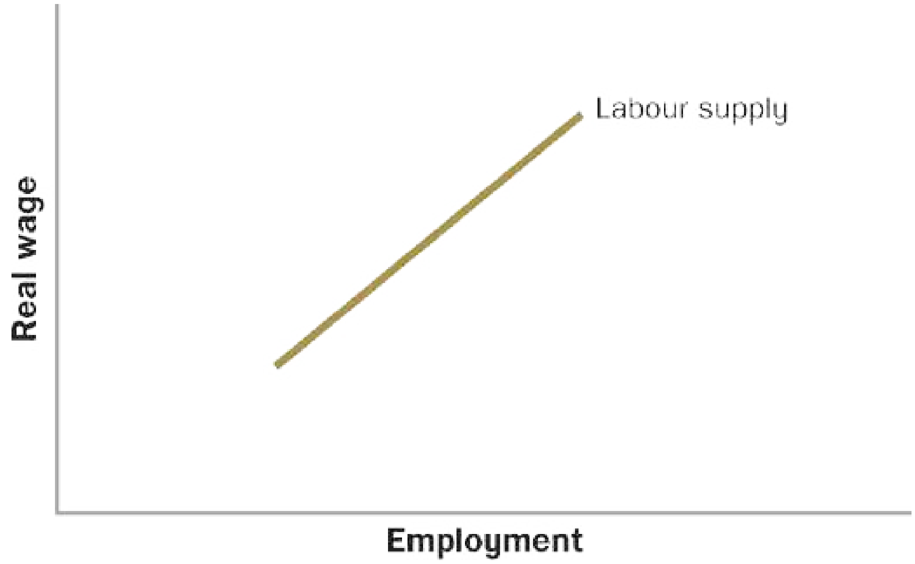

Figure 5.5 The supply of labour

The labour supply curve is upward sloping because, in general, the higher the real wage the more people are willing to work.

CONCEPT CHECK 5.4

You want to make a career in broadcasting. A local public radio station is offering an unpaid summer internship that would give you valuable experience. Your alternative to the internship is to earn $3000 working at a car wash. How do you decide which job to take? Would a decision to take the internship contradict the conclusion that the labour supply curve is upward sloping?

5.1.4 SHIFTS IN THE SUPPLY OF LABOUR

Any factor that affects the quantity of labour offered at a given real wage will shift the labour supply curve. At the macroeconomic level, the most important factor affecting the supply of labour is the size of the working-age population (defined as between 15 and 64 years of age), which is influenced by factors such as the domestic birth rate, immigration and emigration rates and the ages at which people normally first enter the workforce and retire. All else being equal, an increase in the working-age population raises the quantity of labour supplied at each real wage, shifting the labour supply curve to the right. Changes in the percentage of people of working age who seek employment—for example, as a result of social changes that encourage women to work outside the home—

can also affect the supply of labour.

5.1.5 EQUILIBRIUM IN THE PERFECTLY COMPETITIVE MODEL OF THE LABOUR MARKET

Figure 5.6 shows the complete perfectly competitive model of the labour market. This figure is derived by combining Figures 5.2 and 5.5.

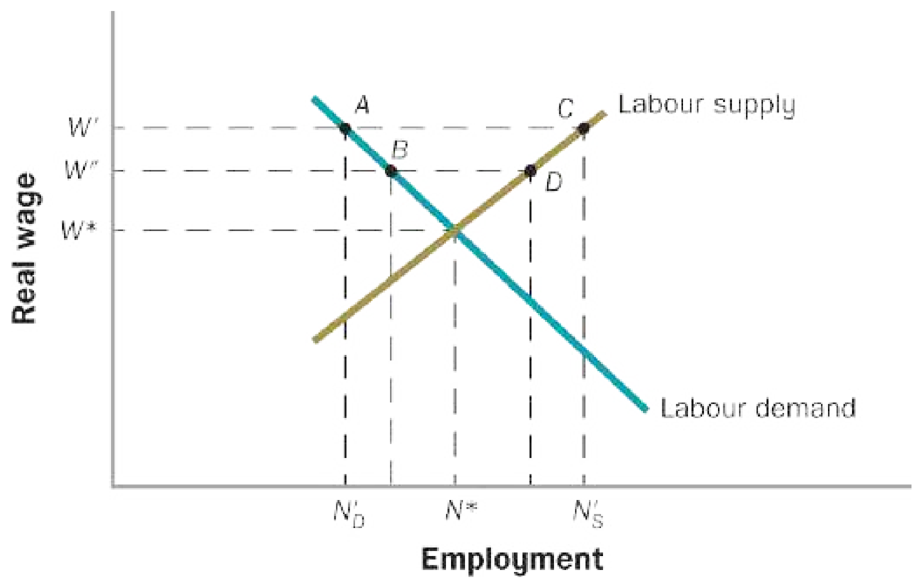

Figure 5.6 **The perfectly competitive model of the labour market**

Market forces bring about an equilibrium in the labour market where the labour supply decisions of workers and the labour demand decisions of firms are perfectly coordinated. All those who offer themselves for work at the equilibrium wage

are employed.

W^* and N^* are known as, respectively, the equilibrium real wage and equilibrium level of employment. In the perfectly competitive model of the labour market, equilibrium is the normal state of the market; that is, we would predict in this market the real wage would be W^* and the level of employment would be N^*.

To see why it is this combination of real wage and employment that occurs, and no other, suppose that the situation was different. What would happen in this labour market if the real wage was not W^* but was, instead, W'. What happens is illustrated in Figure 5.6. At W', workers are willing to supply an amount of labour equivalent to N_S'; given that W' is a relatively high real wage, workers are prepared to supply a relatively large amount of labour. However, at that high wage, firms would require all of those workers either to be highly productive or the price of the product they make to be high before it would be in the firms' interest to hire all of the N_S' labour on offer. If we now look at the labour demand curve, we can see that those conditions are not met; firms are willing to hire only an amount of labour equivalent to N_D' at a wage of W'. This is a situation of *excess supply*: at the going wage, W', there is more labour supplied than is being demanded. Excess supply is one type of *disequilibrium*; the other occurs when there is *excess demand*, such as would be the case if the wage were below W^* and there was more labour being demanded than is being supplied.

In the perfectly competitive model of the labour market, a situation Page 113

of excess supply, such as illustrated in Figure 5.6, or excess demand, is always temporary. The reason is that market forces will act in a way that eliminates the disequilibrium. Take the situation of excess supply shown in Figure 5.6. Those workers who wish to supply labour but who do not receive jobs have an incentive to offer themselves for work at a lower wage than W', for example, W''; they do this in the expectation that firms, using the cost–benefit principle, are likely to hire more workers if the cost of doing so was lower.

You can see from Figure 5.6 that this is exactly what happens. Originally, firms' demand for labour corresponded to point A on the demand curve. At W'', firms are now at point B on their demand curve. Workers' offer to supply labour at a lower real wage has caused firms to move their labour demand from point A to point B and increase their demand for labour. Note that some workers who were willing to supply labour at W'' now decide that the real wage is too low and withdraw their offer to supply labour. As a result, there is a movement along the labour supply curve from point C to point D.

There is now a smaller excess supply of labour than was previously the case; the distance between the labour demand and supply curves is narrower. Nonetheless, there is still some excess supply present. We assume that, once again, those workers unable to find work offer themselves for a lower real wage. As before, we would see a movement along the labour demand curve, as firms respond to the lower wage by hiring more labour, and a movement along the labour supply curve as some workers no longer wish to supply labour.

These adjustments will continue until the real wage reaches *W**. At that *equilibrium* real wage, the amounts of labour supplied and demanded are in balance. There is no need for any worker to offer themselves for a wage different from *W** since all labour supplied is hired by firms. Unless something happens to shift either or both of the labour supply or demand curves, we would expect this situation to prevail. The equilibrium real wage and level of employment is represented by the combination of *W** and *N**.

CONCEPT CHECK 5.5

Consider Figure 5.6. What would happen if for some reason the real wage was below W*?

Now that we have discussed both the demand for and supply of labour, we are ready to apply supply and demand analysis to real-world labour markets. But, first, try your hand at using supply and demand analysis to answer the following question.

CONCEPT CHECK 5.6

Trade unions typically favour tough restrictions on immigration, while employers tend to favour more liberal rules. Why? (*Hint*: How is an influx of potential workers likely to affect real wages?)

▹▹ RECAP

When deciding on how much labour to employ, firms adopt the cost–benefit principle. That is, firms are willing to employ labour up to the point where the benefits from an additional worker no longer exceed the costs. The benefit from the firm's perspective is the extra revenue it receives from selling the output produced by an additional worker; this benefit declines as the amount of labour employed increases, because of the existence of diminishing returns. The cost for the firm is the wage that must be paid. Measuring both the benefit and the cost relative to the average price level in the economy yields the demand for labour curve which will be downward sloping—as the real wage falls, firms will demand more labour.

A change in the benefits that firms derive from labour will shift the labour demand curve. There are two reasons these benefits might change. First, something could affect the productivity of labour; for example, a new technological innovation might increase labour productivity, making workers more valuable to firms and shifting the demand for labour curve outward. Second, the relative price of firms' output could change; for example, a decrease in the relative price of output means that the output produced by workers is now of less value to a particular firm. This would shift the demand for labour curve inward.

Workers decide how much labour they will supply by weighing up the costs and benefits. The cost is the value of the activity that could have been performed with the time spent at work; this relates to activities such as leisure and other non-work pursuits. The benefit is the wage that would be received in return for giving up those non-work pursuits.

Any non-wage factor that affects the supply of labour will shift the labour supply curve.

5.2 EXPLAINING THE TRENDS IN REAL WAGES AND EMPLOYMENT

LO 5.2, 5.3

We are now ready to analyse the important trends in real wages and employment discussed earlier in the chapter.

5.2.1 LARGE INCREASES IN REAL WAGES IN INDUSTRIALISED COUNTRIES

As we discussed, there have been significant increases in real annual earnings in Australia since World War II. Other industrialised countries have experienced similar gains. These increases have greatly improved the standard of living of workers in these countries. Why have real wages increased by so much in Australia and other industrialised countries?

The large increase in real wages results from the sustained growth in productivity experienced by the industrialised countries since World War II. As illustrated in Figure 5.7, increased productivity raises the demand for labour, which in the perfectly competitive model of the labour market will increase employment and the real wage.

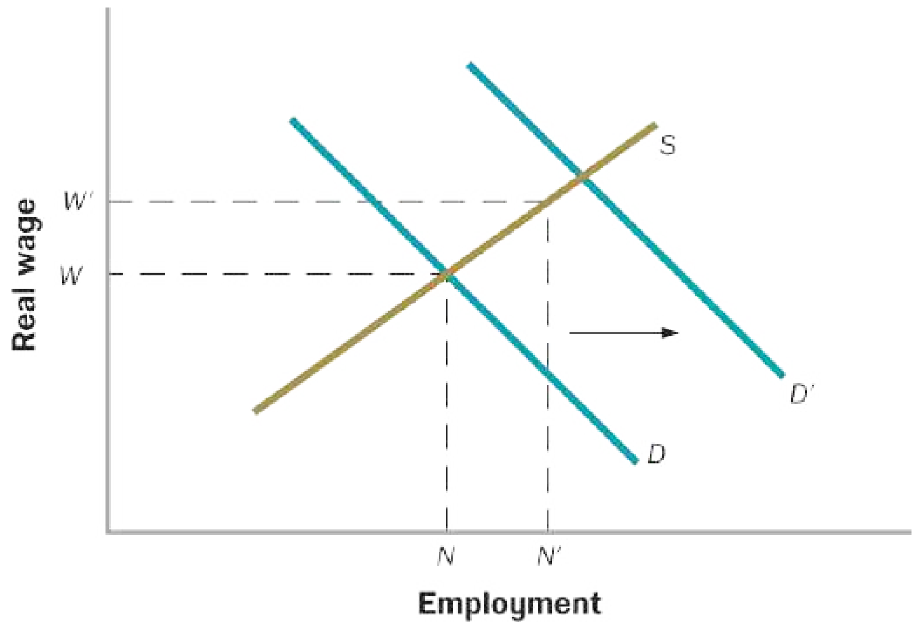

Figure 5.7 **An increase in productivity raises the real wage**

Note: An increase in productivity raises the demand for labour, shifting the labour demand curve from *D* to *D′*. The real wage rises from *W* to *W′*, and employment rises from *N* to *N′*.

Of the factors contributing to productivity growth in the industrialised countries, two of the most important have been:

1. the dramatic technological progress that occurred over the past 50 years
2. large increases in capital stocks.

These factors together mean that workers have more and better tools with which to work, thus increasing their productivity. Labour supply increased during the twentieth century as well, of course (not shown in the diagram). However, the increases in labour demand, driven by rapidly expanding productivity, have been so great as to overwhelm the depressing effect on real wages of increased labour supply.

5.2.2 REAL WAGES GROWTH AND EMPLOYMENT IN AUSTRALIA

Australia has had an extraordinary variety of labour market outcomes over the past 30 years. These are summarised in Table 5.4.

TABLE 5.4 **Labour market outcomes, Australia**

PERIOD	REAL EARNINGS (AVERAGE ANNUAL % GROWTH)	PRODUCTIVITY (AVERAGE ANNUAL % GROWTH)	EMPLOYMENT (AVERAGE ANNUAL % GROWTH)
1983–89	0.74	1.24	3.53
1990–99	1.36	2.08	1.16
2000–09	0.54	0.91	2.21
2010–17	1.18	0.97	1.66

Real earnings are measured by the average wage of all employees deflated by the implicit price deflator of gross domestic product (GDP). Productivity is real GDP divided by the total number of employed workers. Employment is the total number of employed workers.

Sources: Federal Reserve Bank of St Louis (FRED) 2018, Federal Reserve economic data, https://fred.stlouisfed.org/.

While the 1970s produced very poor labour market outcomes in Australia (especially in terms of employment), the 1980s were a different story. That decade saw an annual average rate of employment growth of around 3.5 per cent. The reason for the employment growth is readily apparent from Table 5.4 : the real cost of employing labour rose only slowly during the 1980s at a rate below that of productivity growth. This meant that the cost–benefit calculation facing firms was skewed in favour of the benefits of employing more workers; firms were willing to offer considerably more jobs than previously. What was responsible for the low rate of a wage increase? Most commentators agree that the various prices and wages Accords introduced by prime minister Bob Hawke's Labor government were the key. The Accords (there were several over the 1980s) were formal agreements between the government and Australia's trade unions by which the government promised various tax and welfare concessions and a role for unions in the making of public policy, in return for wage restraint. The explicit aim was to stimulate employment growth in a way that had proved impossible in the 1970s.

What of the 1990s? The decade began with a major recession in Australia, with the **unemployment rate** reaching 11 per cent. The Accord system was gradually abandoned in favour of a new emphasis on labour market flexibility, with wage bargains conducted at the enterprise level rather than being nationally coordinated through wage-fixing tribunals (this was partly a response to the disappointing growth in labour productivity throughout the

1980s, which was seen as symptomatic of a regulated labour market—labour markets in Australia have a long history of regulation and control, with wages being heavily influenced throughout the twentieth century by centralised wage-setting tribunals). By the middle of the decade, a new government was in power (led by John Howard) that accelerated the move to a more deregulated labour market. Real wages began to grow again, although in contrast to the 1970s their rate of increase was kept below the rate of increase in productivity. However, employment growth did not reach the heights of the 1980s and this can be largely attributed to a rise in the working-age population (over the 1990s, the working-age population in Australia grew by around 15%). Unemployment remained stubbornly high.

What happened in the 2000s? Real earnings growth remained subdued. While productivity growth was also disappointingly low, it nevertheless still exceeded the rate of real wages growth. As a consequence, employment growth was relatively strong and the unemployment rate fell.

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To date, the 2010s have seen a small pickup in productivity with an increase in the rate of real wages growth. The relatively strong performance of real wages may be surprising to you in light of our earlier discussion of the great wages slowdown. However, the wages slowdown referred to at the beginning of this chapter is most noticeable in nominal wages. Given Australia’s very low inflation rates in recent years, there has still been scope for real wage increases even though the nominal wage has not increased rapidly.

CONCEPT CHECK 5.7

How might a low rate of consumer price inflation contribute to the wages slowdown described at the beginning of this chapter?

5.2.3 INCREASING WAGE INEQUALITY: THE EFFECTS OF GLOBALISATION AND TECHNOLOGICAL CHANGE

FIND ONLINE

Another important trend in labour markets in industrialised countries such as Australia and the United States is increasing inequality in wages, especially the tendency for the wages of the less skilled and less educated to fall further and further behind those of better-trained workers. This is an extremely complex issue, which is the product of many factors. Here, we focus on two possible reasons for this increasing inequality:

1. globalisation
2. technological change.

In recent years the real wages of more highly skilled and educated workers have continued to rise, while the real wages of less-skilled workers have stagnated or even declined. Does the globalisation of the world economy have anything to do with this trend?

Many commentators have blamed the increasing divergence between the wages of skilled and unskilled workers on the phenomenon of globalisation. This popular term refers to the fact that, to an increasing extent, the markets for many goods and services are becoming international, rather than national or local in scope. While people have long been able to buy products from all over the world, the ease with which goods and services can cross borders is increasing rapidly. In part, this trend is the result of international trade agreements, such as the North American–Australian free trade agreement, which came into effect on 1 January 2005, and reduced taxes on goods and services traded. However, technological advances such as the internet have also promoted globalisation.

The main economic benefit of globalisation is increased specialisation and the efficiency that it brings. Instead of each country trying to produce everything its citizens consume, each can concentrate on producing those goods and services at which it is relatively most efficient.

The effects of globalisation on the *labour* market are mixed, however, which explains why many politicians oppose free trade agreements. Expanded trade means that consumers stop buying certain goods and services from domestic producers and switch to foreign-made products. Consumers would not make this switch unless the foreign products were better, cheaper, or both, so expanded trade clearly makes them better off. But the workers and firm owners in the domestic industries that lose business may well suffer from the increase in foreign competition.

The effects of increasing trade on the labour market can be analysed using Figure 5.8. The figure contrasts the supply and demand for labour in two different industries:

1. textiles
2. computer software.

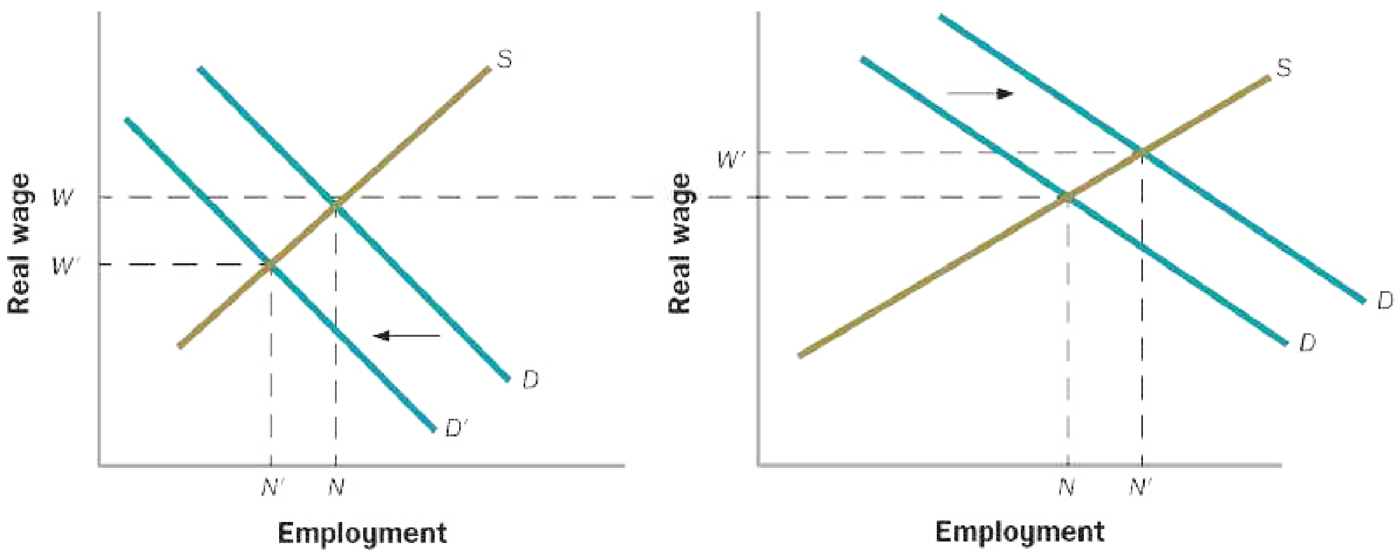

Figure 5.8 **The effect of globalisation on the demand for workers in two industries**

Initially, real wages in the two industries are equal at *W*. After an increase in trade, demand for workers in the importing industry (textiles) declines, lowering real wages

and employment, while demand for workers in the exporting industry (software) increases, raising real wages and employment in that industry.

Imagine that, initially, there is little or no international trade in these two goods. Without trade, the demand for workers in each industry is indicated by the curves marked *D*. Wages and employment in each industry are determined by the intersection of the demand curves and the labour supply curves in each industry. As we have drawn the figure, initially, the real wage is the same in both industries, equal to *W*. Employment is indicated by *N* in each industry.

What will happen when this economy is opened up to trade, perhaps because of a free trade agreement? Under the agreement, countries will begin to produce for export those goods or services at which they are relatively more efficient, and therefore have a competitive advantage relative to other countries, and to import goods or services that they are relatively less efficient at producing. Suppose the country in this example is relatively more efficient at producing software than manufacturing textiles. With the opening of trade, the country gains new foreign markets for its software and begins to produce for export as well as for domestic use. Meanwhile, because the country is relatively less efficient at producing textiles, consumers begin to purchase foreign-made textiles, which are cheaper or of higher quality, instead of the domestic product. In short, software becomes an exporting industry and textiles an importing industry.

These changes in the demand for domestic products are translated into changes in the demand for labour. The opening of export markets increases the demand for domestic software, raising its relative price. The higher price for domestic software, in turn, raises the value of the marginal products of software workers, shifting the labour demand curve in the software industry to the right, from D to D' in the right hand panel of Figure 5.8. Wages in the software industry rise, from W to W', and employment in the industry rises as well. In the textile industry, the opposite happens. Demand for domestic textiles falls as consumers switch to imports. The relative price of domestic textiles falls with demand, reducing the value of the marginal product of textile workers and hence the demand for their labour, to D' in the left hand panel of Figure 5.8. Employment in the textile industry falls, and the real wage falls as well, from W to W'.

In sum, Figure 5.8 shows how globalisation can contribute to increasing wage inequality. Initially, we assumed that software workers and textile workers received the same wage. However, the opening up of trade raised the wages of workers in the 'winning' industry (software) and lowered the wages of workers in the 'losing' industry (textiles), increasing inequality.

In practice, the tendency of trade to increase wage inequality may be even worse than depicted in the example, because the great majority of the world's workers, particularly those in developing countries, have relatively low skill levels. Thus, when industrialised countries open up trade with developing countries, the domestic industries that are likely to face the toughest international competition are those that use mostly low-skilled labour.

Conversely, the industries that are likely to do the best in international competition are those that employ mostly skilled workers. Thus, increased trade may lower the wages of those workers who are already poorly paid and increase the wages of those who are well paid.

The fact that increasing trade may exacerbate wage inequality explains some of the political resistance to globalisation, but in general, it does not justify attempts to reverse the trend. Increasing trade and specialisation is a major source of improvement in living standards, so trying to stop the process is counterproductive. Indeed, the economic forces behind globalisation—primarily, the desire of consumers for better and cheaper products and of producers for new markets—are so powerful that the process would be hard to stop even if government officials were determined to do so.

Rather than trying to stop globalisation, helping the labour market to adjust to the effects of globalisation is probably a better course. To a certain extent, the economy will adjust on its own. Figure 5.8 showed that following the opening to trade, real wages and employment fall in textiles and rise in software. At that point, wages and job opportunities are much more attractive in the software industry than in textiles. Will this situation persist? Clearly, there is a strong incentive for workers who are able to do so to leave the textile industry and seek employment in the software industry.

The movement of workers between jobs, firms and industries is called **worker mobility**. In our example, worker mobility will tend to reduce labour supply in textiles and increase it in software, as workers move from the contracting industry to the growing one. This process will reverse some of the increase in wage inequality by raising wages in textiles and lowering them in software. It will also shift workers from a less competitive sector to a more competitive sector. To some extent, then, the labour market can adjust on its own to the effects of globalisation.

Of course, there are many barriers to a textile worker becoming a software engineer. So, there may also be a need for transition aid to workers in the affected sectors. Ideally, such aid helps workers train for and find new jobs. If that is not possible or desirable—say, because a worker is nearing retirement—transition aid can take the form of government payments to help the worker maintain their standard of living. Because trade and specialisation increase the total economic pie, the 'winners' of globalisation can afford the taxes necessary to finance aid and still enjoy a net benefit from increased trade. (We will look in detail at some of the issues surrounding globalisation later in this text.)

A second source of increasing wage inequality is the ongoing technological change that favours more highly skilled or educated workers. Thinking as an economist 5.1 examines the effect of technological change on the labour market.

THINKING AS AN ECONOMIST 5.1

Why has the gap between the wages of less-skilled and higher skilled workers widened in recent years?

How has the pattern of technological change contributed to increasing inequality of wages?

New scientific knowledge and the technological advances associated with it are a major source of improved productivity and economic growth. Increases in worker productivity are in turn a driving force behind wage increases and higher average living standards. In the long run, on average, technological progress is undoubtedly the worker's friend.

This sweeping statement is not true at all times and in all places, however. Whether a particular technological development is good for a particular worker depends on the effect of that innovation on the worker's value of marginal product and, hence, on their wage. For example, at one time the ability to add numbers rapidly and accurately was a valuable skill; a clerk with that skill could expect advancement and higher wages. However, the invention and mass production of the electronic calculator has rendered human calculating skills less valuable, to the detriment of those who have that skill.

History is replete with examples of workers who opposed new technologies out of fear that their skills would become less valuable. In England in the early nineteenth century, rioting workers destroyed newly introduced labour-saving machinery.

The name of the workers' reputed leader, Ned Ludd, has been preserved in the term *Luddite*, meaning a person who is opposed to the introduction of new technologies.

How do these observations bear on wage inequality? According to some economists, many recent technological advances have taken the form of **skill-biased technological change**, that is, technological change that affects the marginal product of higher-skilled workers differently from that of lower-skilled workers. Specifically, technological developments in recent decades appear to have favoured more-skilled and educated workers. Developments in car production are a case in point. The advent of mass production techniques in the 1920s provided highly paid work for several generations of relatively low-skilled car workers. But, in recent years, car production, like the cars themselves, has become considerably more sophisticated. The simplest production jobs have been taken over by robots and computer-controlled machinery, which require skilled operatives who know how to use and maintain the new equipment. Consumer demand for luxury features and customised options has also raised the car makers' demand for highly skilled artisans. Thus, in general, the skill requirements for jobs in car production have risen. Similarly, few office workers today can escape the need to use computer applications, such as word processing and spreadsheets. And in many schools, teachers are expected to know how to set up a web page or use the internet.

Figure 5.9 illustrates the effects of technological change that favours skilled workers. The left hand panel shows the market for unskilled workers; the right hand panel shows the market for skilled workers. The demand curves, each labelled *D*, show the demand for each type of worker before a skill-biased technological change. Wages and employment for each type of worker are determined by the intersection of the demand and supply curves in each market. Figure 5.9 shows that, even before the technological change, unskilled workers received lower real wages than skilled workers, reflecting the lower marginal products of the unskilled.

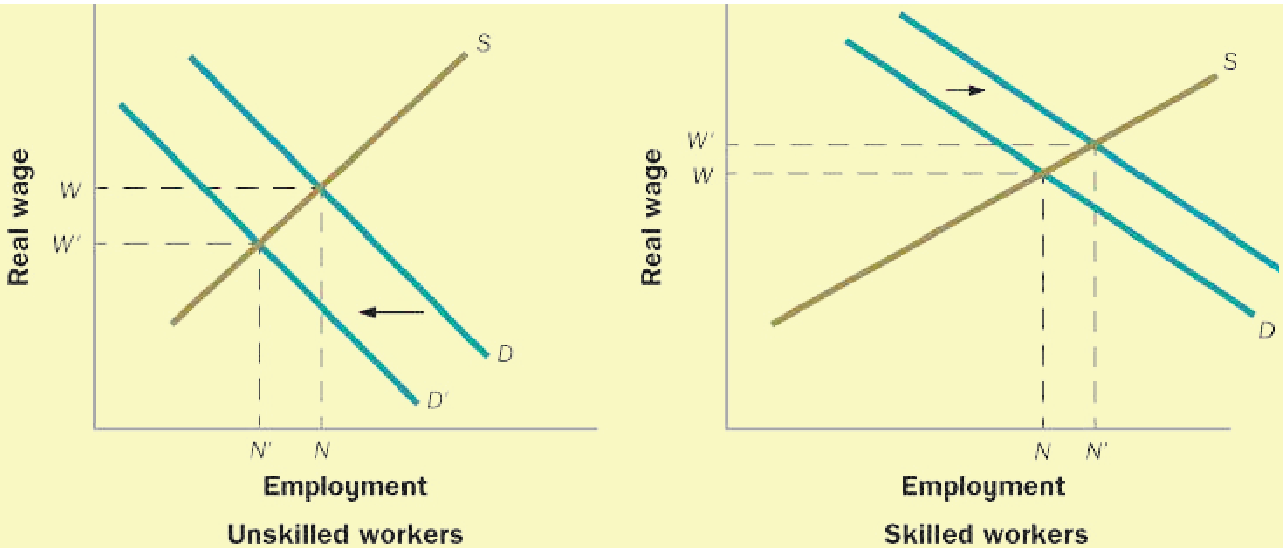

Figure 5.9 **The effect of skill-biased technological change on wage inequality**

Note: The figure shows the effects of a skill-biased technological change that increases the marginal product of skilled workers and reduces the marginal product of unskilled workers. The resulting increase in the demand for skilled workers raises their wages, while the decline in demand for unskilled workers reduces their wages. Wage inequality increases.

Now suppose that a new technology—computer-controlled machinery, for example—is introduced. This technological change is biased towards skilled workers, which means that it raises their marginal productivity relative to unskilled workers. We will assume in this example that the new technology also lowers the marginal productivity of unskilled workers, perhaps because they are unable to use the new technology, but all that is necessary for our conclusions is that they benefit less than skilled workers. Figure 5.9 shows the effect of this change in marginal products. In the right hand panel of Figure 5.9, the increase in the marginal productivity of skilled workers raises the demand for those workers; the demand curve shifts rightward to *D*′. Accordingly, the real wages and employment of skilled workers also rise. In contrast, because they have been made less productive by the technological change, the demand for unskilled workers shifts leftward. Lower demand for unskilled workers reduces their real wages and employment.

In summary, this analysis supports the conclusion that technological change that is biased in favour of skilled workers will tend to increase the wage gap between the skilled and unskilled. Empirical studies have confirmed the role of skill-biased technological change in increasing wage inequality.

Because new technologies that favour skilled workers increase wage inequality, should government regulators act to block them? As in the case of globalisation, most economists would argue against this, since technological advances are necessary for economic growth and improved living standards. If the Luddites had somehow succeeded in preventing the introduction of labour-saving machinery in Britain, economic growth and development over the past few centuries might have been greatly reduced.

The remedies for the problem of wage inequalities caused by technological change are similar to those for wage inequalities caused by globalisation. First among them is worker mobility. As the pay differential between skilled and unskilled work increases, unskilled workers will have a stronger incentive to acquire education and skills, to everyone's benefit. A second remedy is transition aid. Government policymakers should consider programs that will help workers to retrain if they are able to, or provide income support if they are not.

▹▹ RECAP

The supply and demand analysis we have developed in this chapter is a very powerful tool for understanding labour market outcomes. Using this framework we have been able to:

1. see how long-run technological growth has contributed to increasing real wages in industrialised countries
2. explain the very different labour market outcomes in Australia in the 1980s, 1990s, 2000s and 2010s
3. examine how globalisation and technological change have led to growing wage inequality in many countries.

5.3 UNEMPLOYMENT

LO 5.5

The unemployment rate is a sensitive indicator of conditions in the labour market. When the unemployment rate is low, jobs are secure and relatively easier to find. Low unemployment is often associated with improving wages and working conditions as well, as employers compete to attract and retain workers. We discussed the measurement of unemployment in Chapter 2 and this may be a good time to review that material before proceeding.

5.3.1 TYPES OF UNEMPLOYMENT AND THEIR COSTS

Economists have found it useful to think of unemployment as being of three broad types: *frictional* unemployment, *structural* unemployment and *cyclical* unemployment. Each type of unemployment has different causes and imposes different economic and social costs. However, the first two types of unemployment, frictional and structural, are conceptually quite different from the third, cyclical, type of unemployment. This is because frictional and structural unemployment occurs irrespective of the state of the economy—for example, the economy could be in economic expansion and there still exist these types of unemployment. Economists sometimes refer to this as the economy's **natural rate of unemployment** —unemployment that exists independently of whether the economy is in expansion or contraction.

Cyclical unemployment, on the other hand, is the unemployment that is directly related to how well the economy is performing—it increases when the economy is in economic contraction and decreases when the economy is expanding.

The economy's natural rate of unemployment is thought to be related to some key structural features of the economy: for frictional unemployment, this is the efficiency with which the labour market facilitates the process of people searching for the right job; for structural unemployment, it is the way available jobs are distributed in the economy relative to the talents and aspirations of the workforce. There is no reason to expect that these structural features of the economy remain static over time. For example, many economists believe that the natural rate of unemployment in Australia increased significantly in the second half of the 1970s (see Crosby & Olekalns 1998). This could have been due to a range of factors; some examples are changes to the system of unemployment benefits that occurred in Australia in the first half of the 1970s—this made it easier for unemployed workers to sustain longer periods of time searching for work—and the changes that have occurred in the overall industrial structure of the Australian economy, in particular the decline in the relative size of Australia's manufacturing sector.

The natural rate of unemployment requires a very different sort of policy response from cyclical unemployment, policies that tackle the structural problems that give rise to unemployment even when the economy is performing well. Cyclical unemployment, however, requires policies that act on the business cycle itself.

Let us now look in more detail at these different types of unemployment.

Frictional unemployment

At any given moment in time, there will always be some workers who are searching for jobs. These could be people who have recently finished school and are looking for their first job or people who for whatever reason have left their existing job and are in the process of looking for another job. One of the functions of the labour market is to facilitate this process of *job* search; in essence, bringing together those seeking work with those offering work. If all jobs and workers were the same, or if the set of jobs and workers were static and unchanging, this matching process would be quick and easy. But the real world is more complicated. In practice, both jobs and workers are highly *heterogeneous*. Jobs differ in their location, in the skills they require, in their working conditions and hours and in many other ways. Workers differ in their career aspirations, their skills and experience, their preferred working hours, their willingness to travel and so on.

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The real labour market is also *dynamic*, or constantly changing and evolving. On the demand side of the labour market technological advances, globalisation and changing consumer tastes spur the creation of new products, new firms and even new industries, while outmoded products, firms and industries disappear—word processors have replaced typewriters, for example. As a result of this upheaval, new jobs are constantly being created, while some old jobs cease to be viable. The workforce in a modern economy is equally dynamic. People move, gain new skills, leave the labour force for a time to rear children or go back to school, and even change careers.

Because the labour market is heterogeneous and dynamic, the process of job search often takes time. For example, a software engineer who loses or quits their job in Sydney may take weeks or even months to find an appropriate new job. In their search, they will probably consider alternative areas of software development or even totally new challenges. They may also want to think about different regions of the country in which software companies are located, such as Melbourne or Canberra. During the period in which they are searching for a new job, they are counted as unemployed.

Short-term unemployment that is associated with the process of workers searching for jobs is called **frictional unemployment** . The *costs* of frictional unemployment are low and may even be negative; that is, frictional unemployment may be economically beneficial. First, frictional unemployment is short term, so its psychological effects and direct economic losses are minimal. Second, to the extent that the search process leads to a better fit between worker and job, a period of frictional unemployment is actually productive, in the sense that it leads to higher output over the long run. Indeed, a certain amount of frictional unemployment seems essential to the smooth functioning of a rapidly changing, dynamic economy.

Structural unemployment

A second major type of unemployment is **structural unemployment** , or the long-term and chronic unemployment that exists because the distribution of skills or aspirations across unemployed workers does not *match* the distribution of available jobs across the economy. It takes a long time for structural mismatches in the economy to be overcome, and so people who are structurally unemployed are often without work for an extended period of time.

Several factors contribute to structural unemployment. First, a *lack of skills*, *language barriers* or *discrimination* keep some workers from finding stable, long-term jobs. Unskilled workers who find short-term or temporary jobs from time to time, but never stay in one job for very long, fit the definition of chronically unemployed.

Second, economic changes sometimes create a *long-term mismatch* between the skills some workers have and the available jobs. The Australian steel industry, for example, has declined over the years, while the computer industry has grown rapidly. Ideally, steelworkers who lose their jobs would be able to find new jobs in computer firms (worker mobility), so their unemployment would only be frictional in nature. In practice, of course, many ex-steelworkers lack the education, ability or interest necessary to work in the computer industry. Since their skills are no longer in demand, these workers may drift into long-term or chronic unemployment.

Finally, structural unemployment can result from various *structural features of the labour market* that act as barriers to employment. Examples of such barriers include unions and minimum wage laws, both of which may keep wages above their market-clearing level, creating unemployment. We will discuss some of these structural features shortly.

The *costs* of structural unemployment are much higher than those of frictional unemployment. Because structurally unemployed workers do little productive work over long periods, there can be substantial economic losses both to the unemployed workers and to society. Structurally unemployed workers also lose out on the opportunity to develop new skills on the job, and their existing skills wither from disuse. Long spells of unemployment are also much more difficult for workers to handle psychologically than the relatively brief spells associated with frictional unemployment.

Cyclical unemployment

The third type of unemployment occurs during periods of economic contraction and is called **cyclical unemployment** . The sharp peaks in unemployment during economic downturns reflect the cyclical unemployment that occurs during recessions. Increases in cyclical unemployment, although relatively short-lived, are associated with significant declines in real GDP and are therefore quite costly economically. We will study cyclical unemployment in more detail later in the chapters dealing with expansions and contractions.

In principle, frictional, structural and cyclical unemployment add up to the total unemployment rate. In practice, sharp distinctions often cannot be made between the different categories, so any breakdown of the total unemployment rate into the three types of unemployment is necessarily subjective and approximate.

▹▹ RECAP

Economists recognise three distinct types of unemployment. Structural unemployment arises when the distribution of skills across workers does not correspond to the distribution of required skills implied by the economy's structure. Frictional unemployment refers to people who are unemployed in the period between finding jobs; they have left one job and spend a brief period of time out of work before moving on to their next job. The cyclical unemployed are those who lose their job as a result of a general downturn in the level of economic activity (a recession).

5.4 IMPEDIMENTS TO FULL EMPLOYMENT

LO 5.6

In the first part of this chapter, to help us understand significant trends in labour markets, we outlined the perfectly competitive model of the labour market. We saw how useful this model was in explaining what has happened to real wages and employment. However, the perfectly competitive framework does not perform as well as we might like as an explanation of unemployment. This is because the model's equilibrium results in a perfect balance between labour demand and labour supply; there is no unemployment in equilibrium in the perfectly competitive model. All who wish to work at the going wage are able to find employment. If we wish to use this framework to understand unemployment, we need to explain how it might be possible for the labour market to fail to attain equilibrium. Economists usually point to various structural features of the labour market that might contribute to the labour market being away from equilibrium for a sustained period of time, thereby providing an explanation for long-term and chronic unemployment. Let us discuss a few of those features.

5.4.1 MINIMUM WAGE LAWS

Australia has a long history of the statutory setting of minimum wages. In fact, Australia and New Zealand were the first countries in the world to adopt such a system (in the 1890s).

Minimum wage regulations prescribe the lowest hourly wage that employers may pay to workers. In Australia, these are known as award wages and are set by the Australian Fair Work Commission following regular hearings at which employers, trade unions, the government and other interested parties make formal submissions.

The perfectly competitive model of the labour market predicts that if the minimum wage law has any effect at all, it must raise the unemployment rate. Figure 5.10 shows why. The figure shows the demand and supply curves for low-skilled workers, to whom the minimum wage is most relevant. The market-clearing real wage, at which the quantity of labour demanded equals the quantity of labour supplied, is W^*, and the corresponding level of employment of low-skilled workers is N^*. Now suppose there is a legal minimum wage, W_{min}, that exceeds the market-clearing wage, W, as shown in Figure 5.10. At the minimum wage, the number of people who want jobs, N_B, exceeds the number of workers that employers are willing to hire, N_A. The result is unemployment of the amount $N_B - N_A$, also equal to the length of the line segment AB in the figure. If there were no minimum wage, this unemployment would not exist, since the labour market would clear at wage W.

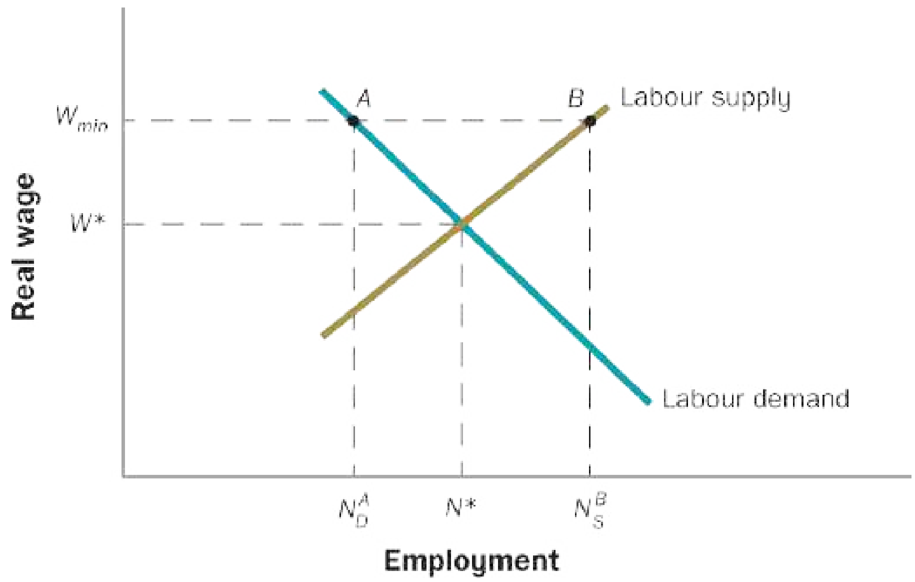

Figure 5.10 **A legal minimum wage may create unemployment**

Note: If the minimum wage, W_{min}, exceeds the market-clearing wage, W, for low-skilled workers, this will create unemployment equal to the difference between the number of people who want to work at the minimum wage, N_{B}, and the number of people that employers are willing to hire, N_{A}.

If minimum wages create unemployment, why are they used? A minimum wage creates two classes of workers: those who are lucky enough to find jobs at the minimum wage and those who are shut out because the minimum wage exceeds the market-clearing wage. Workers who do find jobs at the minimum wage will earn more than they would have otherwise because the minimum wage is higher than the market-clearing wage. If the minimum wage were put to a vote, the number of workers who benefit from the legislation and who could thus be expected to support it might well exceed the number of workers who are hurt by it.

5.4.2 LABOUR UNIONS

Labour unions are organisations that negotiate with employers on behalf of workers. Among the issues that unions negotiate are the wages workers earn, rules for hiring and firing, the duties of different types of workers, working hours and conditions and procedures for resolving disputes between workers and employers. Unions gain negotiating power by their power to call a strike—that is, to refuse to work until an agreement has been reached.

Through the threat of a strike, a union can often get employers to agree to a wage that is higher than the market-clearing wage. Thus Figure 5.10 could represent conditions in a unionised industry if W_{min} is interpreted as the union wage instead of the legal minimum wage. As in the case of a minimum wage, a union wage that is higher than the market-clearing wage leads to unemployment, of the amount $N_B - N_A$ in Figure 5.10 . Furthermore, a high union wage creates a trade-off similar to the one created by a minimum wage. Those workers who are lucky enough to get jobs as union members will be paid more than they would otherwise. Unfortunately, their gain comes at the expense of other workers, who are unemployed as a result of the artificially high union wage.

Are labour unions good for the economy? That is a controversial, emotionally charged question. Early in the twentieth century some employers who faced little local competition for workers—shipping companies, for example—exploited their advantage by forcing workers to toil long hours in dangerous conditions for low pay. Through bitter and sometimes bloody confrontations with these companies, labour organisations succeeded in eliminating many of the worst abuses. Unions also point with pride to their historic political role in supporting progressive labour legislation, such as laws that banned child labour. Finally, union leaders often claim to increase productivity and promote democracy in the workplace by giving workers some voice in the operations of the firm.

Opponents of unions, while acknowledging that these organisations may have played a positive role in the past, question their value in a modern economy. Today, more and more workers are professionals or semi-professionals, rather than production workers, so they can move relatively easily from firm to firm. Indeed, many labour markets have become national or even international, so today's workers have numerous potential employers. Thus the forces of competition—the fact that employers must persuade talented workers to work for them—should provide adequate protection for workers. Indeed, opponents would argue that unions are becoming increasingly self-defeating since firms that must pay artificially high union wages and abide by inflexible work rules will not be able to compete in a global economy. The ultimate effect of such handicaps will be the failure of unionised firms and the loss of union jobs. Unions are already in decline in Australia and now represent just 15 per cent of the workforce, down from one-third of the workforce that belonged to unions in the mid-1990s (Bowden 2017).

5.4.3 UNEMPLOYMENT BENEFITS

Another structural feature of the labour market that may increase the unemployment rate is the availability of *unemployment benefits* or government transfer payments to unemployed workers. Unemployment benefits provide an important social role in that they help the unemployed to maintain a decent standard of living while they are looking for a job. But because the availability of benefits allows the unemployed to search longer or less intensively for a job, it may lengthen the average amount of time the typical unemployed worker is without a job.

Most economists would argue that unemployment benefits should be generous enough to provide basic support to the unemployed but not so generous as to remove the incentive to seek work actively. Thus, unemployment benefits should not be as high as the income a worker receives when working.

5.4.4 OTHER GOVERNMENT REGULATIONS

Besides minimum wage legislation, many other government regulations bear on the labour market. They include *health and safety regulations*, which establish the safety standards employers must follow, and rules that prohibit racial or gender-based discrimination in hiring. Many of these regulations are beneficial. In some cases, however, the costs of complying with regulations may exceed the benefits they provide. Further, to the extent that regulations increase employer costs and reduce productivity, they depress the demand for labour, lowering real wages and contributing to unemployment. For maximum economic efficiency, legislators should use the *cost–benefit* *criterion* when deciding what regulations to impose on the labour market.

The points raised in this section can help us to understand an important, international labour market trend discussed earlier in the chapter, namely, the persistence of high unemployment in Western Europe.

THINKING AS AN ECONOMIST 5.2

Why are unemployment rates so high in some Western European countries?

For more than three decades unemployment has been exceptionally high in the major countries of Western Europe, a situation made even worse by the Global Financial Crisis, as Figure 5.11 shows. Yet, in the 1950s, 1960s and 1970s, Western Europe consistently enjoyed very low unemployment rates. Why has Western European unemployment been so stubbornly high for the past three decades or so, and why has the situation become so much worse?

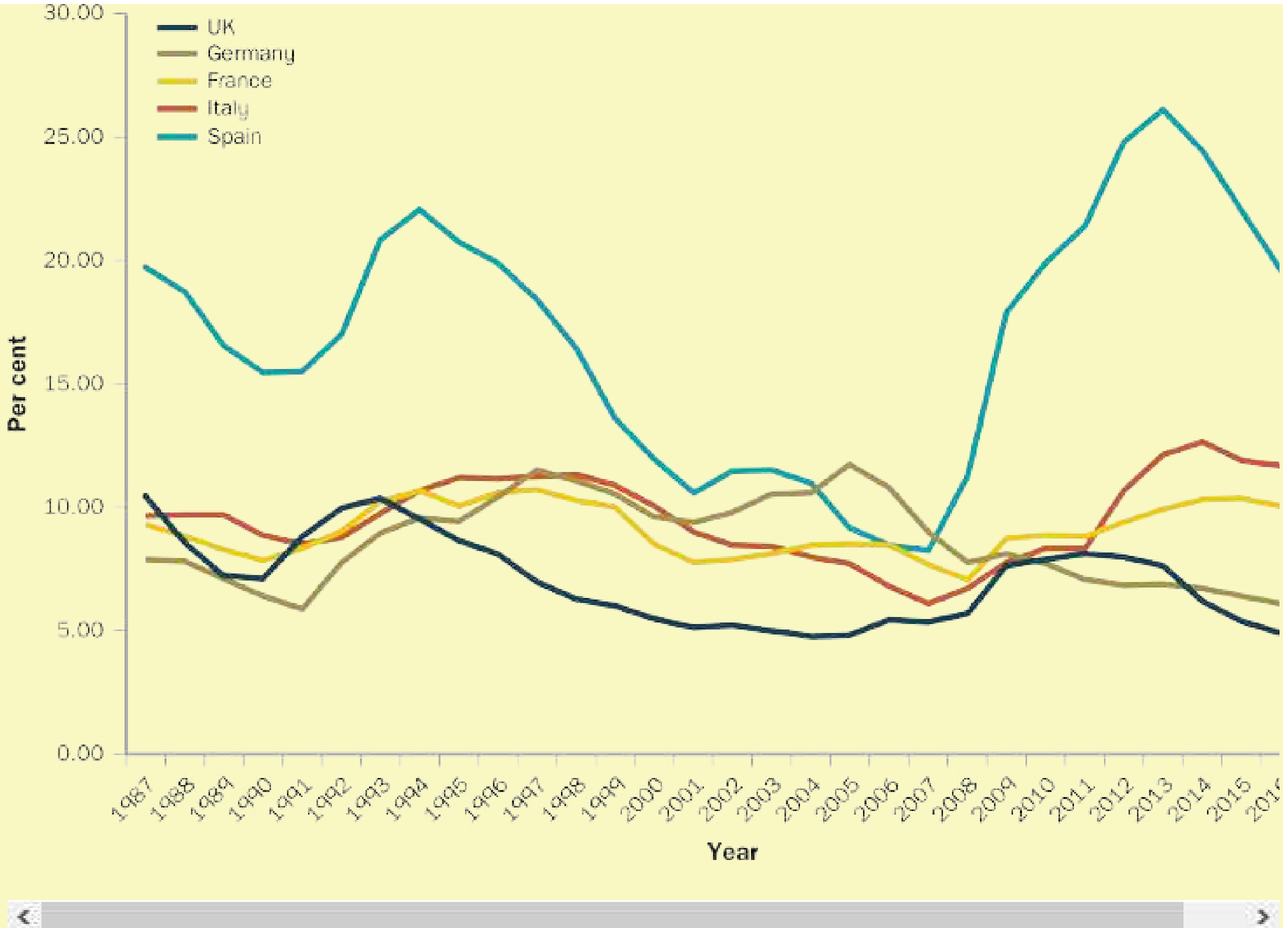

Figure 5.11 **Unemployment rates, selected Western European countries**

Source: Based on data from the Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/.

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One explanation for the high unemployment in major Western European countries is the existence of structural 'rigidities' in their labour markets. Relative to many countries, Western European labour markets are highly regulated. Western European governments set rules regarding matters ranging from the number of weeks of annual leave workers must receive to the reasons for which a worker can be dismissed. Minimum wages in Western Europe are high, and unemployment benefits are relatively generous. This lack of flexibility in labour markets—which some observers refer to as *Eurosclerosis*—causes higher frictional and structural unemployment.

If Western European labour markets are so dysfunctional, why has serious Western European unemployment emerged only in the past three decades or so? One explanation turns on the increasing pace of *globalisation* and *skill-biased technological change*. As we saw, these two factors decrease the demand for less-skilled labour relative to the demand for skilled labour. In Western Europe, high minimum wages, union contracts, generous unemployment insurance and other factors may have created a floor for the wage that firms could pay or that workers would accept. As the marginal productivity of the less skilled dropped below that floor, firms no longer found it profitable to employ those workers, swelling the ranks of the unemployed. Thus, the combination of labour market rigidity and the declining marginal productivity of low-skilled workers may be responsible for the Western European unemployment problem.

Evidence for the idea that inflexible labour markets have contributed to Western European unemployment comes from the United Kingdom, where the government of Prime Minister

Margaret Thatcher instituted a series of reforms beginning in the early 1980s. Britain has since largely deregulated its labour market so that it functions much more like that in countries such as the United States. Even at the height of the Global Financial Crisis, unemployment in Britain did not approach the highs of the rest of Western Europe. Labour market reforms like those in Britain are examples of *structural policies*.

While being stubbornly high for some time now, unemployment in Western Europe has become even more pronounced in the aftermath of the Global Financial Crisis. We will return to this topic later in the book after we have studied the business cycle in more detail.

▹▹ RECAP

A minimum wage set above the market equilibrium wage will create an excess supply of labour. The difference between labour demand and labour supply will be unemployment.

Labour unions have done much to improve the conditions experienced by workers. However, if unions use their market power to drive wages above their equilibrium level, then they may also cause some of their members to become unemployed.

Unemployment benefits have an important social role in ensuring that those without work are not completely disadvantaged by the lack of an income. At the same time, unemployment benefits may contribute to unemployment by prolonging the period before which an individual might be willing to accept employment.

SUMMARY

- For the average person, the most tangible result of economic growth and increasing productivity is the availability of ‘good jobs at good wages’. Over the long run, industrialised economies have for the most part delivered on this promise, as both real wages and employment have grown strongly.
- Trends in real wages and employment can be studied using the perfectly competitive model of the labour market. The productivity of labour and the relative price of workers’ output determine the demand for labour. Employers will hire workers only as long as the value of the marginal product of the last worker hired equals or exceeds the wage the firm must pay. Because of *diminishing returns to labour*, the more workers a firm employs, the less additional product will be obtained by adding yet another worker. The lower the going wage, the more workers will be hired; that is, the demand for labour curve slopes downward. Economic changes that increase the value of labour’s marginal product, such as an increase in the relative price of workers’ output or an increase in productivity, shift the labour demand curve to the right. Conversely, changes that reduce the value of labour’s marginal product shift the labour demand curve to the left.
- The supply curve for labour shows the number of people willing to work at any given real wage. Since more people will work at Page 126 a higher real wage, the supply curve is upward sloping. An

increase in the working-age population, or a social change that promotes labour market participation (like increased acceptance of women in the labour force) will raise labour supply and shift the labour supply curve to the right.

- Improvements in productivity, which raise the demand for labour, account for the bulk of the increase in real wages over the past century. The slowdown in real wage growth that has occurred in recent decades is the result of slower growth in labour demand, which was caused in turn by a slowdown in the rate of productivity improvement and of more rapid growth in labour supply. Rapid growth in labour supply, caused by such factors as immigration and increased labour force participation by women, has also contributed to the continued expansion of employment. Recently, there has been some improvement in the rate of growth of productivity and real wages.
- Two reasons for the increasing wage inequality are *economic globalisation* and *skill-biased technological change*. Both have increased the demand for, and hence the real wages of, relatively skilled and educated workers. Attempting to block globalisation and technological change is counterproductive, however, since both factors are essential to economic growth and increased productivity. To some extent, the movement of workers from lower-paying to higher-paying jobs or industries (*worker mobility*) will counteract the trend towards wage inequality. A policy of providing transition aid and training for workers with obsolete skills is a more useful response to the problem.

- There are three broad types of unemployment: frictional, structural and cyclical. *Frictional unemployment* is the short-term unemployment associated with the process of matching workers with jobs in a dynamic, heterogeneous labour market. *Structural unemployment* is the long-term and chronic unemployment that exists even when the economy is producing at a normal rate. It arises from a variety of factors, including language barriers, discrimination, structural features of the labour market, lack of skills or long-term mismatches between the skills workers have and the available jobs. *Cyclical unemployment* is the extra unemployment that occurs during periods of economic contraction, especially when the economy is in recession. The costs of frictional unemployment are low, as it tends to be brief and to create more productive matches between workers and jobs. But structural unemployment, which is often long term, and cyclical unemployment, which is associated with significant reductions in real GDP, are relatively more costly.
- Structural features of the labour market that may contribute to unemployment include minimum wage laws, which discourage firms from hiring low-skilled workers; labour unions, which can set wages above market-clearing levels; unemployment insurance, which reduces the incentives of the unemployed to find work quickly; and other government regulations, which—although possibly conferring benefits—increase the costs of employing workers. The labour market 'rigidity' created by government regulations and union contracts are a problem in Western Europe,

which may account for Europe’s high unemployment rates.

KEY TERMS

cyclical unemployment 122

diminishing returns to labour 107

frictional unemployment 121

natural rate of employment 120

skill-biased technological change 118

structural unemployment 121

unemployment rate 115

worker mobility 118

REVIEW QUESTIONS

1. List and discuss the five important labour market trends given in the first section of this chapter. How do these trends either support or qualify the proposition that increasing labour productivity leads to higher standards of living? LO 5.1 **EASY**
2. Alice is very skilled at fixing manual typewriters. Would you expect her high productivity to result in a high real wage for her? Why or why not? LO 5.4 **EASY**
3. Acme Corporation is considering hiring Jane Smith. Based on her other opportunities in the job market, Jane has told Acme that she will work for them for $40 000 per year. How should Acme determine whether to employ her? LO 5.2 **EASY**
4. Why have real wages risen by so much in the past century? Why did real wage growth slow in the mid-1970s? What has been happening to nominal and real wages recently? LO 5.4 **MEDIUM**
5. What are two major factors contributing to increased inequality in wages? Briefly, why do these factors raise wage inequality? Contrast possible policy responses to increasing inequality in terms of their effects on economic efficiency. LO 5.4 **MEDIUM**
6. List three types of unemployment and their causes. Which of these types is economically and socially the least costly? Explain. LO 5.5 **EASY**
7. Describe some of the structural features of Western European

labour markets that have helped to keep Western European unemployment rates high. If these structural features create unemployment, why do Western European governments not just eliminate them? LO 5.6 **HARD**

PROBLEMS

1. Production data for Danny's skateboard factory are as follows:

NUMBER OF WORKERS	SKATEBOARDS ASSEMBLED/DAY
1	10
2	18
3	24
4	28
5	30

Other than wages, Danny has costs of $100 (for parts and so on) for each skateboard assembled. LO 5.2 **MEDIUM**

a) Skateboards sell for $130 each. Find the marginal product and the value of the marginal product for each worker (don't forget about Danny's cost of parts).

b) Make a table showing Danny's demand curve for labour.

c) Repeat part (b) for the case in which skateboards sell for $140 each.

d) Repeat part (b) for the case in which worker productivity increases by 50 per cent. Skateboards sell for $130 each.

2. The marginal product of a worker in a flashlight factory equals $30 - N$ flashlights per hour, where N is the total number of workers employed. Flashlights sell for $2 each, and there are no costs to producing them other than labour costs. LO 5.2 **HARD**

a) The going hourly wage for factory workers is $20 per hour. How many workers should the factory manager hire? What if the wage were $30 per hour?

b) Graph the factory's demand for labour.

c) Repeat part (b) for the case in which flashlights sell for $3 each.

d) Suppose the supply of factory workers in the town in which the flashlight factory is located is 20 workers (i.e. the labour supply curve is vertical at 20 workers). What will be the equilibrium real wage for factory workers in the town if flashlights sell for $2 each? If they sell for $3 each?

3. How would each of the following be likely to affect the real wage and employment of unskilled workers on a car plant assembly line? LO 5.4 **EASY**

a) Demand for the type of car made by the plant increases.

b) A sharp increase in the price of petrol causes many commuters to switch to public transport.

c) Because of alternative opportunities, people become less willing to do factory work.

d) The plant management introduces new assembly line methods that increase the number of cars unskilled workers can produce per hour while reducing defects.

e) Robots are introduced to do most basic assembly line tasks.

f) The workers unionise.

4. How would each of the following factors be likely to affect the economy-wide supply of labour? LO 5.3 **EASY**

a) The compulsory retirement age is increased.

b) Increased productivity causes real wages to rise.

c) War preparations lead to the institution of a national draft, and many young people are called up.

d) More people decide to have children (consider both short-run and long-run effects).

e) Social security benefits are made more generous.

5. Either skilled or unskilled workers can be used to produce a small toy. The marginal product of skilled workers, measured in terms of toys produced per day, equals $200 - N^s$, where N^s is the number of skilled workers employed. Similarly, the marginal product of unskilled workers is $100 - N^u$, where N^u is the number of unskilled workers employed. The toys sell for $3 each. LO 5.3 LO 5.4 **HARD**

a) Assume that there are 100 skilled workers and 50 unskilled workers available (and the labour supply curves for each group are vertical). In dollars, what will be the equilibrium wage for each type of worker? (*Hint*: What are the marginal products and the values of marginal product for each type of worker when all workers are employed?)

b) Electronic equipment is introduced that increases the marginal product of skilled workers (who can use the equipment) to 300 – N^S. The marginal products of unskilled workers are unaffected. What are the equilibrium wages for the two groups?

c) Suppose that unskilled workers find it worthwhile to acquire skills when the wage differential between skilled and unskilled workers is $300 per day or greater. Following the introduction of the electronic equipment, how many unskilled workers will become skilled? (*Hint*: How many workers would have to shift from the unskilled to the skilled category to make the equilibrium difference in wages precisely equal to $300 per day?) What are the equilibrium wages for skilled and unskilled workers after some unskilled workers acquire training?

6. An economy with no foreign trade produces jackets and pants. There are 14 workers in the jackets industry and 26 workers in the pants industry. The marginal product of workers in the jackets industry, measured in jackets produced per day, is 20 – N_S, where N_S is the number of workers employed in the jackets industry. The marginal product of workers in the pants industry, measured in pants produced per day, is 30 – N_D, where N_D is the number of workers employed in the pants industry. LO 5.4 **HARD**

a) Initially, jackets sell for $40 each and pants are $60 each. Find the equilibrium wage in each industry.

b) The economy opens up to trade. Foreign demand for domestically produced jackets is strong, raising the price of jackets to $50 each. But foreign competition reduces demand for domestically produced pants so that they now sell for $50 each.

Assuming that workers cannot move between industries, what are wages in each industry now? Who has been hurt and who has been helped by the opening up to trade?

c) Now suppose that workers can move freely from one industry to the other, and will always move to the industry that pays the higher wage. In the long run, how many of the 40 workers in the economy will be in each industry? What wages will they receive? In the long run, are domestic workers hurt or helped by the opening up to foreign trade? Assume that jackets and pants continue to sell for $50.

7. For each of the following scenarios, state whether the unemployment is frictional, structural or cyclical. Justify your answer. LO 5.5 **MEDIUM**

a) Ted lost his job when the steel factory closed down. He lacks the skills to work in another industry and so has been unemployed for over a year.

b) Alice was laid off from her job at the car plant because the recession reduced the demand for cars. She expects to get her job back when the economy picks up.

c) Lance is an unskilled worker who works for local moving companies during their busy seasons. The rest of the year he is unemployed.

d) Gwen had a job as a clerk but quit when her husband was transferred to another state. She looked for a month before finding a new job that she liked.

e) Tao looked for a job for six weeks after finishing university. He turned down a couple of offers because they did not let him use the skills he had acquired at university, but now he has a job in the area he studied.

f) Karen, a software engineer, lost her job when the start-up company she was working for went bankrupt. She was interviewed at five companies before accepting a new job in another firm in the same industry.

8. The demand for and supply of labour in a certain industry are given by the equations

$$N_D = 400 - 2W$$
$$N_S = 240 + 2W$$

where N_D is the number of workers employers want to hire, N_S is the number of people willing to work and both labour demand and labour supply depend on the real wage W, which is measured in dollars per day. LO 5.6 **HARD**

a) Find employment and the real wage in labour market equilibrium.

b) Suppose the minimum wage is $50 per day. Find employment and unemployment. Is anyone made better off by the minimum wage? Worse off? In answering the last part of the question, consider not only workers but employers and other people in the society, such as consumers and taxpayers.

c) Repeat part (b), but now assume that a union contract requires that workers be paid $60 per day.

d) Repeat part (b) but, instead of a minimum wage, suppose there is an unemployment benefit that pays $50 per day. Workers are indifferent between earning a wage of $50 per day and remaining unemployed and collecting the benefit.

e) Repeat part (b), assuming that the minimum wage is $50 per day. However, assume that the cost of complying with government regulations on workplace safety reduces labour demand to $N_D = 360 - 2W$.

REFERENCES

Bowden B 2017, ‘Three charts on: The changing face of Australian union members’, The Conversation, 5 July, http://theconversation.com/three-charts-on-the-changing-face-of-australian-union-members-80141.

Crosby M, Olekalns N 1998, ‘Inflation, unemployment and the NAIRU in Australia’, *Australian Economic Review*, vol. 31, no. 2, pp. 117–29.

Harding A, Greenwell H 2001, ‘Trends in income and expenditure inequality in the 1980s and 1990s’, Discussion paper no. 56, National Centre for Social and Economic Modelling, December.

Leonhardt D 2014, ‘The great wage slowdown of the 21st century’, The New York Times, 7 October.

Organization for Economic Co-operation and Development (OECD) n.d.(a), ‘Harmonized unemployment rate: Total: All persons for the Euro area’, retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/LRHUTTTTEZQ156S.

Organization for Economic Co-operation and Development (OECD) n.d.(b), ‘Harmonized unemployment rate: Total: All persons for Australia’, retrieved from Federal Reserve Bank of St Louis

(FRED), https://fred.stlouisfed.org/series/LRHUTTTTAUA156N.

Reserve Bank of Australia (RBA) 2018a, 'Statistical tables: Labour force', www.rba.gov.au/statistics/tables.

Reserve Bank of Australia (RBA) 2018b, 'Statistical tables: Labour costs and productivity', http://www.rba.gov.au/statistics/tables.

US Bureau of Labor Statistics (USBLS) n.d., 'Civilian Unemployment Rate', retrieved from Federal Reserve Bank of St Louis (FRED). https://fred.stlouisfed.org/series/UNRATE.

PART 2

SHORT-RUN MACROECONOMICS: THE ANALYSIS OF THE BUSINESS CYCLE

PART 2 of the text looks at one of the key concerns of macroeconomists: understanding the short-run business cycle.

Over time the economy tends to grow, particularly if we look at relatively long periods. However, the growth is not always smooth. Sometimes economies perform relatively poorly, GDP growth slows or even becomes negative, expenditure slows, and unemployment rises. Other times economies perform better than expected, GDP growth is unusually strong, expenditure is high and unemployment falls. Understanding why this occurs and what macroeconomic policies exist to manage these periodic upswings and downswings is the subject matter of this part of the text.

Contractions—periods in which the economy performs poorly—are very costly; not as much output as usual is produced and fewer people have jobs. Economic expansions, where the economy grows strongly, can also be costly, particularly if they lead to the economy coming up against capacity constraints, thus leading to inflation. Understanding these costs, and how the tools of monetary and fiscal policy can be used to avoid them, have been key contributions of macroeconomics.

GRADUATE SPOTLIGHT

Name: Brendan Coates
Degree studied: Bachelor Arts (History) / Bachelor of Commerce (Economics)

University: University of Melbourne
Current position: Australian Perspectives Fellow
Employer: Grattan Institute

Early on, what interested you about a career in economics?

Of all the social sciences, economics seemed the most useful for understanding the big events of history. Despite its obvious flaws, economics has enormous predictive power in explaining how citizens behave and why some societies succeed and others fail.

As someone who was always interested in a career in public policy, economics also spoke to the trade-offs inherent in that area—and what tools could best be used by governments to achieve policy objectives at least cost, and which ones should be avoided.

What did you learn in your degree that has been most useful in your career?

My big takeaway was that sound macroeconomic management was the cornerstone for economic development. If a nation can't achieve macroeconomic stability then it won't get very far in achieving anything else.

What have you been up to since graduation?

After graduating I spent five years with the Australian Treasury. The highlight was designing the household compensation package for Australia’s first carbon emission trading scheme. The lowlight was when the same scheme failed to pass the parliament. I also represented Australia at G20 forums.

Later I worked as a macro-financial economist with the World Bank in Indonesia and Latin America.

I’ve spent the past four years with the Grattan Institute, the independent public policy think tank.

What does your current job involve? Where is it taking you?

Grattan’s mission is to provide rigorous and practical solutions to some of Australia’s most pressing problems. I lead a research program on aspects of tax, economic and budget policy, retirement incomes, superannuation, housing and cities. I typically publish two to three major reports a year as well as a number of submissions to parliamentary inquiries and around 20 to 25 newspaper opinion pieces.

What do you enjoy most about your job?

I really enjoy the public aspects of the role. I spend a lot of time talking to journalists and presenting at public forums. It takes sustained advocacy over a long period to make the case for policy reforms, especially where those reforms generate some losers.

What advice would you share with students who want to pursue a career in economics?

Work hard to develop your quantitative toolkit. Graduates with well-developed coding skills (such as R or Python) really stand out, and universities still don’t teach these skills well. Learning the basics of how to clean and wrangle large datasets matters as much (if not more) than mastering the minutiae of econometric models.

What are your thoughts on the future of the economics industry?

Going forward, economics is likely to become even more empirical: there’s just so much data being produced today and those that can glean the insights from those datasets will prove incredibly valuable.

INDUSTRY SPOTLIGHT

Name: Cherelle Murphy
Current Position: Senior Economist
Employer: ANZ Research

Could you give us a brief summary of your career in economics so far?

After my inspiring Year 11 teacher taught me what made economies tick and I pursued that interest through an honours degree at Curtin University, my supervisor pushed me to apply for a graduate position at either the Reserve Bank of Australia or Treasury. I was offered positions at both but chose the RBA given my strong interest in monetary policy (and Sydney nightlife!).

Given my interest in telling the stories that help people understand their financial experiences, I applied for a cadetship at *The Australian Financial Review* and eventually became the economics correspondent for the newspaper. While working in the parliamentary press gallery in Canberra, I also pursued a Master of Population Studies from the Australian National University, before moving to an economics job in the banking sector with ANZ.

What does your current job involve?

As Senior Economist at ANZ Research, I focus on the domestic economic outlook and issues that are front of mind for our clients. This includes following Australia’s parliamentary and budget developments, opinion polls and the announcements of the major parties. Given many of our clients (and bankers) work within state boundaries, I also spend significant time breaking down our national forecasts into state and territory outlooks.

In the ANZ research team, we communicate our work with succinct and digestible notes meant for a wide audience (of non-economists) and through presentations of our forecasts and analysis. These range from one-on-one meetings through to conferences where we speak to several hundred people at time.

What advice would you share with students who want to pursue a career in economics?

If you want to understand how to maximise people’s welfare, you’ve chosen the right profession! But don’t expect the answers to come easily or without original thought and empirical investigation. Trying to understand the dynamics of economies and how the people in it make decisions is challenging. For example, how should we plan sensibly for climate change or ageing? And what about the unknowns? How do we bring them into our thinking? Empirical analysis is useful but far from reliable when you have structural changes constantly disrupting what we thought was a 'sure thing'. Having said that, we have better tools than most to look to the future.

What current macroeconomic event are you watching with interest?

How the world continues to cope with the unwinding of the super-stimulatory monetary policy that was put in place following the Global Financial Crisis. Liquidity in global markets is diminishing, but we're not panicking. In fact, it seems likely that this global slowdown will remain gradual. Also, the impact of trade wars may be substantial but the impact is only likely to be felt over time.

We are also watching technology's impact on both the economic structure and the nature of the cycle. Even as wages recover with stronger labour markets, the rate of increase remains gradual, and at least part of this we put down to technology.

CHAPTER 6

Short-term economic fluctuations: An introduction

After reading this chapter, you should be able to answer the following questions.

6.1 How do economists decide whether the economy is in recession?

6.2 What typically happens to the unemployment rate in recessions?

6.3 What caused the early 1990s recession in Australia?

6.4 What features seem to be common to most business cycle fluctuations in the economy?

6.5 How are output gaps and cyclical unemployment related?

a) For what reasons might actual output sometimes grow quickly and sometimes grow slowly?

b) What is the natural rate of unemployment?

c) What is the significance of Okun's law?

SETTING THE SCENE

On 2 May 1932, at the height of the Great Depression, an Adelaide newspaper ran an article titled 'Depression's effects on family life'. It cited evidence from a United States report on the effects of the Great Depression on family life in New York, findings that applied to all nations undergoing the trauma of those years. The paper noted that:

"the adverse consequences … make a long and sinister catalogue …:
"Discouragement, depression, desperation—often to the verge, and sometimes to the point, of stealing, murder, and suicide.
"Bewilderment and mental confusion.
"Loss of self-confidence, development of a sense of failure and inferiority.
"Loss of initiative and sense of responsibility.
"Passive submission and endurance, loss of courage to go on looking for work or to try anything new.
"Obsession with the necessity of finding work, inability to take an interest in other activities or to meet other obligations.
"Bitterness and disrespect for law and religion, moral and spiritual deterioration.
"Cynicism, resentment, antagonism, rebellion—against society, against the Government, against things in general.
"Loss of pride and self-respect, carelessness about personal appearance, sensitiveness, and avoidance of social contacts.
"Restlessness, craving for excitement and distraction, leading to drinking and gambling.

"Mental and nervous disturbances, from irritability and excessive worry up to serious pathological conditions.
"Constant fear, even when again employed."

The devastating social effects of economic downturns like the Great Depression are not some relic of the distant past. More recently, the social effects of the Great Recession have also been documented. These ranged from a drop in the birth rate, an increase in the divorce rate, an increase in family violence, and adverse effects on mental health, the latter being experienced not only by the unemployed but by those in employment but under increased stress (e.g. see Bacigalupe, Esnaola & Martín 2016; Cohen 2015).

All of this points to the seriousness of economic downturns. While the effects on gross domestic product (GDP) and employment are all too obvious (and indeed will occupy our attention in this and the next few chapters), there is a social dimension to the cycle of expansion and contraction that needs to be remembered always.

Source: 'Depression's effect on family life', *The News*, 2 May 1932, p. 4, retrieved from Trove, http://nla.gov.au/nla.news-article129050630, accessed 15 October 2018.

6.1 CONTRACTIONS AND EXPANSIONS

LO 6.1–6.3

A large part of modern macroeconomics is concerned with analysing the business cycle, the term used to describe the tendency for economies to go through periodic bursts of good economic performance, known as expansions, punctuated by periods of poor economic performance, known as contractions. Figure 6.1 shows one representation of the business cycle, known as the **classical cycle**. The figure shows a stylised representation of real GDP throughout a period. In the figure, real GDP is trending upwards. This is consistent with the observation that, for most countries, real GDP does grow in the long run. Nevertheless, there are periods of time in which real GDP reaches a **peak**, a point in time where subsequent GDP growth is relatively disappointing. Indeed, GDP may even fall after a peak, as shown in Figure 6.1. The fall in real GDP eventually bottoms out, at a period known as the **trough**. After a trough, real GDP recovers, eventually reaching a new peak. The period between the peak and the trough is known as a **contraction**. An **expansion** is the term used to describe the period between a trough and the next peak.

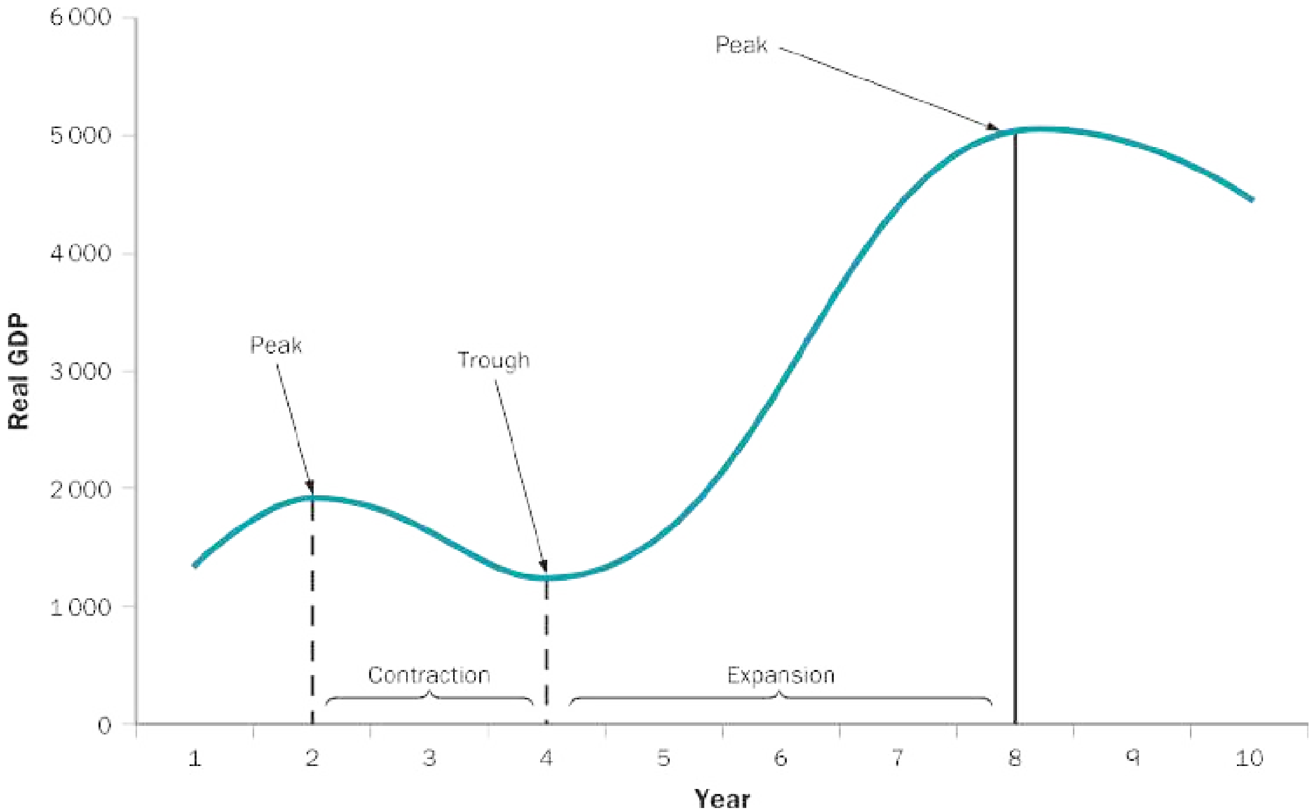

Figure 6.1 **Stylised characteristics of the business cycle**

Note: Business cycles are usually thought of as being characterised by periods of transition from peak to trough (a contraction) and then from trough to peak (an expansion).

A different way of representing the business cycle is known as the **growth cycle** . This approach is based on whether the growth rate of the economy differs significantly from its historical average. To keep the two ways of identifying the business cycle straight in your mind, remember that the *classical* cycle identifies peaks and troughs based on what has happened to the *level* of GDP. The *growth* cycle, in contrast, looks at *how quickly* the level of GDP has grown over time.

As background to the study of short-term economic fluctuations, let us review the historical record of business cycle fluctuations in the Australian economy. To do this we will use the work of the Melbourne Institute of Applied Economics and Social Research, located at the University of Melbourne. Researchers at the Melbourne Institute use statistical criteria *based on the growth cycle* to ascertain the timing of peaks and troughs. Table 6.1 lists the beginning and ending dates of Australian recessions since 1960, as reported by the Melbourne Institute.

TABLE 6.1 The phases of business cycles, Australia 1960 to

		CONTRACTION	EXPANSION	CY
PEAK	TROUGH	PEAK TO TROUGH (MONTHS)	TROUGH TO PEAK (MONTHS)	PEAK TO TROUG (MONTHS
	May-1961			
June-1964	Feb-1966	20	37	—
Aug-1969	Nov-1971	27	42	62
Aug-1973	Feb-1975	18	21	48
Aug-1976	Nov-1977	15	18	36
Jan-1980	Nov-1982	34	26	41
Jan-1984	Jun-1986	29	14	48

May-1988	Apr-1991	35	23	52
Oct-1994	Jul-1996	21	42	77
Dec-1997	Oct-1998	10	17	38
Dec-1999	Nov-2001	23	14	24
Nov-2002	Jun-2003	7	12	35
May-2007	May-2009	24	47	54
Jan-2011	Aug-2012	19	20	44
Aug-2013	Mar-2016	31	12	31
Jan-2017	Jun-2017	5	10	41
			ongoing	
Average durations		**21**	**24**	**45**
Standard deviations		**9**	**12**	**13**

You can see from Table 6.1 that contractions are on average of less than two years' duration using the growth cycle approach. Expansions, in contrast, last for longer. The longest contraction, however, which lasted nearly three years from May 1988 to April 1991, was also the most severe recession in Australia since the Great Depression of the 1930s.

Figure 6.2 shows data for Australia's growth rate of real GDP and rate of unemployment, extending back to 1959. What do these data reveal about the business cycle? Let us take first the case of a special type of contraction, a recession. Recessions occur when the contraction is especially large. Deciding when exactly the economy is in recession is not an easy task. One simple rule of thumb is that a recession occurs when there are two consecutive quarters in which the rate of growth of real GDP is negative. Using this definition, there have been three recessions in Australia since the early 1960s, the last one being the recession of the early 1990s. You will note from Figure 6.2 that these recessions were periods in which the unemployment rate increased significantly. Indeed, this increase in cyclical unemployment is one of the hallmarks of a recession. More generally, using the concept of the growth cycle and referring again to Figure 6.2, we can see that nearly all periods of unusually low growth (contractions) coincided with some increase in the rate of unemployment. We will explore this link between real GDP and cyclical unemployment in more detail later in the chapter.

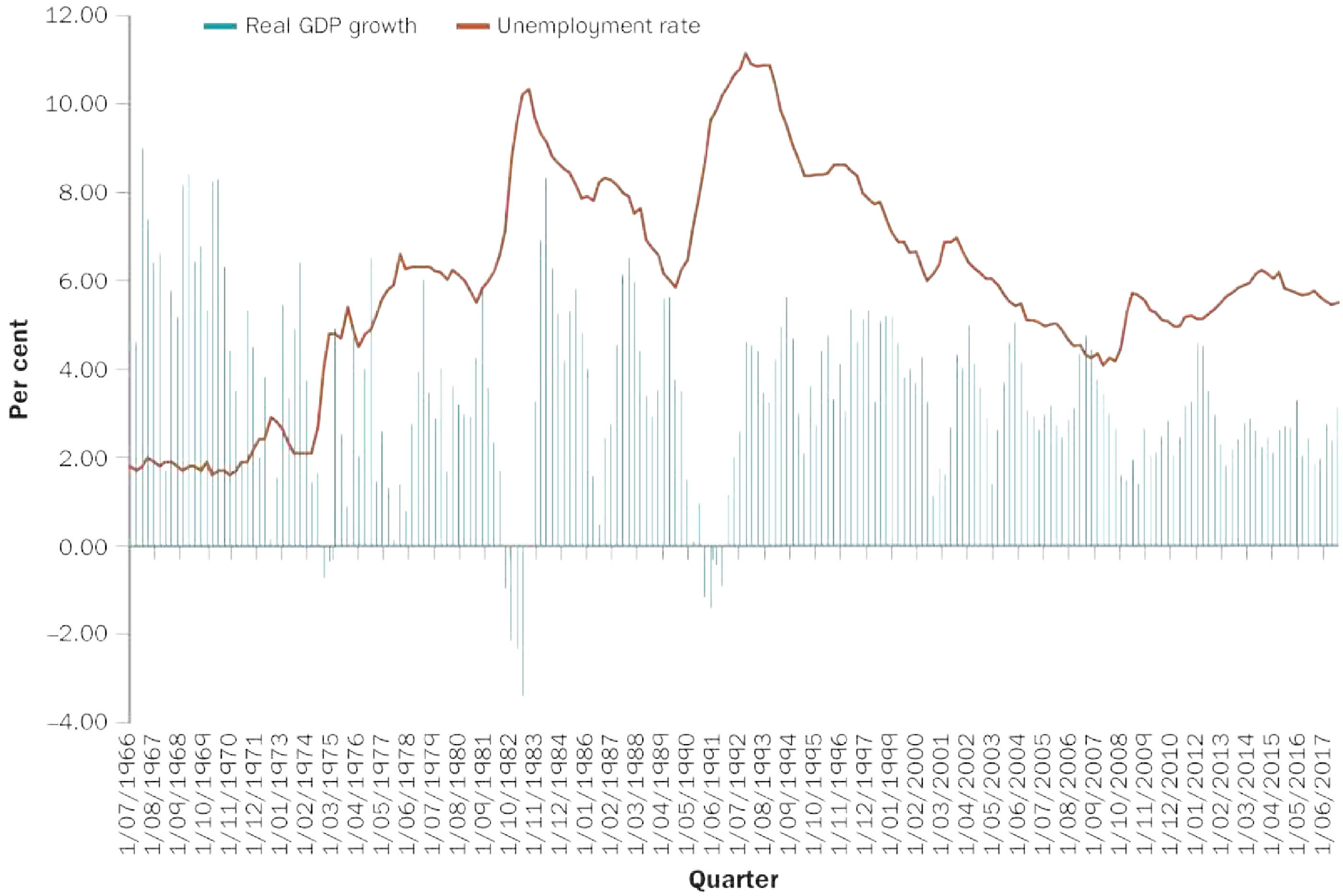

Figure 6.2 **Real GDP growth and unemployment, Australia**

Source: Compiled based on Organization for Economic Co-operation and Development 2018, 'Main economic indicators–complete database', http://dx.doi.org/10.1787/data-00052-en, and Organization for Economic Co-operation and Development 2010 "Main Economic Indicators - complete database", Main Economic Indicators (database), http://dx.doi.org/10.1787/data-00052-en, accessed 15 October 2018.

There is one other noteworthy feature of Australia's business cycle apparent from Figure 6.2. Since the recession of the early 1990s, Australia has managed to avoid recessions (defined as two consecutive quarters of negative real GDP growth). Australia's unemployment record over the 1990s, 2000s and 2010s has also improved relative to the 1970s and the 1980s. This suggests that the avoidance of recessions may be a highly effective means of securing good outcomes for unemployment.

BACKGROUND BRIEFING 6.1

The Great Moderation

Australia's worst post-war recession was that of the early 1990s. It was a recession that surprised many with its voracity, coming as it did after some seven years of reasonably good macroeconomic performance. Yet that recession seemed to mark a turning point in Australia's business cycle. Not only has a recession of that magnitude not reoccurred (and this includes the period of the Global Financial Crisis), the economy overall appears far less volatile than was previously the case, an observation known as the Great Moderation. This is a term attributed to Ben Bernanke (among others), one of the authors of this book. In a speech in 2004, Bernanke observed that 'one of the most striking features of the economic landscape over the past twenty years or so has been a substantial decline in macroeconomic volatility'. By this he meant that measures of economic activity such as real GDP seemed to have become smoother over the past two decades, without the booms and busts that had previously characterised economic activity. This newfound stability seemed to characterise inflation as well. One could have been forgiven for thinking that the business cycle had finally been relegated to the past, something of interest to scholars of economic history but of little interest to those considering the contemporary economic landscape.

Figure 6.3 shows what is meant by the 'Great Moderation'. The figure plots the percentage change between quarters for Australia's real GDP, one way of measuring what is meant by economic volatility. Two features of the data point to the existence of the Great Moderation. First, the largest (in absolute value) percentage changes in real GDP from one quarter to the next all occur in the period up to the early 1990s recession. Since that date, the percentage change in real GDP has been relatively modest, usually in the order of 1 to 2 per cent at most, and nearly always positive. This is indicative of a prolonged period of consolidated growth in the economy. The second feature relates to the absence of dramatic swings in the percentage change in real GDP between quarters. Look carefully at the figure in the period up to 1991. You can see many instances where a quarter featuring relatively large growth is followed either immediately or soon after by a quarter where the percentage change in real GDP is also relatively large, but negative. For example, the percentage change in real GDP in the June quarter of 1975 was 3.2 per cent; this was followed immediately afterwards by a fall in GDP of 1.1 per cent. Swings in economic performance of this type have been non-existent since the early 1990s.

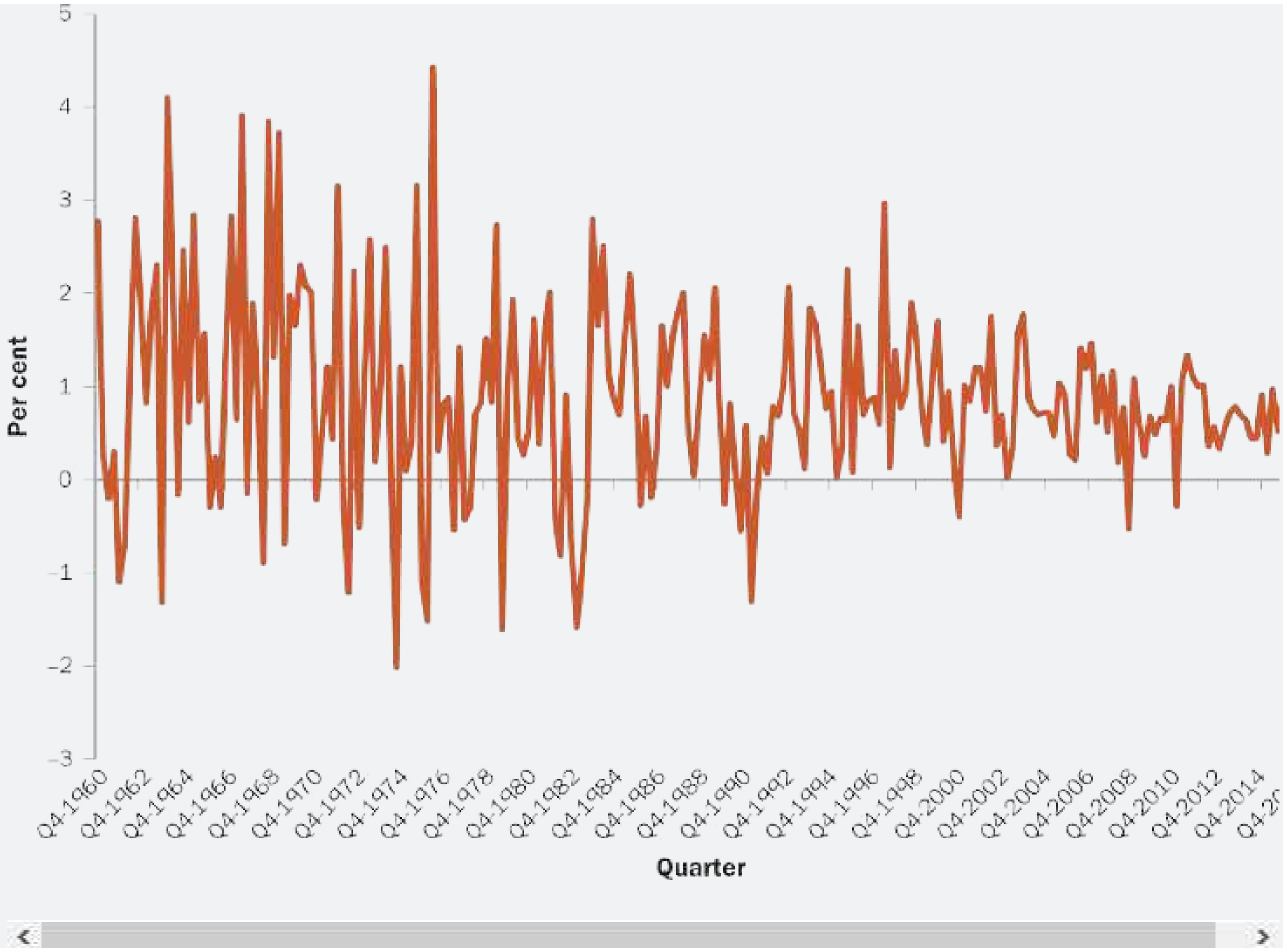

Figure 6.3 **The Great Moderation**

Note: A reduction in the economy's volatility is indicated by a fall in the percentage changes in real GDP from one quarter to the next since the early 1990s.

Source: Based on data from Organization for Economic Co-operation and Development n.d., 'Constant price gross domestic product in Australia', retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/AUSGDPRQDSMEI.

The Great Moderation was not confined to Australia. Notwithstanding the turmoil associated with the Global Financial Crisis, most industrialised nations have experienced a more stable economic environment over this period. Why?

In a conference organised by the Reserve Bank of Australia, on ‘The changing nature of the business cycle’, a group of researchers (Cecchetti et al. 2005) analysed five possible explanations for the Great Moderation:

1. better management of inventories
2. an improvement in the conduct of monetary policy
3. greater efficiency in financial markets
4. increased openness in international trade
5. luck.

Their detailed analysis suggests better management of inventories is an important explanation. Inventory management means that changes in consumer demand can be accommodated through the careful use of inventories without necessitating major changes to production schedules. Financial markets have also played a role in the Great Moderation, particularly in assisting firms to manage business risk. Likewise, changes in the way monetary policy has been conducted seems also to have played a role.

What about luck? This perhaps seems an odd explanation for the Great Moderation. However, some economists believe the reduction in economic volatility may simply have reflected a period of unusual calm in the global economy with no major economic disturbances occurring; not because of better management of the economy or more efficient inventory control procedures or better financial markets, but because of a long run of fortuitous (lucky) circumstances. This view was not widely accepted for a long time. More recently, however, the Global Financial Crisis and the extraordinary volatility that followed has focused more attention on the 'luck' explanation for the Great Moderation. Perhaps, as the events of the crisis showed all too clearly, economists and policymakers should not rely on good luck holding out forever.

References

Bernanke B 2004, 'The Great Moderation', Remarks at the meetings of the Eastern Economic Association, Washington DC, 20 February, www.federalreserve.gov/boarddocs/speeches/2004/20040220/default.html.
Cecchetti SG, Flores-Lagunes A, Krause S, Kent C and Norman D 2005, 'The changing nature of the business cycle', www.rba.gov.au/publications/confs/2005/index.html.

6.1.1 SOME FACTS ABOUT SHORT-TERM ECONOMIC FLUCTUATIONS

LO 6.4

Periods of expansion and contraction have been a feature of industrial economies since at least the late eighteenth century. Karl Marx and Friedrich Engels referred to these fluctuations, which they called ‘commercial crises’, in their *Communist Manifesto* of 1848. As you know, the traditional term for these fluctuations is the *business cycle*, and they are still often referred to as *cyclical fluctuations*. Neither term is accurate though; as Figure 6.2 and Table 6.1 show, economic fluctuations are not ‘cyclical’ at all, in the sense that they recur at predictable intervals—instead, they are *irregular in their length and severity*. This irregularity makes the dates of peaks and troughs extremely hard to predict, even though professional forecasters have devoted a great deal of effort and brainpower to the task.

Expansions and contractions are usually not limited to a few industries or regions but are felt throughout the economy. Indeed, the largest fluctuations may have a global impact. For instance, the Great Depression of the 1930s affected nearly all the world’s economies, and the 1973–75 and 1981–82 recessions were also widely felt in many countries. When East Asia suffered a major slowdown in the late 1990s, the effects of that slowdown spilled over into many other regions. The recent global financial crisis also affected most countries.

As suggested earlier, unemployment is a key indicator of short-term economic fluctuations. You can see from Figure 6.2 that the unemployment rate typically rises sharply during recessions and recovers (although more slowly) during expansions. Beyond this increase in unemployment, labour market conditions generally worsen during recessions. For example, during recessions, workers are less likely to receive promotions or bonuses and may even be asked to work fewer hours, and new entrants to the labour force (such as university graduates) have a much tougher time finding attractive jobs.

Generally, industries that produce durable goods, such as cars, houses and capital equipment, are more affected than others by recessions and **booms** . In contrast, industries that provide services and non-durable *goods* like food are much less sensitive to short-term fluctuations. Thus, a car worker or a construction worker is far more likely to lose their job in a recession than is a hairdresser or a baker.

Like unemployment, inflation follows a typical pattern in expansions and contractions, though it is not so sharply defined. Figure 6.4 shows Australia's inflation rate since 1960; in the figure, periods of contraction (identified using the concept of growth cycles) are indicated by the shaded regions (note the temporary distortion introduced into Australia's inflation data by the introduction of the goods and services tax (GST) in 2000). As you can see, contractions tend to be followed soon after by a decline in the rate of inflation. For example, the recession of 1981–82 was followed by a sharp reduction in inflation. Furthermore, many—though not all—post-war contractions have been preceded by increases in inflation, as Figure 6.4 shows.

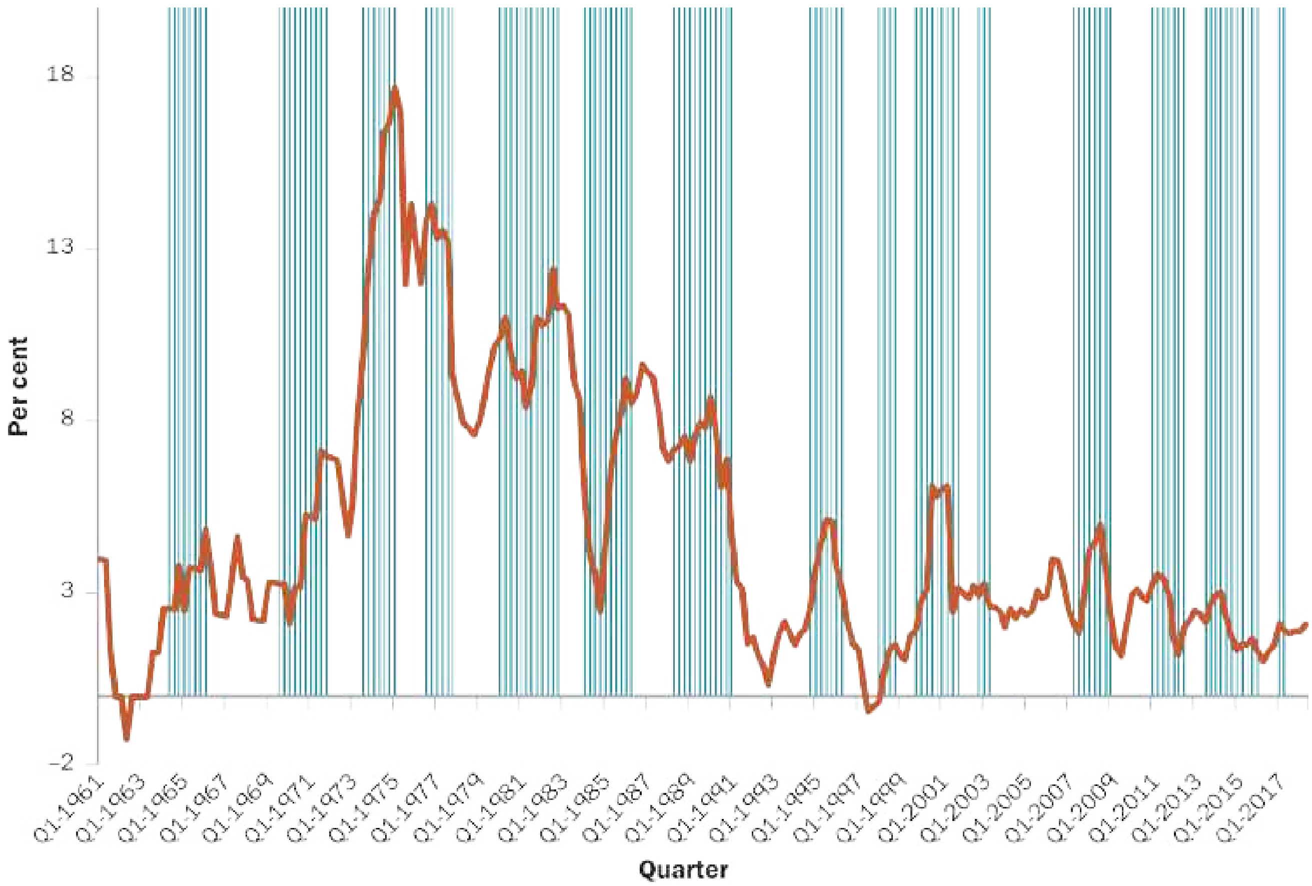

Figure 6.4 **Inflation in Australia, 1960–2018**

Note: Australian inflation is measured by the percentage change in the consumer price index (CPI); periods of contraction are indicated by the shaded regions.

Source: Based on Australian Bureau of Statistics 2018, 'Consumer price index', Cat. no. 6401.0, www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6401.0Sep%202018?OpenDocument and macroeconomics reports from The Melbourne Institute of Applied Economics and Social Research.

▹▹ RECAP

The business cycle refers to the fact that, through time, the economy undergoes a series of contractions (a period when the economy is performing poorly) and expansions (a period of strong economic performance). These expansions and contractions, which can be identified using statistical criteria, are not necessarily of regular length or magnitude. However, contractions are of shorter duration than expansions.

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Three of the key features of short-term economic fluctuations are:

1. Their effects can spill over from one country to other countries.
2. Contractions, especially recessions, and expansions have implications for the rate of unemployment, with unemployment increasing rapidly during economic downturns and decreasing relatively more slowly when the economy recovers.
3. They have systematic effects on the rate of inflation, with inflation slowing in the wake of recessions.

BACKGROUND BRIEFING 6.2

The Global Financial Crisis

Background briefing 6.1 described the Great Moderation, a sustained period of relative economic calm beginning in the early 1990s. What a difference a few years make! Starting around 2007, we witnessed an extraordinary turnaround in economic activity, with the worst economic contraction in many countries since the Great Depression of the 1930s. This is especially true of the world's largest economy, the United States. According to the US National Bureau of Economic Research (2018), the US economy entered recession in December 2007, with the trough occurring in June 2009. Other countries fared little better, particularly those of Western Europe.

Australia, in contrast, performed relatively well. Figure 6.5 shows a comparison of real GDP for the United States and Australia. To make the comparison easier, the two sets of data have been adjusted so that each is expressed as an index in which the value of real GDP in the March quarter of 2007 is represented by the value 100. Thereafter, movements in the respective indices reflect what has happened to the two countries' GDPs.

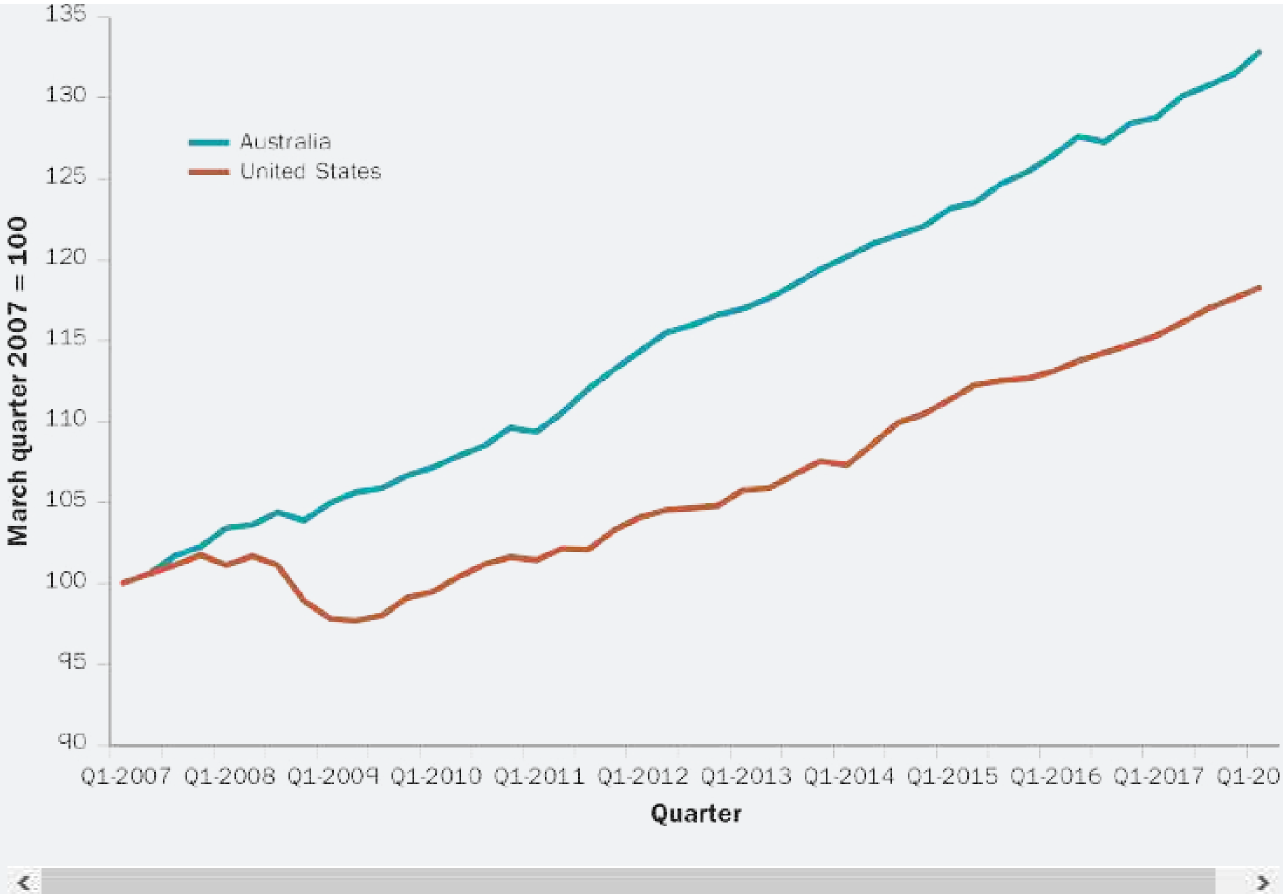

Figure 6.5 **Australia and the United States in the Global Financial Crisis**

Note: Relative to the United States, the performance of Australia's real GDP has been strong.

Source: FRED database, Federal Reserve Bank of St Louis, http://research.stlouisfed.org/fred2; and Australian Bureau of Statistics, Income, Expenditure and Production, cat. no. 5206.0.

The recession in the United States shows up starkly in these data. The observation for the June quarter of 2009 is more than 4.5 per cent lower than the figure at the start of the recession (December 2007). In contrast, Australia's real GDP is 2.5 per cent *higher* in the June quarter of 2009 compared to the December quarter of 2007.

THE US RECESSION

As we discussed in Chapter 2, economists divide the users of the final goods and services that make up real GDP into four categories: households, firms, governments and the foreign sector (i.e. foreign purchasers of domestic products). Corresponding to the four groups of final users are four components of expenditure: consumption, investment, government purchases and net exports. Three of these four components declined in the United States during the last two quarters of 2008, at accelerating rates:

- Consumption spending decreased by 3.8 per cent in the third quarter and by 4.3 per cent in the fourth quarter.
- Investment spending fell by 1.7 per cent in the third quarter and by 21.1 per cent in the fourth quarter.
- Exports rose by 3 per cent in the third quarter but declined by 23.6 per cent in the fourth quarter; imports shrank by 3.5 per cent in the third quarter and by 16 per cent in the fourth quarter.

The only component of real GDP to rise over this period was government expenditure, which rose by 5.8 per cent in the third quarter and by 1.6 per cent in the fourth quarter.

UNEMPLOYMENT

As one might expect considering our discussion of Figure 6.2, the Global Financial Crisis saw increases in the unemployment rate. Figure 6.6 shows the unemployment rate since the late 1970s. For comparison, the figures for both the United States and Australia are shown. You can see that the unemployment rate in the United States rose from 5.0 per cent in December 2007 to 9.9 per cent in December 2009. This increase was reflected across all demographic and educational groups. An increase in the rate of unemployment, albeit less dramatic, was also recorded in Australia. However, in the aftermath of the crisis, as economic conditions improved, the normal historical pattern of the Unites States having a relatively lower unemployment rate than Australia re-emerged.

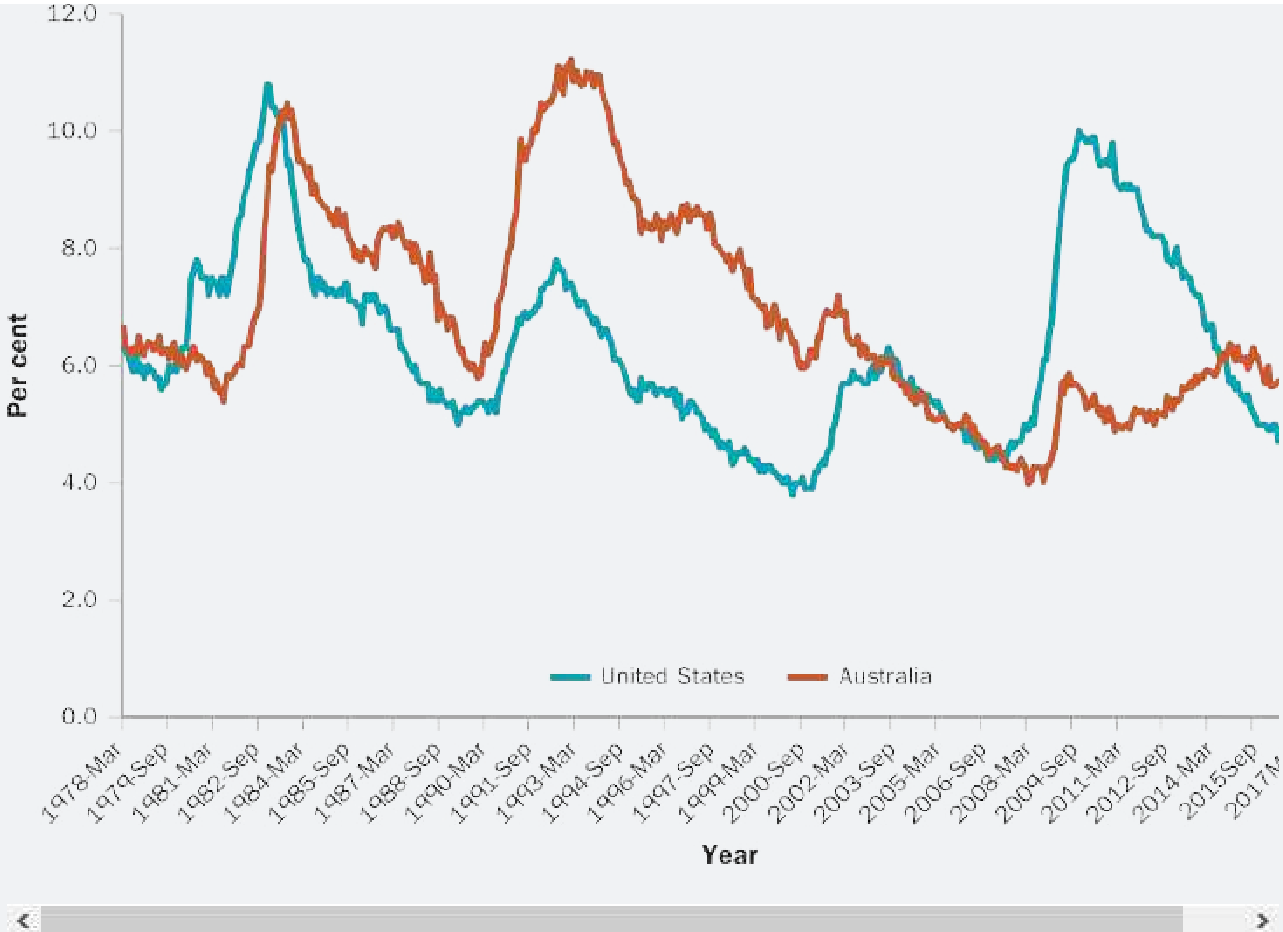

Figure 6.6 **Unemployment in the United States and Australia**

Note: Unemployment rose in the United States and Australia in the wake of the Global Financial Crisis, although the rise was much stronger in the United States.

Source: Compiled based on Organization for Economic Co-operation and Development n.d., 'Harmonized unemployment rate: Total: all persons for Australia' (LRHUTTTTAUM156S), retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/tags/series?t=australia%3Bunemployment; US Bureau of Labor Statistics n.d., 'Civilian unemployment rate', retrieved from FRED, https://fred.stlouisfed.org/series/UNRATE/.

INFLATION

The only bright spot throughout the recession was the inflation rate. The inflation rate using the CPI is shown as the blue line in Figure 6.7, which plots inflation rates since 2001.

Figure 6.7 **US inflation rate**

Note: The Global Financial Crisis contributed to keeping inflation low in the United States.

Source: Compiled based on US Bureau of Labor Statistics n.d., 'Consumer price index for all urban consumers: All items', retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/CPIAUCSL; US Bureau of Labor Statistics n.d., 'Consumer price index for all urban consumers: All items less food and energy', retrieved from FRED, https://fred.stlouisfed.org/series/CPILFESL.

However, the inflation rate calculated directly from the CPI can be misleading as it can be unduly affected by items that both have a large weight in the index and also behave in a volatile manner, for example, food and energy. A more useful measure of the underlying inflation trend is the core rate of inflation, which is equal to the inflation rate calculated from the CPI when food and energy prices are removed. This measure was relatively steady throughout this period.

Reference

National Bureau of Economic Research 2018, 'US business cycle expansions and contractions', www.nber.org/cycles/cyclesmain.html.

6.2 OUTPUT GAPS AND CYCLICAL UNEMPLOYMENT

LO 6.5

If policymakers are to respond appropriately to contractions and expansions, and economists are to study them, knowing whether an economic fluctuation is 'big' or 'small' is essential. Economists tend to use the classical cycle definition of the business cycle in this context. Intuitively, a 'big' contraction or expansion is one in which output and the unemployment rate deviate significantly from their normal or trend levels. In this section we will attempt to be more precise about this idea by introducing the concept of the 'output gap', which measures how far output is from its normal level. We will also revisit the idea of cyclical unemployment, or the deviation of unemployment from its normal level. Finally, we will examine how these two concepts are related.

6.2.1 POTENTIAL OUTPUT AND THE OUTPUT GAP

The concept of potential output is a useful starting point for thinking about the measurement of expansions and contractions. **Potential output**, also called 'potential GDP' or 'full-employment output', is the amount of output (real GDP) that an economy can produce when using its resources, such as capital and labour, at normal rates. (The term ‘potential output’ is slightly misleading, in that *potential* output is not the same as *maximum* output. Because capital and labour can be utilised at greater than normal rates, at least for a time, a country’s actual output can exceed its potential output.) Potential output is not a fixed number but grows over time, reflecting increases in both the amounts of available capital and labour and their productivity. The reason potential output grows over time is the subject matter of growth economics, to be studied later in this book. We will use the symbol Y^* to signify the economy’s potential output at a given point in time.

Why does a nation’s actual output sometimes expand and sometimes contract? Logically, there are two possibilities. Firstly, changes in output may reflect changes in the country’s potential output. For example, unfavourable weather conditions, such as a severe drought, could reduce potential output growth in an economy such as Australia’s, or a decline in technological innovation might also reduce potential output. Under the assumption that the country is using its resources at normal rates, so that actual output equals potential output, a significant fall in potential output growth would tend to result in recession. Similarly, new technologies, increased capital investment or a surge in immigration that swells the labour force could produce unusually brisk growth in potential output, and hence an economic expansion or even a boom.

Undoubtedly, changes in potential output are part of the explanation for expansions and contractions. In the United States, for example, the economic boom of the second half of the 1990s was propelled in part by new information technologies, such as the internet. And the severe slowdown in Japan during the 1990s reflected in part a reduction in the growth of potential output, arising from factors such as slower growth in the Japanese labour force (due to an ageing population—see McDonald 2003). When a contraction or recession results from slowing growth in potential output, the government's best response is to try to promote saving, investment, technological innovation, human capital formation and other activities that support growth.

A second possible explanation for short-term economic fluctuations is that actual output does not always equal potential output. For example, potential output may be growing normally but for some reason the economy's capital and labour resources may not be utilised fully, so that actual output is significantly below the level of potential output. If severe, this low level of output, resulting from underutilisation of economic resources, would generally be interpreted as a recession. Alternatively, capital and labour may be working much harder than normal (e.g. firms may put workers on overtime) so that actual output expands significantly beyond potential output, creating a boom.

At any point in time, the difference between potential output and actual output is called the **output gap**. Recalling that Y^* is the symbol for potential output and that Y stands for actual output (real GDP), we can express the output gap as:

$$\text{Output gap (in per cent)} = 100 \times \left(\frac{Y - Y^*}{Y^*}\right)$$

Note that when measured this way, the output gap is being expressed in terms of the percentage deviation of actual real GDP from potential real GDP. For example, a situation where actual real GDP was equal to 90 and potential real GDP was equal to 80 would correspond to an output gap of 12.5 per cent. A positive output gap such as this—when actual output is above potential and resources are being utilised at above-normal rates—is called an **expansionary gap**. A negative output gap—when actual output is below potential, and resources are not being utilised—is referred to as a **contractionary gap**.

Policymakers generally view both contractionary gaps and expansionary gaps as problems. It is not difficult to see why a contractionary gap is bad news for the economy: when there is a contractionary gap, capital and labour resources are not being fully utilised, and output and employment are below normal levels. An expansionary gap is considered a problem by policymakers for a subtler reason: what is wrong, after all, with having higher output and employment than normal? A prolonged expansionary gap is problematic because, when faced with a demand for their products that significantly exceeds their normal capacity, firms tend to raise prices. Thus, an expansionary gap typically results in increased inflation, which reduces the efficiency of the economy in the longer run. (Recall our discussion of the costs of inflation in Chapter 3.)

Thus, whenever an output gap exists, whether it is contractionary or expansionary, policymakers have an incentive to try to eliminate the gap by returning actual output to potential. In later chapters we will discuss both how output gaps arise and the tools that policymakers have for stabilising the economy—that is, bringing actual output into line with potential output.

6.2.2 THE NATURAL RATE OF UNEMPLOYMENT

Whether contractions arise because of slower growth in potential output or because actual output falls below potential, they bring bad times. In either case, output falls (or at least grows more slowly), implying reduced living standards. Contractionary output gaps are particularly frustrating for policymakers, because they imply that the economy has the capacity to produce more but for some reason available resources are not being fully utilised. Contractionary gaps are inefficient in that they unnecessarily reduce the total economic pie, making the typical person worse off. This is especially the case in recessions.

An important indicator of the low utilisation of resources during contractions is the unemployment rate. In general, a high unemployment rate means that labour resources are not being fully utilised, so that output has fallen below potential (a contractionary gap). By the same logic, an unusually low unemployment rate suggests that labour is being utilised at a rate greater than normal, so that actual output exceeds potential output (an expansionary gap).

To better understand the relationship between the output gap and unemployment, recall from Chapter 5 the three broad types of unemployment: frictional unemployment, structural unemployment and cyclical unemployment. Frictional unemployment is the short-term unemployment that is associated with workers moving between jobs. Some amount of frictional unemployment is necessary for the labour market to function efficiently in a dynamic, changing economy. Structural unemployment is the long-term and chronic unemployment that occurs even when the economy is producing at its normal rate. Structural unemployment often results when workers' skills are outmoded and do not meet the needs of employers—so, for example, steelworkers may become structurally unemployed as the steel industry goes into a long-term decline, unless those workers can retrain to find jobs in growing industries. Finally, cyclical unemployment is the extra unemployment that occurs during periods of recession. Unlike cyclical unemployment, which is present only during recessions, frictional unemployment and structural unemployment are always present in the labour market, even when the economy is operating normally. Recall from Chapter 5 that economists call the part of the total unemployment rate that is attributable to frictional and structural unemployment the **natural rate of unemployment**. Put another way, the natural rate of unemployment is the unemployment rate that prevails when cyclical unemployment is zero, so that the economy has neither a contractionary nor an expansionary output gap. We will denote the natural rate of unemployment as U^*.

Cyclical unemployment, which is the difference between the total unemployment rate and the natural rate, can thus be expressed as $U - U^*$, where U is the actual unemployment rate and U^* denotes the natural rate of unemployment. In a contraction, the actual unemployment rate, U, exceeds the natural unemployment rate, U^*, so cyclical unemployment, $U - U^*$, is positive. When the economy experiences an expansionary gap, in contrast, the actual unemployment rate is lower than the natural rate, so that cyclical unemployment is negative. Negative cyclical unemployment corresponds to a situation in which labour is being used more intensively than normal, so that actual unemployment has dipped below its usual frictional and structural levels.

THINKING AS AN ECONOMIST 6.1

What factors influence the natural rate of unemployment?

Have another look at the unemployment data graphed in Figure 6.2. A striking feature of Australia's unemployment experience is a shift in the average rate of unemployment around the mid-1970s with relatively high rates of unemployment persisting until the early 1990s. The rate of unemployment then steadily (but slowly) declined, a state of affairs that lasted until the Global Financial Crisis, when unemployment again appeared to shift upwards, however this time by a relatively small amount.

Disentangling the many factors that influence the unemployment rate is never easy. Nevertheless, many economists believe that to understand these long trends in the unemployment rate, it is important to think of the role that changes in the natural rate of unemployment may have played. For example, if various factors led to an increase in the natural rate of unemployment in the mid-1970s, even if cyclical unemployment had been eliminated, unemployment in Australia would have been much higher than was the case previously. However, determining exactly how much of the increase in unemployment we have seen in Australia has been due to changes in the natural rate has proven to be a difficult task, since there are no official data on the natural rate of unemployment. Instead, researchers must infer estimates of the natural rate based on the behaviour of economic variables that are believed to have an important influence on non-cyclical unemployment (see Groenewold and Hagger 2000). Specifically, these are factors that relate to frictional and structural unemployment.

A variety of ideas have been advanced to explain increases in both types of unemployment. One suggestion is that the generosity of the unemployment benefits available, which improved quite significantly in the mid-1970s in Australia, lengthened the amount of time that unemployed people spent searching for work (remember, we are not talking about cyclical unemployment in this context, so presumably there are jobs on offer). Once again, this is an application of the cost–benefit principle. With more generous income support during periods of unemployment, the cost of spending time without work is reduced. And, unlike many other countries, the unemployment benefit did not cut out in Australia after a specified period (although recipients of the benefit have to demonstrate a preparedness to seek work actively).

What explains the long-term fall in the rate of unemployment since the early 1990s? A variety of ideas have been advanced to explain declines in both frictional and structural unemployment over this period. One suggestion is based on the changing age structure of the labour force. According to the Australian Bureau of Statistics (2018), the average age of Australian workers is rising, reflecting the aging of the baby boom generation. Indeed, over the past four decades, the share of the labour force aged 15–24 has fallen from about 28 per cent to around 17 per cent. Since young workers are more prone to unemployment than older workers, the ageing of the labour force may help to explain the overall decline in unemployment.

Why are young workers more likely to be unemployed? Compared to teenagers and workers in their twenties, older workers are much more likely to hold long-term, stable jobs.

In contrast, younger workers tend to hold short-term jobs, perhaps because they are not ready to commit to a particular career or because their time in the labour market is interrupted by education. Because they change jobs more often, younger workers are more prone than others to frictional unemployment. They also have fewer skills, on average, than older workers, so they may experience more structural unemployment. As workers age and gain experience, their risk of unemployment declines.

Another possible explanation for the declining natural rate of unemployment is that labour markets have become more efficient at matching workers with jobs, thereby reducing both frictional and structural unemployment. For example, agencies that arrange temporary help have become much more commonplace in Australia in recent years. Although the placements these agencies make are intended to be temporary, they often become permanent when an employer and worker discover that a particularly good match has been made. Online job services, which allow workers to search for jobs nationally and even internationally, have also become increasingly important. By reducing the time people must spend in unemployment and by creating more lasting matches between workers and jobs, temporary help agencies, online job services, job-search apps and similar innovations may have reduced the natural rate of unemployment.

References

Australian Bureau of Statistics 2018, 'Labour force, Australia, Jul 2018', Cat. no. 6202.0.
Groenewold N and Hagger AJ 2000, 'The natural rate of unemployment in Australia: Estimates from a structural VAR', *Australian Economic Papers*, vol. 39, no. 2, June, pp. 121–37.

6.2.3 OKUN'S LAW

What is the relationship between an output gap and the amount of cyclical unemployment in the economy? By definition, cyclical unemployment is positive when the economy has a contractionary gap, negative when there is an expansionary gap and zero when there is no output gap. A more quantitative relationship between cyclical unemployment and the output gap is given by a rule of thumb called **Okun's law**, after Arthur Okun, one of President John F Kennedy's chief economic advisers in the early 1960s. According to Okun's law, each extra percentage point of cyclical unemployment is associated with approximately a two-percentage-point increase in the output gap, measured in relation to potential output. Okun's calculation related to the United States. For Australia, the figure is slightly lower—around 1.8 (this figure is based on calculations made by researchers at the International Monetary Fund: see Ball, Leigh & Loungani 2013). So, for example, if cyclical unemployment is equal to 2 per cent of the labour force, the contractionary gap will be 3.6 per cent of potential GDP.

In symbols, Okun's law can be written as:

$$100 \times \left(\frac{Y - Y*}{Y*}\right) = -\beta \times (U - U*)$$ **Equation 6.1**

where β is 1.8 for Australia.

Example 6.1 illustrates further.

EXAMPLE 6.1 – OKUN’S LAW AND THE OUTPUT GAP IN THE AUSTRALIAN ECONOMY

Below are the actual unemployment rate, estimates of the natural unemployment rate and potential GDP (in millions of dollars) for the Australian economy in three selected years. Using Okun’s law, estimate the output gap in each year, in millions of dollars.

QUARTER	*U*	*U**	*Y**($ MIL. 2006–07 PRICES)
June 1983	10.3%	8.08%	118 658.3
June 1992	10.5%	9.14%	155 972.3
March 2006	5.1%	4.93%	254 582.8

Source: Based on Australian Bureau of Statistics 2018 data on unemployment rate, natural unemployment rate and potential GDP.

In the June quarter of 1983, cyclical unemployment, $U - U^*$, was 10.3 – 8.08 per cent, or 2.22 per cent of the labour force. According to Okun's law, the output gap for that year would be 1.8 times that percentage, or 4 per cent of potential output. Since potential output in June 1983 was $118 658.3 million, the value of the output gap for that quarter was 4 per cent of $118 658 million, or $4 746.32 million.

In the June 1992 quarter, cyclical unemployment was 10.5 – 9.14 per cent, or 1.36 per cent of the labour force. According to Okun's law, the output gap for June 1992 would be 2.45 per cent of potential GDP. Since potential GDP in June 1992 was $155 972.3 million, the output gap in that quarter would have been 2.45 per cent of $155 972.3 million, or $3821.3 million.

Both June 1983 and June 1992 were periods of recession, so the output gaps were recessionary gaps. In contrast, March 2006 was a year in which unemployment was very much closer to our estimate of the natural rate, and the economy experienced neither an expansionary nor a contractionary gap. Cyclical unemployment in March 2006 was very small and, as a result, there was no significant output gap to speak of.

CONCEPT CHECK 6.1

In 2003 the Australian unemployment rate averaged about 6 per cent. Assuming that the natural rate is 5.5 per cent, by what percentage amount did actual GDP differ from potential GDP in 2003?

The output losses sustained in recessions, calculated according to Okun's law, can be quite significant. In Example 6.1 we found the Australian output gap in the June quarter of 1992 to be $3821.32 million, measured in 2006–07 prices. The Australian adult population in June 1992 was 13.591 million. Hence the output loss per adult person *in that quarter* equalled the total output gap of $3821.32 million divided by 13.591 million people, or about $281 per adult, in 2006–07 prices. To put this in perspective, average earnings in the June quarter of 1992 in Australia were $3 019 in 2006/07 prices. The output loss per adult of $281 therefore represents around 3% of the average person's earning. Calculations based on weekly earnings—OECD, Weekly Earnings: All activities for Australia [LCEATT02AUQ189S], retrieved from FRED—deflated by the implicit price deflator or GDP (rebased to 2006/07 prices)—OECD, GDP implicit price deflator in Australia [AUSGDPDEFQISMEI], retrieved from FRED. This calculation implies that output gaps and cyclical unemployment may have significant costs—a conclusion that justifies the concern that the public and policymakers have about contractions and recessions.

▹▹ RECAP

The economy's potential output is the level of output that can be produced if factors of production are being utilised at their normal level. Should output fall below its potential, the economy is said to have a contractionary gap. Contractionary gaps are a problem for the economy as they imply that more output could be enjoyed if the contractionary gap could be eliminated. Output above its potential is known as an expansionary gap. Expansionary gaps are a problem as they usually create inflationary pressures.

The economy's natural rate of unemployment is unemployment that would be present even if the economy was not in contraction or recession; this comprises frictional and structural unemployment. A variety of reasons have been forwarded to explain why Australia's natural rate of unemployment is now higher than it once was, including the relative generosity of Australia's unemployment benefits.

Okun's law describes a systematic relationship between cyclical unemployment and the output gap. For Australia, each extra percentage point of cyclical unemployment is associated with about a 1.8 percentage point increase in the output gap, measured in relation to potential output. This suggests that the economic costs of a recession, per person, can be quite significant.

6.3 WHY DO SHORT-TERM FLUCTUATIONS OCCUR? A PREVIEW AND A PARABLE

What causes periods of contraction and expansion? In the preceding section we discussed two possible reasons for slowdowns and speed-ups in real GDP growth. First, growth in potential output itself may slow down or speed up, reflecting changes in the growth rates of available capital and labour and in the pace of technological progress. Second, even if potential output is growing normally, actual output may be higher or lower than potential output—that is, contractionary or expansionary output gaps may develop. Later in this book, when we explicitly address long-run issues in macroeconomics, we will discuss some of the reasons why growth in potential output can vary, and the options that policymakers have for stimulating its growth. In Chapter 7 we will address the question of how output gaps can arise or what policymakers should do in response, *on the assumption that the economy's potential output is constant*. This assumption enables us to focus exclusively on output fluctuations associated with expansionary or contractionary gaps. Most economists believe that this assumption is justified when studying business cycle fluctuations, since they believe that the factors that affect long-run growth in potential output are substantially different from the factors leading to contractionary and expansionary gaps.

Here is a brief preview of the main conclusions of Chapter 7:

1. A standard assumption in a lot of economics is that prices adjust quickly in response to market forces. For example, should demand for a product fall,

the price of that product will also fall as firms try to restore their sales. On the other hand, should demand rise, the scarcity of productive inputs means that firms can only expand production by incurring higher costs and this will then be reflected in higher prices. However, in macroeconomics, there is a belief that over short periods of time the assumption that prices will adjust immediately to changes in market conditions is not always realistic. Instead, many firms adjust the prices of their output only periodically. Rather than changing prices with every variation in demand, firms tend to adjust to changes in demand in the *short run* by varying the quantity of output they produce and sell. This type of behaviour is known as 'meeting the demand' at a preset price.

2. Because, in the short run, firms tend to meet the demand for their output at preset prices, changes in the amount that customers decide to spend will affect output. When total spending is low for some reason, output may fall below potential output; conversely, when spending is high, output may rise above potential output. In other words, *changes in economy-wide spending are the primary cause of output gaps*. Thus, government policies can help to eliminate output gaps by influencing total spending. For example, the government can affect total spending directly simply by changing its own level of purchases.

   Later in the book we will extend the time horizon we are analysing to one where the economy's price level begins to adjust in response to changes in aggregate demand. The main points we will cover with this material are previewed next.

3. Although firms tend to meet demand in the short run, they will not be

willing to do so indefinitely. If customer demand continues to differ from potential output, firms will eventually adjust their prices to eliminate output gaps. If demand exceeds potential output (an expansionary gap) firms will raise their prices aggressively, spurring inflation. If demand falls below potential output (a contractionary gap) firms will raise their prices less aggressively or even cut prices, reducing inflation.

4. Over the *long run*, price changes by firms eliminate any output gap and bring production back into line with the economy's potential output. Thus, the economy is 'self-correcting', in the sense that it operates to eliminate output gaps over time. Because of this self-correcting tendency, in the long run actual output equals potential output, so that output is determined by the economy's productive capacity rather than by the rate of spending. In the long run, total spending influences only the rate of inflation.

   These ideas will become clearer as we proceed through the remaining chapters of the book. Before plunging into the details of the analysis, though, let us consider an example that illustrates the links between spending and output in the short and long run. It will be useful to keep this example in mind as you work through the rest of the material in this book.

Lisa's Ice-cream Store

Lisa's Ice-cream Store produces gourmet ice-cream on the premises and sells it directly to the public. What determines the amount of ice-cream that Lisa produces daily? The productive capacity, or potential output, of the shop is one important factor. Specifically, Lisa's potential output of ice-cream depends on the amount of capital (number of ice-cream makers) and labour (number of workers) that she employs, and on the productivity of that capital and labour. Although Lisa's potential output usually changes rather slowly, on occasion it can fluctuate significantly—for example, if an ice-cream maker breaks down or Lisa contracts the flu.

The main source of day-to-day variations in Lisa's ice-cream production, however, is not changes in potential output but fluctuations in the demand for ice-cream by the public. Some of these fluctuations in spending occur predictably over the course of the day (e.g. more demand in the afternoon than in the morning), the week (e.g. more demand on weekends) or the year (e.g. more demand in the summer). Other changes in demand are less regular: for example, more demand on a hot day than a cool one or when a street parade is passing by the store. Some changes in demand are hard for Lisa to interpret: for example, a surge in demand for rocky road ice-cream on one Tuesday could reflect a permanent change in consumer tastes or it might just be a random, one-time event.

How should Lisa react to these ebbs and flows in the demand for ice-cream? Basic supply-and-demand analysis, if applied to the market for ice-cream, would predict that the price of ice-cream should change with every change in the demand for ice-cream. For example, prices should rise just after people from the movie theatre next door to Lisa's shop come out on Friday night, and they should fall on unusually cold, blustery days, when most people would prefer a hot chocolate to an ice-cream. Indeed, taken literally, the supply-and-demand model predicts that ice-cream prices should change almost moment to moment. Imagine Lisa standing in front of her shop like an auctioneer, calling out prices to determine how many people are willing to buy at each price!

Of course, we do not expect to see this behaviour by an ice-cream store owner. Price setting by auction does in fact occur in some markets, such as the market for grain or the share market, but it is not the normal procedure in most retail markets, such as the market for ice-cream. Why this difference? The basic reason is that sometimes the economic benefits of hiring an auctioneer and setting up an auction exceed the costs of doing so, and sometimes they do not. In the market for grain, for example, many buyers and sellers gather together in the same place at the same time to trade large volumes of standardised goods (bushels of grain). In that kind of situation, an auction is an efficient way to determine prices and balance the quantities supplied and demanded. In an ice-cream store, by contrast, customers come in by twos and threes at random times throughout the day. Some want milkshakes, some cones of ice-cream and some soft drinks. With small numbers of customers and a low sales volume at any given time, the costs involved in selling ice-cream by auction are much greater than the benefits of allowing prices to vary with demand.

So how does Lisa deal with changes in the demand for ice-cream? Observation suggests that she begins by setting prices based on the best information she has about the demand for her product and the costs of production. Perhaps she prints up a menu or makes a sign announcing the prices. Then, over a period, she will keep her prices fixed and serve as many customers as want to buy (up to the point where she runs out of ice-cream at these prices). This behaviour is what we call ‘meeting the demand’ at preset prices, and it implies that, *in the short run*, the amount of ice-cream Lisa produces and sells is determined by the demand for her products.

However, *in the long run* the situation is quite different. Suppose, for example, that Lisa’s ice-cream earns a city-wide reputation for its freshness and flavour. Day after day, Lisa observes long lines in her store. Her ice-cream maker is overtaxed, as are her employees and her table space. There can no longer be any doubt that, at current prices, the quantity of ice-cream the public wants to consume exceeds what Lisa is able and willing to supply on a normal basis (her potential output). Expanding the store is an attractive possibility, but not one (we assume) that is immediately feasible. What will Lisa do?

Certainly, one thing Lisa can do is raise her prices. At higher prices, Lisa will earn higher profits. Moreover, raising ice-cream prices will bring the quantity of ice-cream demanded closer to Lisa’s normal production capacity—her potential output. Indeed, when the price of Lisa’s ice-cream finally rises to its equilibrium level, the shop’s actual output will equal its potential output. Thus, over the long run, ice-cream prices adjust to their equilibrium level, and the amount that is sold is determined by potential output.

This example illustrates in a simple way the links between spending and output—except, of course, that we must think of this story as applying to the whole economy, not to a single business. The key point is that there is an important difference between the short run and the long run. In the short run, producers often choose not to change their prices but rather to meet the demand at preset prices. Because output is determined by demand, in the short run total spending plays a central role in determining the level of economic activity. Thus, Lisa's ice-cream store enjoys an expansion on an unusually hot day, when the demand for ice-cream is strong, while an unseasonably cold day brings an ice-cream contraction. But, in the long run, prices adjust to their market-clearing levels, and output equals potential output. Therefore, the quantities of inputs and the productivity with which they are used are the primary determinants of economic activity in the long run. Although total spending affects output in the short run, in the long run its main effects are on prices.

BACKGROUND BRIEFING 6.3

Housing and the Global Financial Crisis

The US house price bubble that burst in mid-2006 is widely regarded as a primary cause of the US recession, and in turn contributing to the Global Financial Crisis. The average price of US homes rose at a spectacular rate from the late 1990s until the middle of 2006; this phenomenon attracted both borrowers and lenders who wished to profit from the record real estate boom. This was unprecedented in post-war US history, as shown in Figure 6.8. The highest average annual rate of increase in house prices previously was the spike of 1976 to 1979, when house prices rose 4.9 per cent per year. By contrast, from 2001 to 2006, average house prices rose by an average of 7 per cent per year. This number masks the fact that over the period the rate of increase itself rose, starting at 4 per cent in 2001 and peaking at an annual rate of 12 per cent in 2004–05.

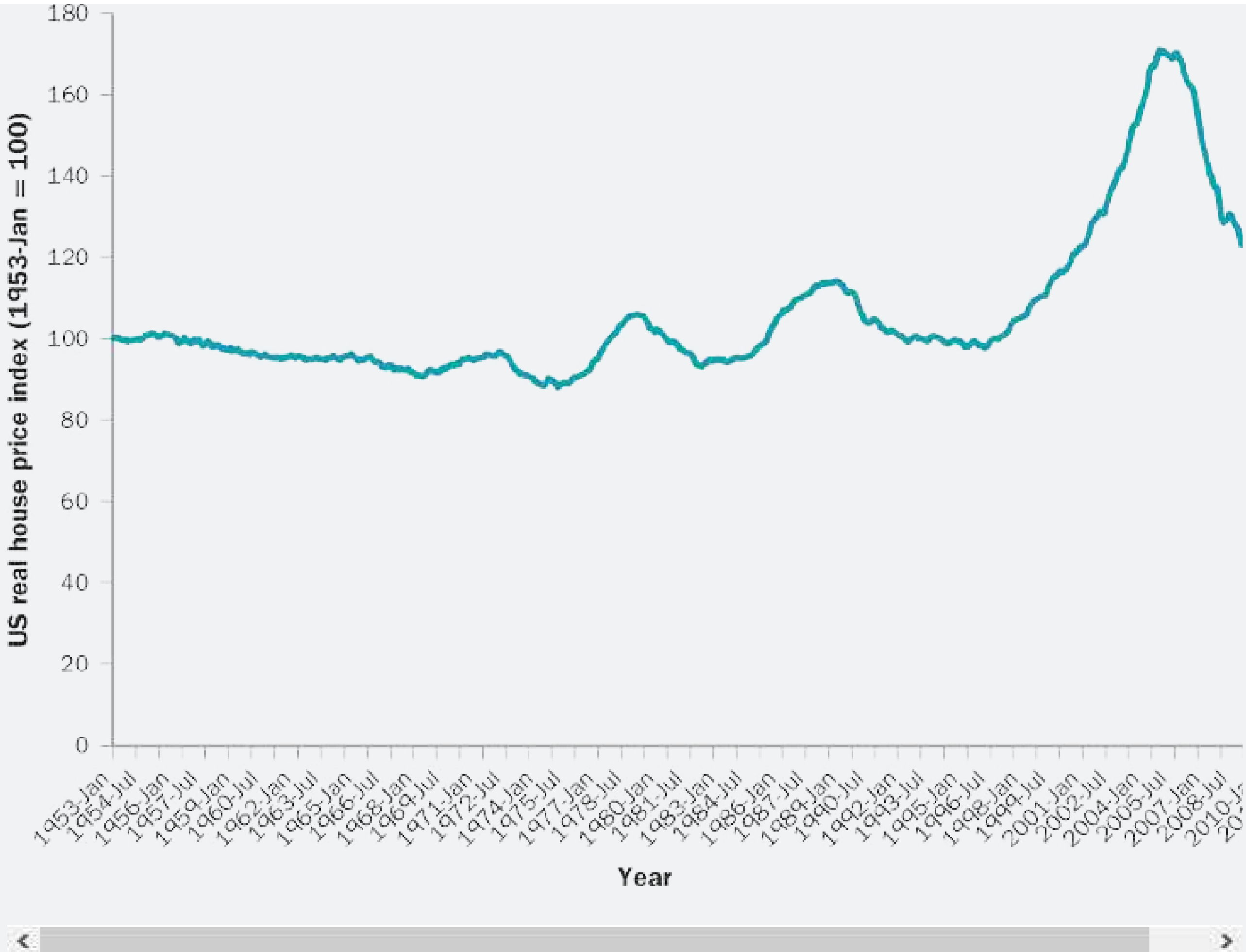

Figure 6.8 **Index of US house prices, 1953–2011**

Note: An important contributing factor to the Global Financial Crisis was the bursting of the house price bubble in the United States in 2006–07.

Source: Based on data in Robert J. Shiller's *Irrational Exuberance* (2001, Broadway Books), available at www.econ.yale.edu/~shiller/data.htm.

At the growth rates experienced in the 1970s and 1980s, the average price of a US house doubled in 15 to 19 years. By contrast, at the growth rates experienced in the recent house price boom, the average price of a house doubles in about 10 years, that is, between 50 per cent and 100 per cent faster than ever before.

Why did the US house price bubble grow so large? Three factors seem to have been particularly important. First, households began using real estate generally, and their own homes in particular, as the primary means of increasing their wealth rather than doing so through saving. This trend should have led to an increase in interest rates, which in turn would have slowed down the formation of the bubble or perhaps even punctured it. Rates did not rise, however, which leads to the second factor in the story: the globalisation of international capital markets, and the consequent increase in the supply of saving available to US borrowers, kept interest rates from rising and pricking the bubble. Third, the US Federal Reserve did not begin to raise interest rates until mid-2004, and only then in quarter-percentage-point increments. This action was not enough to stop the bubble from growing.

The average US home price peaked in July 2006. Prices at first fell gradually, declining by about 6 per cent from July 2006 to May 2007. The decline then accelerated, and between May 2007 and February 2009 the average home price dropped by 19 per cent.

The bursting of the house price bubble in the United States had repercussions all over the world. We will take up this further in Chapter 7.

▹▹ RECAP

Over short periods of time, firms rarely adjust prices in response to changes in demand. Instead, production is adjusted to meet demand. So if demand falls, instead of prices falling, output is reduced. This might mean laying off some workers until demand once again picks up. If this experience is repeated economy-wide, the result will be a contraction. Should demand increase, instead of prices increasing, output will be increased. This could be achieved by asking workers to increase their supply of overtime hours. If repeated economy-wide, the result will be an expansion.

Over longer periods of time, prices begin to adjust in the wake of changes in demand. As a result, demand would once again be brought into alignment with the economy's normal, or potential, level of output.

SUMMARY

- Real GDP does not grow smoothly. Periods in which the economy is growing at a rate significantly below normal are called *contractions*; periods in which the economy is growing at a rate significantly above normal are called *expansions*. Particularly severe contractions are known as *recessions*.
- The beginning of a recession is called a *peak*, because it represents the high point of economic activity prior to a downturn. The end of a recession, which marks the low point of economic activity prior to a recovery, is called a *trough*.
- *Expansions* describe the path the economy takes between a trough and a peak; *contractions* refer to the economy's path between a peak and a trough.
- Short-term economic fluctuations are irregular in length and severity, and are thus hard to forecast. Expansions and contractions are typically felt throughout the economy and may even be global in scope. Unemployment rises sharply during recessions, while inflation tends to fall during or shortly after a recession. Durable goods industries tend to be particularly sensitive to recessions and booms, whereas services and non-durable goods industries are less sensitive.
- *Potential output*, also called potential GDP or full-employment output, is the amount of output (real GDP) that an economy can produce when it is using its resources, such as capital and labour, at

normal rates. The difference between potential output and actual output is the *output gap*. When output is below potential, the gap is called a *contractionary gap*; when output is above potential, the difference is called an *expansionary gap*. Because recessionary gaps represent wasted resources and expansionary gaps threaten to create inflation, policymakers have an incentive to try to eliminate both types of gap.

- *The natural rate of unemployment* is the part of the total unemployment rate that is attributable to frictional and structural unemployment. Equivalently, the natural rate of unemployment is the rate of unemployment that exists when the output gap is zero. Cyclical unemployment, the part of unemployment that is associated with recessions and expansions, equals the total unemployment rate less the natural unemployment rate. Cyclical unemployment is related to the output gap by Okun's law, which states that each extra percentage point of cyclical unemployment is associated with about a 1.8-percentage-point increase in the output gap in Australia, measured in relation to potential output.

- In the next four chapters our study of contractions and expansions will focus on the role of economy-wide spending. If firms adjust prices only periodically, and in the meantime produce enough output to meet demand, then fluctuations in spending will lead to fluctuations in output over the short run. During that short-run period, government policies that influence aggregate spending may help to eliminate output gaps. In the long run, however, firms' price changes will eliminate output gaps—that is, the economy will ‘self-correct’—and total spending will influence only the rate of inflation.

KEY TERMS

boom 141

classical cycle 136

contraction 137

contractionary gap 145

expansion 137

expansionary gap 145

growth cycle 137

natural rate of unemployment, U* 146

Okun's law 148

output gap 145

peak 136

potential output, Y* (or potential GDP or full-employme

nt output) 145

trough 137

REVIEW QUESTIONS

1. Define ‘contraction’ and ‘expansion’. What are the beginning and ending points of a recession called? In post-war Australia, which have been longer on average—contractions or expansions? LO 6.1 **EASY**
2. Why is the traditional term ‘business cycles’ a misnomer? How does your answer relate to the ease or difficulty of forecasting peaks and troughs? LO 6.1 **MEDIUM**
3. Which firm is likely to see its profits reduced the most in a recession: a car manufacturer, a manufacturer of boots and shoes, or a building maintenance service? Which is likely to see its profits reduced the least? Explain. LO 6.4 **MEDIUM**
4. How is each of the following likely to be affected by a recession: the natural unemployment rate, the cyclical unemployment rate, the inflation rate, the poll ratings of the prime minister? LO 6.5 **EASY**
5. Define potential output. Is it possible for an economy to produce an amount greater than potential output? Explain. LO 6.5 **EASY**
6. True or false: All recessions are the result of output gaps. Explain. LO 6.5 **MEDIUM**
7. True or false: When output equals potential output, the unemployment rate is zero. Explain. LO 6.5 **EASY**
8. If the natural rate of unemployment is 5 per cent, what is the total

rate of unemployment if output is 2 per cent below potential output? What if output is 2 per cent above potential output?
LO 6.5 **MEDIUM**

PROBLEMS

1. Using Table 6.1, find the average duration, the minimum duration and the maximum duration of expansions in Australia since 1959. Are expansions getting longer or shorter on average over time? Is there any tendency for long expansions to be followed by long recessions? LO 6.1 **EASY**
2. From the home page of the Australian Bureau of Statistics (www.abs.gov.au), obtain quarterly data for real GDP for 1990 and 1991. Did the 1991 recession satisfy the informal criterion that a recession must involve two consecutive quarters of negative GDP growth? LO 6.1 **HARD**
3. From the home page of the Australian Bureau of Statistics (www.abs.gov.au), obtain the most recent available data on the unemployment rate for workers aged 15–19 and workers aged 20 or over. How do they differ? What are some of the reasons for the difference? How does this difference relate to the decline in the overall natural rate of unemployment since 1980? LO 6.5 **HARD**
4. Using Okun's law, fill in the four pieces of missing data in the table below. The data are hypothetical. LO 6.5 **MEDIUM**

YEAR	REAL GDP	POTENTIAL GDP	NATURAL UNEMPLOYMENT RATE (%)	ACTU UNEMPLO RATE
2012	7840	8000	(a)	6
2013	8100	(b)	5	5
2014	(c)	8200	4.5	4
2015	8415	8250	5	(d)

REFERENCES

Australian Bureau of Statistics 2018, ‘Consumer price index’, Cat. no. 6401.0, www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6401.0Sep%202018?OpenDocument.

Australian Bureau of Statistics 2018, ‘Labour force, Australia, Jul 2018’, Cat. no. 6202.0, www.abs.gov.au/ausstats/abs@.nsf/mf/6202.0.

Bacigalupe A, Esnaola S and Martín U 2016, ‘The impact of the Great Recession on mental health and its inequalities: The case of a Southern European region, 1997–2013’, *Int J Equity Health*, vol. 15, no. 17, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4727262/.

Ball L, Leigh D and Loungani P 2013, ‘Okun’s Law: fit at 50?’, International Monetary Fund Working Paper WP/13/10, www.imf.org/external/pubs/ft/wp/2013/wp1310.pdf.

Bernanke B 2004, ‘The Great Moderation’, Remarks at the meetings of the Eastern Economic Association, Washington DC, 20 February, www.federalreserve.gov/boarddocs/speeches/2004/20040220/default.htm.

Cecchetti SG, Flores-Lagunes A, Krause S, Kent C and Norman D 2005, ‘The changing nature of the business cycle’, www.rba.gov.a u/publications/confs/2005/index.html.

Cohen P 2015, ‘How the American family was affected by the Great Recession’, *Pacific Standard*, 5 February, https://psmag.com/economics/how-the-american-family-was-affected-by-the-great-recession.

‘Depression’s effect on family life’, *The News*, 2 May 1932, p. 4, retrieved from Trove, http://nla.gov.au/nla.news-article129050630, accessed 15 October 2018.

Groenewold N and Hagger AJ 2000, ‘The natural rate of unemployment in Australia: Estimates from a structural VAR’, *Australian Economic Papers*, vol. 39, no. 2, June, pp. 121–37.

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Melbourne Institute n.d., ‘Macroeconomic reports’, https://melbourneinstitute.unimelb.edu.au/publications/macroeconomic-reports.

McDonald IM 2003, ‘For the student: Demographic change and the Japanese recession’, *Australian Economic Review*, vol. 36, no. 4, December, pp. 442–58.

National Bureau of Economic Research 2018, ‘US business cycle expansions and contractions’, www.nber.org/cycles/cyclesmain.html.

Organization for Economic Co-operation and Development n.d., ‘Constant price gross domestic product in Australia’, retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/AUSGDPRQDSMEI.

Organization for Economic Co-operation and Development n.d., ‘Harmonized unemployment rate: Total: all persons for Australia’ (LRHUTTTTAUM156S), retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/tags/series?t=australia%3Bunemployment.

Organization for Economic Co-operation and Development 2018, ‘Main economic indicators–complete database’, http://dx.doi.org/10.1787/data-00052-en, accessed 15 October 2018.

Shiller RJ 2001, *Irrational Exuberance*, Broadway Books, www.econ.yale.edu/~shiller/data.htm.

US Bureau of Labor Statistics n.d., ‘Civilian unemployment rate’, retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/UNRATE/.

US Bureau of Labor Statistics n.d., ‘Consumer price index for all urban consumers: All items’, retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/CPIAU

CSL.

US Bureau of Labor Statistics n.d., ‘Consumer price index for all urban consumers: All items less food and energy’, retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/CPILFESL.

CHAPTER 7

Spending and output in the short run

After reading this chapter, you should be able to answer the following questions.

7.1 What is the key assumption of the basic Keynesian model?

a) To what time frame does the basic Keynesian model apply?

7.2 What are the four components of the economy's planned aggregate expenditure?

7.3 What is the consumption function?

a) What is the difference between exogenous and induced consumption?

7.4 In what way is planned aggregate expenditure linked to aggregate output?

7.5 What is meant by equilibrium output?

a) How does equilibrium relate to (i) planned aggregate expenditure and output, and (ii) planned injections and withdrawals?

b) Starting from a point of disequilibrium, how does the economy reach its equilibrium?

c) What is meant by the paradox of thrift?

d) How are output gaps created?

e) Why is the value of the multiplier greater than 1?

SETTING THE SCENE

Your great-grandparents', and perhaps your grandparents', generation lived through the turmoil of the Great Depression. At its height, roughly between 1929 and 1931, Australia's real gross domestic product (GDP) fell by 10 per cent. From Okun's law (see Chapter 6), we can predict that this would have been associated with a significant increase in unemployment—in fact, Australia's rate of unemployment rapidly approached 20 per cent. As we noted in Chapter 1, this was an economic catastrophe.

At the time, the Great Depression raised serious doubts about economists' orthodox thinking—while a great many remedies were suggested, in the end, economists seemed powerless to offer advice to the government that might turn the economy around. Faced with an economic calamity that the prevailing theories of the day were unable to explain, it is not at all surprising that economists underwent a crisis of confidence. Future Nobel Laureate Paul Samuelson, who began his prestigious career around the time of the Great Depression, characterised the sense of hopelessness felt by economists in the following terms: ‘it was realised with a belated sense of recognition that one no longer had faith, that one had been living without faith for a long time, and what, after all, was the difference’ (Winch 1969).

A new way of thinking about the economy, one that explained events like the Great Depression but one that also provided guidance as to possible preventive measures, was required. This new way of thinking was provided by John Maynard Keynes (1883–1946), perhaps the most influential economist of the past 100 years. Keynes (pronounced ‘canes’) was a remarkable individual who combined a brilliant career as an economic theorist with an active life in diplomacy, finance, journalism and the arts. He first came to prominence at the end of World War I, when he attended the Versailles peace conference as a representative of the British Treasury. He was appalled by the short-sightedness of the diplomats at the conference, particularly their insistence that the defeated Germans make huge compensatory payments (called reparations) to the victorious nations. In his widely read book *The Economic Consequences of the Peace* (1919), Keynes argued that the reparations imposed on Germany were impossibly large, and that attempts to extract the payments would prevent Germany's economic recovery and perhaps lead to another war. Unfortunately for the world, he turned out to be right.

In the period between the two world wars, Keynes held a professorship at Cambridge University, where his father had taught economics. Keynes's early writings had been on mathematics and logic, but after his experience in Versailles he began to work primarily on economics, producing several well-regarded books. He developed an imposing intellectual reputation, editing Great Britain's leading scholarly journal in economics (*The Economic Journal*, published by the Royal Economic Society), writing articles for newspapers and magazines, advising the government and playing a major role in the political and economic debates of the day. On the side, Keynes made fortunes both for himself and for King's College (a college of Cambridge University) by speculating in international currencies and commodities. He was also an active member of the Bloomsbury group, a circle of leading artists, performers and writers that included EM Forster and Virginia Woolf. In 1925, Keynes married the glamorous Russian ballerina Lydia Lopokova. Theirs was by all accounts a very successful marriage, and Keynes devoted significant energies to managing his wife's career and promoting the arts in Britain.

Like other economists of the time, Keynes struggled to understand the Great Depression that gripped the world in the 1930s. His work on the problem led to the publication in 1936 of the General Theory of Employment, Interest and Money ('The general theory'). In The general theory, Keynes tried to explain how economies can remain at low levels of output and employment for protracted periods. He stressed several factors, most notably that aggregate spending may be too low to permit full employment during such periods. Keynes recommended increases in government spending as the most effective way to increase aggregate spending and restore full employment.

The general theory is a difficult book, reflecting Keynes's own struggle to understand the complex causes of the Great Depression. In retrospect, some of The general theory's arguments seem unclear or even inconsistent. Yet the book is full of fertile ideas, many of which had a worldwide impact and eventually led to what has been called the Keynesian revolution. Over the years, many economists have added to or modified Keynes's conception, to the point that Keynes himself, were he alive today, probably would not recognise much of what is now called 'Keynesian economics'. But the ideas that insufficient aggregate spending can lead to contraction and that government policies can help to restore full employment are still critical to

Keynesian theory.

In 1937, a heart attack curtailed Keynes’s activities, but he remained an important figure on the world scene. In 1944 he led the British delegation to the international conference in Bretton Woods, New Hampshire, which established the key elements of the post-war international monetary and financial system, including the International Monetary Fund and the World Bank. Keynes died in 1946.

7.1 AN INTRODUCTION TO THE KEYNESIAN MODEL

LO 7.1, 7.1a

FIND ONLINE

The idea that a decline in aggregate spending may cause output to fall below potential output was one of the key insights of John Maynard Keynes. Over time, Keynes's ideas have been synthesised into what is now known as the Keynesian model. Here we outline a relatively simple version of the Keynesian model: the basic Keynesian model. We will find that this model provides a very powerful explanation for how contractions and expansions might evolve over the short run; this is the period during which firms adjust their output to match the prevailing level of demand without the price level having changed.

An implication of the basic Keynesian model is that government policies that affect the level of spending can be used to reduce or eliminate output gaps. Policies used in this way are called **stabilisation policies** . Keynes himself argued for the active use of fiscal policy—policy relating to government spending and taxes—to eliminate output gaps and stabilise the economy.

It is important to remember that the basic Keynesian model is not a complete or entirely realistic model of the economy, since it applies only to the relatively short period during which firms do not adjust their prices, but instead meet the demand forthcoming at preset prices. Furthermore, by treating prices as fixed, the basic Keynesian model presented in this chapter does not address the determination of inflation. Nevertheless, this model is an essential building block of leading current theories of short-run economic fluctuations and stabilisation policies. In later chapters we will extend the basic Keynesian model to incorporate inflation and other important features of the economy.

The basic Keynesian model is built on a key assumption, highlighted below. This assumption is that firms do not continuously change their prices as supply and demand conditions change; rather, over short periods, firms tend to keep their prices fixed and *meet the demand* that is forthcoming at those prices. As we will see, the assumption that firms vary their production to meet demand at preset prices implies that fluctuations in spending will have powerful effects on the nation's real GDP. In the short run, firms meet the demand for their products at preset prices.

Firms do not respond to every change in the demand for their products by changing their prices. Instead, they typically set a price for some period, then *meet the demand* at that price. By ‘meeting the demand’, we mean that firms produce just enough to satisfy their customers at the prices that have been set.

The assumption that, over short periods, firms meet the demand for their products at preset prices is generally realistic. Think of the stores where you shop. The price of a pair of jeans does not fluctuate from moment to moment according to the number of customers who enter the store or the latest news about the price of denim. Instead, the store posts a price and sells jeans to any customer who wants to buy at that price, at least until the store runs out of stock. Similarly, the local pizza restaurant may leave the price of its large pizza unchanged for months or longer, allowing its pizza production to be determined by the number of customers who want to buy at the preset price.

Firms do not normally change their prices frequently, because doing so would be costly. Economists refer to the costs of changing prices as **menu costs**. In the case of the pizza restaurant, the menu cost is literally just that—the cost of printing a new menu when prices change. Similarly, the clothing store faces the cost of re-marking all its merchandise if the manager changes prices. But menu costs may also include other kinds of costs—for example, the cost of doing a market survey to determine what price to charge and the cost of informing customers about price changes.

Thinking as an economist 7.1 discusses how technology may affect menu costs in the future.

THINKING AS AN ECONOMIST 7.1

Will new technologies eliminate menu costs?

Thanks to new technologies, changing prices and informing customers about price changes is becoming increasingly less costly. Will technology eliminate menu costs as a factor in price setting?

Keynesian theory assumes that costs of changing prices, which economists refer to as menu costs, are sufficiently large to prevent firms from adjusting prices immediately in response to changing market conditions. However, in many industries, new technologies have eliminated or greatly reduced the direct costs of changing prices. For example, the use of barcodes to identify individual products, together with scanner technologies, allows a grocery store manager to change prices with just a few keystrokes without having to change the price label on each can of soup or loaf of bread. Airlines use sophisticated computer software to implement complex pricing strategies, under which two travellers on the same flight from Sydney to Brisbane may pay very different fares, depending on whether they are business or holiday travellers, and on how far in advance their flights were booked. Online retailers, such as booksellers, have the ability to vary their prices by type of customer and even by individual customer, while other internet-based companies, such as eBay, allow for negotiation over the price of each individual purchase.

Will these reductions in the direct costs of changing prices make the Keynesian theory, which assumes that firms meet demand at preset prices, less relevant to the real world? This is certainly a possibility that macroeconomists must consider. However, it is unlikely that new technologies will eliminate the costs of changing prices in the near future. Gathering the information about market conditions needed to set the profit-maximising price—including the prices charged by competitors, the costs of producing the good or service and the likely demand for the product—will remain costly for firms. Another cost of changing prices is the use of valuable managerial time and attention needed to make informed pricing decisions. A subtler cost of changing prices—particularly raising prices—is that doing so may lead regular customers to rethink their choice of suppliers and decide to search for a better deal elsewhere.

Menu costs will not prevent firms from changing their prices indefinitely. As we saw in the case of Lisa's Ice-cream Store (Chapter 6), too great an imbalance between demand and supply, as reflected by a difference between sales and potential output, will eventually lead firms to change their prices. If no one is buying jeans, for example, at some point the clothing store will mark down its jeans prices. Or, if the pizza restaurant becomes the local hot spot, with a line of customers stretching out the door, eventually the manager will raise the price of a large pizza. Like other economic decisions, the decision to change prices reflects a cost–benefit comparison: prices should be changed if the benefit of doing so—the fact that sales will be brought more nearly in line with the firm's normal production capacity—outweighs the menu costs associated with making the change. As we have stressed, the basic Keynesian model developed in this chapter ignores the fact that prices will eventually adjust, and should therefore be interpreted as applying to the short run.

There is one important implication, which should be noted at the outset. As the short run is defined as the period in which prices do not change, there is no necessary distinction between real and nominal variables such as GDP. The Keynesian model explains why the values of real variables might change over short periods of time. Since prices are not changing over this period, any changes in real variables will be reflected in equivalent changes to the corresponding nominal variables. This concept will not be appropriate from Chapter 9 onwards, when we extend the period of analysis to allow prices to change. Then, the respective values of real and nominal variables can be quite different.

▹▹ RECAP

The basic Keynesian model is an analysis of the economy over the short run. This is the period in which firms match their production to the level of demand, rather than responding to price. In fact, in the basic Keynesian model the price level is held constant. This is another way of thinking about the short run; it is the period in which prices do not adjust in response to changes in demand.

7.2 AGGREGATE EXPENDITURE

LO 7.2

FIND ONLINE

In Keynesian theory, output at each point in time in the economy is determined by the amount that people throughout the economy want to spend—what we will refer to as **planned aggregate expenditure (PAE)**. Specifically, planned aggregate expenditure is total planned spending on final goods and services.

The four components of spending on final goods and services were introduced in Chapter 2:

1. *Consumer expenditure*, or *consumption* (*C*), is spending by households on final goods and services. Examples of consumer expenditure are spending on food, clothes and entertainment, and on consumer durable goods like cars and furniture.
2. *Investment* (*I*) is spending by firms on new capital goods, such as office buildings, factories and equipment. Spending on new houses and apartment buildings (residential investment) and increases in inventories (inventory investment) are also included in investment. (In everyday conversations, people often use the term ‘investment’ to mean *financial* investment, e.g. the purchase of shares or bonds. As we discussed earlier, we use ‘investment’ here to mean spending on new capital goods, such as

factories, housing and equipment, which is not the same as financial investment. This distinction is important to keep in mind.)

3. *Government purchases* (G) is spending by governments (national, state and local) on goods and services. Examples of government purchases include new schools and hospitals, military hardware—and the services of government employees, such as soldiers, police and government office workers. *Transfer payments*, such as social security payments and unemployment benefits, and interest on the government debt are *not* included in government purchases. Transfer payments and interest contribute to aggregate expenditure only at the point when they are spent by their recipients (e.g. when a recipient of a welfare payment uses the funds to buy food, clothing or other consumption goods).
4. *Net exports* (NX) equals exports minus imports. Exports are sales of domestically produced goods and services to foreigners; imports are purchases by domestic residents of goods and services produced abroad. The term 'net exports' represents the net demand for domestic goods by foreigners.

Together these four types of spending—by households, firms, the government and the rest of the world—sum to total, or aggregate, expenditure (AE):

$$AE = C + I + G + NX$$

Equation 7.1

Note that in Equation 7.1 the inclusion of net exports, $NX = X - M$, means that what is being described here is aggregate spending on domestic goods and services. This is because we have subtracted imports from overall spending.

7.2.1 PLANNED EXPENDITURE VERSUS ACTUAL EXPENDITURE

In the Keynesian model, output is determined by planned aggregate expenditure, or 'planned spending'. Could *planned* spending ever differ from *actual* spending? The answer is yes. The most important case is that of a firm that sells either less or more of its product than expected. As was noted in Chapter 2 (Table 2.3), additions to the stocks of goods sitting in a firm's warehouse are treated in official government statistics as inventory investment by the firm. In effect, government statisticians assume that the firm buys its unsold output from itself; they then count those purchases as part of the firm's investment spending. (For the purposes of measuring GDP, treating unsold output as being purchased by its producer has the advantage of ensuring that actual production and actual expenditure are equal.)

Suppose, then, that a firm's actual sales are less than expected, so that part of what it had planned to sell remains in the warehouse. In this case, the firm's actual investment, including the unexpected increases in its inventory, is greater than its planned investment, which did not include the added inventory. Let I^P equal the firm's planned investment, including planned inventory investment. A firm that sells less of its output than planned, and therefore adds more to its inventory than planned, will find that its actual investment (including unplanned inventory investment) exceeds its planned investment, so that $I > I^P$.

What about a firm that sells more of its output than expected? In that case, the firm will add less to its inventory than it planned, so actual investment will be less than planned investment, or $I < I^P$. Example 7.1 gives a numerical illustration.

EXAMPLE 7.1 – ACTUAL AND PLANNED INVESTMENT

The Fly-by-Night Kite Company produces $5 000 000 worth of kites during the year. It expects sales of $4 800 000 for the year, leaving $200 000 worth of kites to be stored in the warehouse for future sale. During the year, Fly-by-Night adds $1 000 000 in new production equipment as part of an expansion plan. Find Fly-by-Night's actual investment, I, and its planned investment, I^P, if actual kite sales turn out to be $4 600 000. What if sales are $4 800 000? What if they are $5 000 000?

Fly-by-Night's planned investment, I^P, equals its purchases of new production equipment ($1 000 000), plus its planned additions to inventory ($200 000), for a total of $1 200 000 in planned investment. The company's planned investment does not depend on how much it actually sells.

If Fly-by-Night sells only \$4 600 000 worth of kites, it will add \$400 000 in kites to its inventory instead of the \$200 000 worth originally planned. In this case, actual investment equals the \$1 000 000 in new equipment, plus the \$400 000 in inventory investment, so I = \$1 400 000. We see that when the firm sells less output than planned, actual investment exceeds planned investment ($I > I^P$).

If Fly-by-Night has \$4 800 000 in sales, then it will add \$200 000 in kites to inventory, just as planned. In this case, actual investment and planned investment are the same:

$$I = I^P = \$1\ 200\ 000$$

Finally, if Fly-by-Night sells \$5 000 000 worth of kites, it will have no output to add to inventory. Its inventory investment will be zero, and its total actual investment (including the new equipment) will equal \$1 000 000, which is less than its planned investment of \$1 200 000 ($I < I^P$).

Because firms that are meeting the demand for their product or service at preset prices cannot control how much they sell, their actual investment (including inventory investment) may well differ from their planned investment. However, for households, the government and foreign purchasers, we may reasonably assume that actual spending and planned spending are the same. Thus, from now on we will assume that, for consumption, government purchases, imports and exports, actual spending equals planned spending.

With these assumptions, we can define planned aggregate expenditure by the following equation:

$$PAE = C + I^P + G + NX \qquad \text{Equation 7.2}$$

Equation 7.2 says that planned aggregate expenditure on domestically produced goods and services is the sum of planned spending by households, firms, governments and foreigners on domestically produced goods and services. We use a superscript P to distinguish planned investment spending by firms, I^P, from actual investment spending, I. However, because planned spending equals actual spending for households, the government and foreigners, we do not need to use superscripts for consumption, government purchases or net exports.

7.2.2 CONSUMER SPENDING AND THE ECONOMY

LO 7.3, 7.3a

FIND ONLINE

The largest component of planned aggregate expenditure—nearly two-thirds of total spending—is consumption spending, denoted by *C*. As already mentioned, consumer spending includes household purchases of goods, such as groceries and clothing; services, such as healthcare, concerts and school fees; and consumer durables, such as cars, furniture and home computers. Thus, consumers' willingness to spend affects sales and profitability in a wide range of industries. (Households' purchases of new homes are classified as investment rather than consumption; but home purchases represent another channel through which household decisions affect total spending.)

What determines how much people plan to spend on consumer goods and services in a given period? While many factors are relevant, a particularly important determinant of the amount people plan to consume is their after-tax, or *disposable*, income. All else being equal, households and individuals with higher disposable incomes will consume more than those with lower disposable incomes. Keynes himself stressed the importance of disposable income in determining household consumption decisions, claiming a 'psychological law' that people would tie their spending closely to their incomes.

We will define the **disposable income** of the private sector as the total production of the economy, *Y*, less net taxes (taxes minus transfers), or *T*. This is the amount of income that the private sector has available to finance consumption. So, we can assume that consumption spending (C) increases as disposable income ($Y - T$) increases. Other factors may also affect consumption, such as the real interest rate. For now, we will ignore those other factors, returning to some of them later.

A general equation that captures the link between consumption and the private sector's disposable income is:

$$C = \overline{C} + c(Y - T)$$

Equation 7.3

Equation 7.3, which we will dissect in a moment, is known as the **consumption function**. The consumption function relates consumption spending to its determinants, in particular disposable (after-tax) income.

Let us look at the consumption function, Equation 7.3, more carefully. The right side of the equation contains two terms, $\overline{C}$ and $c(Y - T)$. The first term, $\overline{C}$, is known as *exogenous* consumption.

The term *exogenous* has a very precise meaning in economics. In general, the value of an **exogenous variable** is determined from outside of the model under consideration. This means that the model does not provide an explanation for why an exogenous variable takes any value. However, this does not mean that changes in an exogenous variable cannot affect other parts of the model. In fact, as we will see, changes in exogenous variables are central to the basic Keynesian model that we are developing in this chapter.

In the consumption function, exogenous consumption is a constant term in the equation that is intended to capture factors *other than disposable income* that affect consumption. For example, suppose consumers were to become more optimistic about the future, so that they felt comfortable about consuming more and saving less at any given level of their current disposable incomes. An increase in desired consumption at any given level of disposable income would be interpreted as an increase in exogenous consumption and is represented in the consumption function as an increase in the term $\bar{c}$.

We can imagine other factors that may affect exogenous consumption. Suppose, for example, that there is a boom in the share market or a sharp increase in home prices, making consumers feel wealthier and hence more inclined to spend, for a given level of current disposable income. This effect could be captured by assuming that $\bar{c}$ increases. Likewise, a fall in home prices or share prices that made consumers feel less wealthy and less inclined to spend would be represented by a decrease in $\bar{c}$. Economists refer to the effect of changes in asset prices on households' wealth and, hence, their consumption spending, as the **wealth effect** of changes in asset prices.

The second term on the right side of Equation 7.3, $c(Y - T)$, reflects the effect of disposable income, $Y - T$, on consumption. This component of consumption is known as *induced* consumption, since it is expenditure that is induced by disposable income. The parameter c, a fixed number, is called the *marginal propensity to consume.* The **marginal propensity to consume (MPC)** is the amount by which consumption rises when current disposable income rises by one dollar. Presumably, if people receive an extra dollar of income, they will consume part of the dollar and save the rest. In other words, their consumption will increase, but by less than the full dollar of extra income. Thus, it is realistic to assume that the marginal propensity to consume is greater than 0 (an increase in income leads to an increase in consumption) but less than 1 (the increase in consumption will be less than the full increase in income). Mathematically, we can summarise these assumptions as $0 < c < 1$.

Figure 7.1 shows a hypothetical consumption function, with consumption spending (C) on the vertical axis and disposable income ($Y - T$) on the horizontal axis. The intercept of the consumption function on the vertical axis equals exogenous consumption $\overline{c}$, and the slope of the consumption function equals the marginal propensity to consume, c.

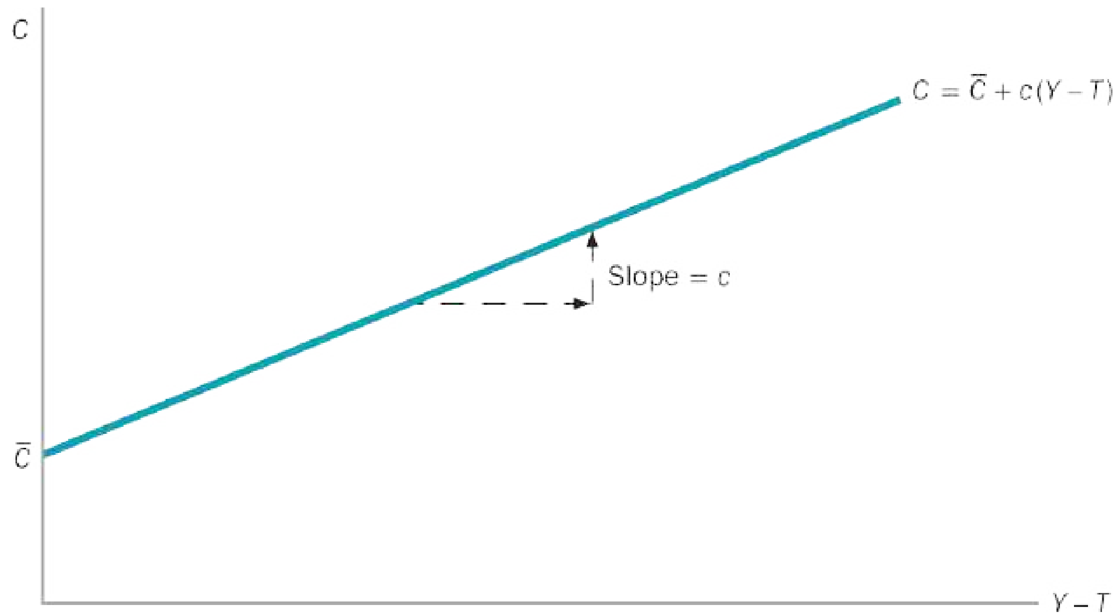

Figure 7.1 **A consumption function**

Note: The consumption function relates households' consumption spending, C, to disposable income, $Y - T$. The vertical intercept of this consumption function is the exogenous component of consumption, $\overline{C}$, and the slope of the line equals the marginal propensity to consume, c.

▷▷ RECAP

In the basic Keynesian model, aggregate expenditure (or spending) on domestically produced goods and services is divided into four components: households' consumption expenditure, firms' investment expenditure, government expenditure and exports.

Planned and actual expenditure will differ in the economy if the amount of output produced by firms differs from what people are prepared to purchase. This leads to an unintended change in firms' inventories, meaning that planned and actual investment differ (remember that inventories are counted as part of firms' investment).

The consumption function summarises households' consumption behaviour. Consumption is assumed to comprise two components. The first is exogenous consumption: this is the component of consumption expenditure that varies for reasons other than changes to disposable income; in other words, its value is determined from outside of the model. The second component is induced consumption. This component is related to disposable income. The fact that induced consumption increases when disposable income increases gives the consumption function its positive slope.

7.3 PLANNED AGGREGATE EXPENDITURE AND OUTPUT

LO 7.4

One of the key insights of the Keynesian model is that changes in production and income affect planned aggregate spending. The consumption function, which relates consumption to disposable income, is the basic source of this relationship. Because consumption spending, *C*, is a large part of planned aggregate spending, and because consumption depends on output, or income, *Y*, aggregate spending as a whole depends on output.
Example 7.2 illustrates this relationship numerically.

EXAMPLE 7.2 – LINKING PLANNED AGGREGATE EXPENDITURE TO OUTPUT

In a particular economy, the consumption function is:

$$C = 620 + 0.8(Y - T)$$

so that the intercept term in the consumption function, exogenous consumption, $\overline{C}$, equals 620 and the marginal propensity to consume, *c*, equals 0.8. Also, suppose that we are given that planned investment spending I^P = 220, government purchases *G* = 300, net

exports X = 20 and net taxes T = 250.

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Write a numerical equation linking planned aggregate expenditure, *PAE*, to output, *Y*. How does planned spending change when output and hence income change?

Recall the definition of planned aggregate expenditure, Equation 7.2:

$$PAE = C + I^P + G + NX$$

To find a numerical equation for planned aggregate expenditure, we need to find numerical expressions for each of its four components. The first component of spending, consumption, is defined by the consumption function, $C = 620 + 0.8(Y - T)$. Since taxes $T = 250$, we can substitute for T to write the consumption function as $C = 620 + 0.8(Y - 250)$. Now plug this expression for C into the definition of planned aggregate expenditure above to get:

$$PAE = [620 + 0.8(Y - 250)] + I^P + G + NX$$

where we have just replaced C by its value as determined by the consumption function. Similarly, we can substitute the given numerical values of planned investment, I^P, government purchases, G, and net exports, NX, into the definition of planned aggregate expenditure to get:

$$PAE = [620 + 0.8(Y - 250)] + 220 + 300 + 20$$

To simplify this equation, first note that $0.8(Y - 250) = 0.8Y - 200$, then add all the terms that do not depend on output *Y*. The result is:

$$PAE = (620 - 200 + 220 + 300 + 20) + 0.8Y = 960 + 0.8Y$$

The final expression shows the relationship between planned aggregate expenditure and output in this numerical example. Note that, according to this equation, a $1 increase in *Y* leads to an increase in *PAE* of (0.8) × ($1), or 80 cents. The reason for this is that the marginal propensity to consume, *c*, in this example is 0.8. Hence a $1 increase in disposable income raises consumption spending by 80 cents. Since consumption is a component of total planned spending, total spending rises by 80 cents as well.

The solution to Example 7.2 illustrates a general point: planned aggregate expenditure can be divided into two parts, a part that depends on output (*Y*) and a part that is independent of output and is therefore determined from outside of the model. The portion of planned aggregate expenditure that is independent of output is called **exogenous expenditure**. In

Example 7.2, exogenous expenditure is the constant term in the equation for planned aggregate expenditure, or 960. This portion of planned spending, being a fixed number, does not vary when output varies. By contrast, the portion of planned aggregate expenditure that depends on output (Y) is called **induced expenditure**. In Example 7.2, induced expenditure equals $0.8Y$, the second term in the expression for planned aggregate expenditure. Note that the numerical value of induced expenditure depends, by definition, on the numerical value taken by output. Exogenous expenditure and induced expenditure together equal planned aggregate expenditure.

▹▹ RECAP

Planned aggregate expenditure (PAE) is total planned spending on final domestically produced goods and services. The four components of planned spending are consumer expenditure (C), planned investment (I^P), government purchases (G) and exports (X). Planned investment differs from actual investment when firms' sales differ from what was expected, so that additions to inventory (a component of investment) are different from what firms anticipated.

The largest component of aggregate expenditure is consumer expenditure or, simply, consumption. Consumption depends on disposable, or after-tax, income, according to a relationship known as the consumption function, stated algebraically as $C = \overline{C} + c(Y - T)$.

The constant term in the consumption function, $\overline{C}$, captures factors other than disposable income that affect consumer spending. For example, an increase in house prices or share prices that makes households wealthier and thus more willing to spend—an effect called the wealth effect—could be captured by an increase in $\overline{C}$. The slope of the consumption function equals the marginal propensity to consume, c, where $0 < c < 1$. This is the amount by which consumption rises when disposable income rises by one dollar.

Increases in output Y, which imply equal increases in income, cause consumption to rise. As consumption is part of planned aggregate expenditure, planned spending depends on output as well. The portion of planned aggregate expenditure that depends on output is called induced expenditure. The portion of planned aggregate expenditure that is independent of output and therefore determined from outside of the model is exogenous expenditure.

7.4 SHORT-RUN EQUILIBRIUM OUTPUT

LO 7.5

Now that we have defined planned aggregate expenditure and seen how it is related to output, the next task is to see how output itself is determined. Recall the assumption of the basic Keynesian model: in the short run, producers leave prices at preset levels and simply meet the demand that is forthcoming at those prices. In other words, during the short-run period in which prices are preset, firms produce an amount that is equal to planned aggregate expenditure. Accordingly, we define **short-run equilibrium output** as the level of output at which output Y equals planned aggregate expenditure PAE:

$$Y = PAE$$

Equation 7.4

We can look more deeply at the meaning of Equation 7.4 using the concepts of planned **injections** and **withdrawals**. These concepts are related to flows into and out of the **circular flow of income**.

Injections refer to that component of the planned aggregate spending on domestic output that does not come from households' consumption expenditure. This comprises firms' investment expenditure, government expenditure and expenditure by foreign residents on domestic exports. We will use the notation INJ^P to represent total planned injections in the economy. Therefore, $INJ^P = I^P + G + X$.

Withdrawals are that part of income not spent on goods and services produced domestically. This includes saving, tax payments and expenditure on imports. Using WD to represent withdrawals, we have $WD = S + T + M$.

Equilibrium is a situation in which planned injections of expenditure exactly offset any withdrawals:

$$INJ^P = WD$$ **Equation 7.5**

How does this definition of equilibrium relate to our previous definition of equilibrium, aggregate output equalling planned aggregate expenditure, $Y = PAE$? To see the link, recall that planned aggregate expenditure can be written as:

$$PAE = C + I^P + G + NX$$ **Equation 7.6**

In equilibrium, it must therefore be the case that:

$$Y = C + I^P + G + NX$$ **Equation 7.7**

If we subtract C from both sides of Equation 7.7, we have:

$$Y - C = I^P + G + NX$$

Equation 7.8

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Recall from Chapter 2 that Y, aggregate output, is equivalent to aggregate income. Therefore, the left-hand side of Equation 7.8 is the amount left over from income after consumption expenditures have been made. This portion of income can be used for two purposes, paying taxation and saving. Equation 7.8 can therefore be written as:

$$S + T = I^P + G + NX$$

Equation 7.9

Remembering that net exports, NX, represents exports, X, less imports, M, Equation 7.9 can be written as:

$$S + T + M = I^P + G + X$$

Equation 7.10

The left-hand side of Equation 7.10 is withdrawals. The right-hand side is planned injections (planned, since it is the planned level of investment). What we have shown using Equations 7.7 to 7.10 is that equilibrium defined by the equality of output and planned aggregate expenditure is exactly the same as equilibrium defined by the *equality of withdrawals and planned injections*. They are two different ways of saying the same thing.

This way of thinking about the economy also gives us some insight into **disequilibrium**, a situation in which the economy is not at its equilibrium. Suppose, by way of example, that the economy found itself in a situation in which planned aggregate expenditure on domestically produced goods and services exceeded domestically produced output:

$$PAE > Y \qquad \textbf{Equation 7.11}$$

Since planned aggregate spending is $C + I^P + G + NX$, you should be able to check for yourself that in this disequilibrium, planned injections would exceed withdrawals: $INJ^P > W$. In such a situation, we would expect the economy to grow so that aggregate output matched the (higher) level of planned aggregate expenditure. What triggers this growth is an unexpected depletion of firms' inventories. The fact that PAE exceeds Y tells us that firms had not made their investment plans based on having to meet this high level of planned expenditure. In the very short run, firms would have to run down their inventories to meet the demand coming from households, firms, the government and foreigners. However, inventories cannot be run down forever, and so firms eventually will have to boost production. In this way, the amount of output produced in aggregate in the economy (Y) rises to meet the higher level of planned aggregate expenditure (PAE). Equilibrium, eventually, is achieved.

It is, of course, possible for planned aggregate spending to fall short of aggregate output:

$$PAE < Y \qquad \textbf{Equation 7.12}$$

Check that this implies $INJ^P < W$. We would expect that this would lead to some contraction in the economy. This is because firms will find themselves with an unplanned increase in inventories, as they are unable to sell all that is produced. Firms take this as a signal to cut back on production, as it is costly for them to add to the stock of inventories. As a result, aggregate output in the economy shrinks to match the relatively low level of planned aggregate expenditure.

These concepts of equilibrium and disequilibrium are extremely important in the short-run model of the economy we are developing. However, it is quite cumbersome to work with sequences of equations such as those shown above. Fortunately, there is a very simple diagrammatic representation of the short-run economy, the **45-degree diagram**, and it is to this that we now turn. The 45-degree diagram provides a visual representation of the arguments concerning equilibrium and disequilibrium described in the preceding paragraphs.

▹▹ RECAP

Equilibrium in the economy can be equivalently described in two ways. The first is when there exists equality between the levels of planned aggregate expenditure (PAE) and GDP (Y). The second is when there is a balance achieved between planned injections (INJ^P) and planned withdrawals (WD).

7.5 CONSUMPTION AND INVESTMENT IN THE TWO-SECTOR MODEL

LO 7.3

We are first going to work with a very simplified model of the economy known as a **two-sector model**. In this approach, we assume that the economy consists of only two sectors, households and firms; we leave out the government sector and the rest of the world from the model. This is purely in the interests of simplifying the analysis; we can, and will, return the government and foreign sectors to the model shortly. Economists often resort to very simple models when first considering a problem, to cut down the number of complications and to ensure that the simplest possible scenario is well understood. Once that is achieved, more realism can be added to the model until we end up with something that looks like the real-world economy with all its complexity. This would be a **four-sector model**, comprising households, firms, the government and the foreign sector.

We begin with the consumption function. Since we are dealing with a two-sector economy, there are no taxes to be paid. This ensures that households' aggregate income corresponds to the economy's total GDP. Such a consumption function is shown in Figure 7.2.

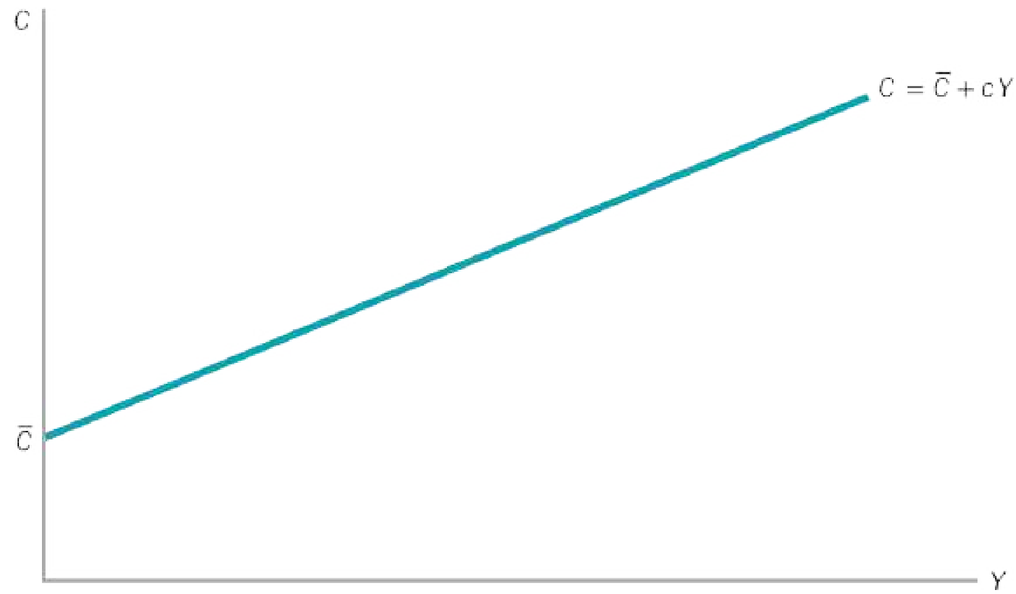

Figure 7.2 **The two-sector consumption function**

Note: In the two-sector model, consumption depends on GDP.

Conceptually, this is exactly the same as the consumption function shown earlier in Figure 7.1, with the exception that total, and not disposable, income is shown on the horizontal axis. Remember, this applies to the two-sector model.

Associated with this consumption function is a *saving function*, showing how much households in total save at each level of income. If we write the consumption function as we did in Equation 7.2, with the exceptions that total and not disposable income is shown on the right-hand side, we have:

$$C = \overline{C} + cY$$

Equation 7.13

Noting that in a two-sector model, $S = Y - C$, we can derive the saving function. To see this, note that $S = Y - C = Y - (\overline{c} + cY)$. Therefore $S = Y - \overline{c} - cY$. After simplifying, we have:

$$S = -\overline{C} + (1 - c)Y$$ **Equation 7.14**

Figure 7.3 shows a consumption function and its associated saving function.

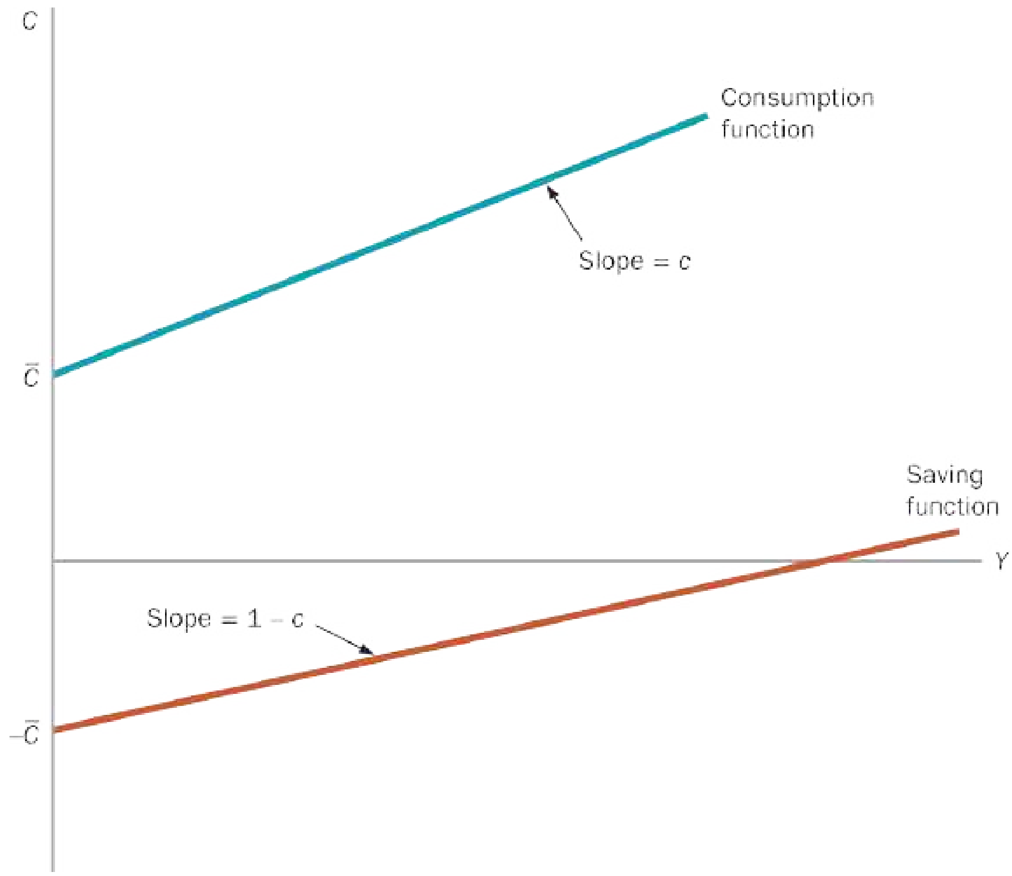

Figure 7.3 **The two-sector consumption and saving functions**

Note: In the two-sector model, consumption and saving depend on GDP.

The vertical intercept for the saving function is the negative of the exogenous component of consumption, which is the vertical intercept of the consumption function. What is the economic significance of these vertical intercepts? Should aggregate income in the economy be zero (admittedly, an unlikely event), there would, by definition, only be exogenous consumption, $\bar{c}$. The funds to finance this consumption would come from reducing saving (this is shown by the negative sign in front of $\bar{c}$ in the saving function—negative saving means to withdraw from, or run down, existing saving). Note also that the slope of the saving function will usually be different from that of the consumption function.

In the two-sector model, saving is the only withdrawal. To find the equilibrium for the economy, that is, the point at which there is no tendency for aggregate output either to expand or contract, we need to establish where withdrawals equals planned injections (recall Equation 7.5) or, equivalently, where planned aggregate expenditure equals output (recall Equation 7.4).

Planned investment represents the only source of planned injections in a two-sector model. By assumption, the Keynesian framework treats planned investment as exogenous. This assumption means that investment plans are not explained within the model and are therefore assumed not to change when GDP changes. We are assuming in this model that GDP is *not* one of the factors that influence firms' investment plans. At first, you might think this is a strange assumption. Surely firms are more likely to buy some plant or equipment when the economy is performing strongly—why then would not investment respond to a change in the current flow of GDP? Keynesian economists do not deny this possibility. Their rationale for assuming that investment is exogenous is that other factors that influence firms' investment plans are much more important. Two factors, in particular, are emphasised.

The first is the real interest rate. As we discussed in Chapter 3, firms' investment plans are sensitive to the real interest rate, since borrowed funds are often used to finance the purchase of plant and equipment. Even if borrowed funds are not used, the **real interest rate** represents the opportunity cost of the funds used to finance investment, since that interest rate could be earned by firms if they forwent their investment and instead purchased an interest-earning asset such as a government bond.

The second factor is harder to quantify, but it is one that Keynes himself thought was of primary importance: **entrepreneurs' expectations** . Entrepreneurs are the decision-makers in firms—CEOs and other executives. Since investment involves an expenditure today that will yield profits for the firm at some time in the future, Keynes believed that expectations of future business conditions were of paramount importance in affecting current investment decisions. Why invest today, even if the economy is currently performing well, if the belief is that future economic prospects will be poor? Keynes also believed that these expectations were not always founded on a rational consideration of the economy's performance. Instead, Keynes spoke of investment decisions being made on the basis of 'animal spirits', a term he used to convey the idea that expectations were formed on the basis of hunches or innate feelings about the future—factors, in other words, that did not necessarily relate to the economy's current flow of GDP.

To say that planned investment is exogenous does not mean it never changes. In fact, as we will see, planned investment changes are an important part of the Keynesian explanation for short-term economic fluctuations. The point about the exogeneity assumption is that when investment changes, it is for reasons other than changes in GDP. Should entrepreneurs' 'animal spirits' change, or should the real interest rate change, or perhaps because of some change in another non-GDP factor, firms' investment plans will change. And, as we will soon discover, investment changes have a way of resonating throughout the whole economy.

Figure 7.4 shows a planned investment function. Its key feature, which is a direct reflection of the assumption that investment does not vary with GDP, is that it is horizontal.

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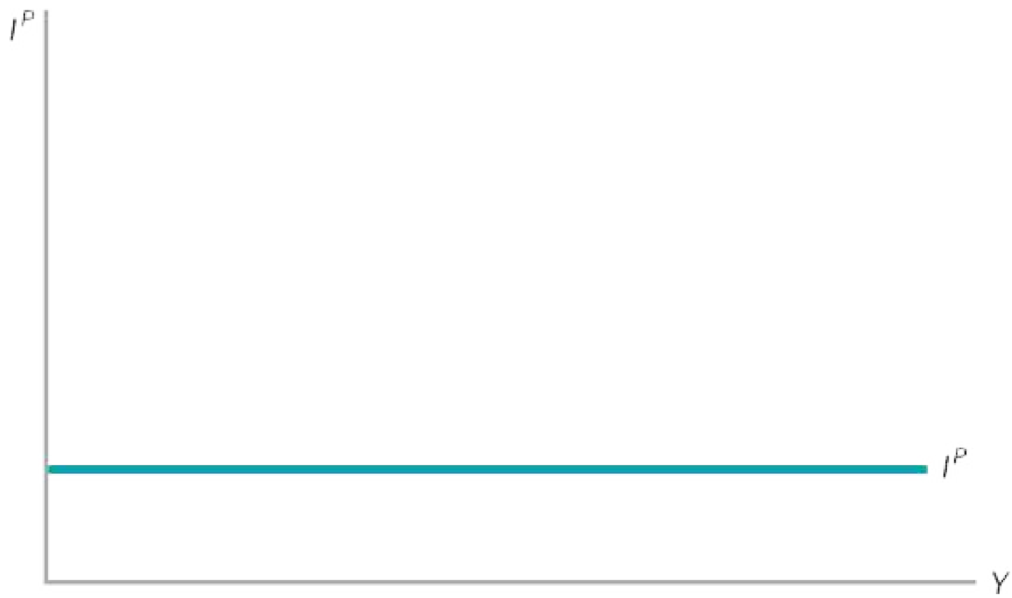

Figure 7.4 **The investment function**

Note: The horizontal investment function reflects the assumption that investment does not change when GDP varies.

7.6 THE 45-DEGREE DIAGRAM

LO 7.5a

We will now show how the concept of equilibrium, as defined by Equation 7.4 (the equality of planned aggregate expenditure and GDP), can be illustrated diagrammatically. We will work with the diagram in Figure 7.5, which has *PAE* on the vertical axis and GDP (*Y*) on the horizontal axis. For reasons that will become obvious in a moment, this diagram is known as the **45-degree diagram** (the diagram is also sometimes known as the Keynesian cross). The 45-degree diagram is a very simple way of visualising the workings of an economy over the period in which firms do not adjust prices in response to changes in demand conditions, the short run.

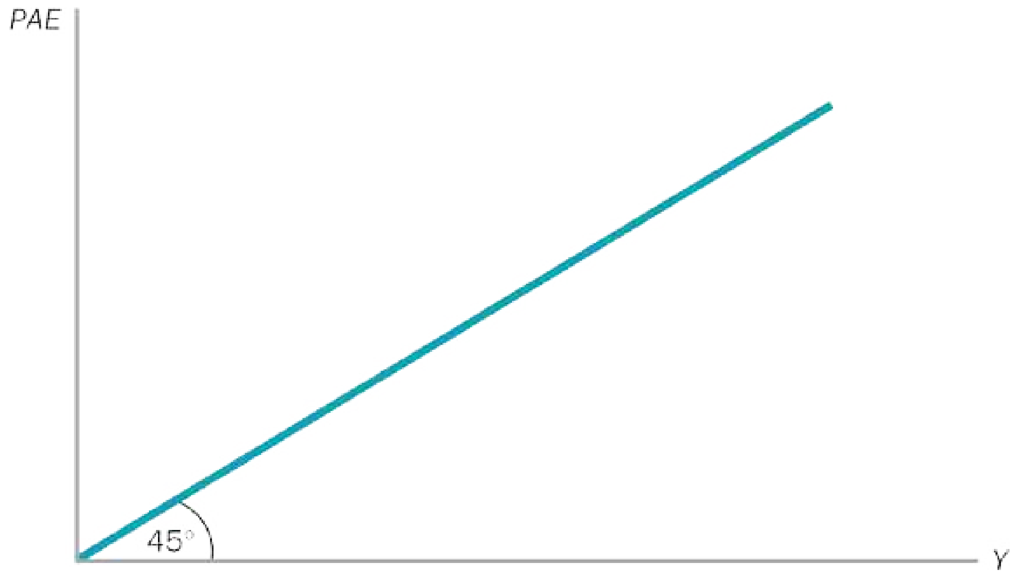

Figure 7.5 **The 45-degree line**

Note: The 45-degree line traces all the economy's points of equilibrium where planned aggregate expenditure equals GDP.

Figure 7.5 begins our development of the 45-degree diagram. The figure shows the 45-degree line. This is a guideline. It traces out all the possible points where the economy's equilibrium condition is satisfied—remember, this is where planned aggregate expenditure (*PAE*) equals GDP (*Y*). This line is drawn at an angle of 45 degrees from the origin so that the corresponding points on the vertical and horizontal axes are equal.

Now we introduce the components of planned aggregate expenditure. We are still working within the framework of the two-sector model. As a result, planned aggregate expenditure refers to the spending plans of households and firms. We have met these concepts before. Planned spending by households can be summarised by the consumption function. Recall that this shows the level of consumption that households in aggregate would like to make at each level of income. Firms' spending plans relate to investment, which we have assumed is exogenous. These two components of planned aggregate expenditure are shown in Figure 7.6.

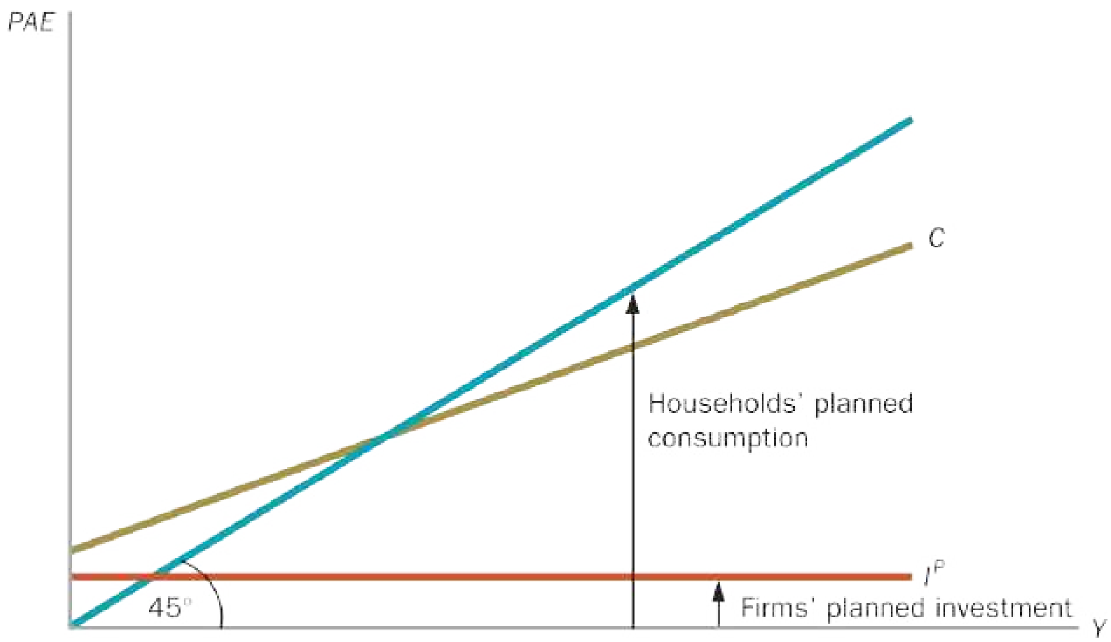

Figure 7.6 **The components of PAE (two-sector economy)**

Note: In the two-sector economy, PAE consists of households' consumption expenditure and firms' investment expenditure.

The economy's total planned aggregate expenditure is the sum of households' consumption spending and firms' planned investment spending. This is represented in Figure 7.7 by the line labelled *PAE*. Note how this line is constructed by adding, at each level of GDP, the consumption expenditure of households to the planned investment expenditure by firms. The vertical distance between the *PAE* schedule and the consumption function will match exactly the height of the planned investment schedule above the horizontal axis.

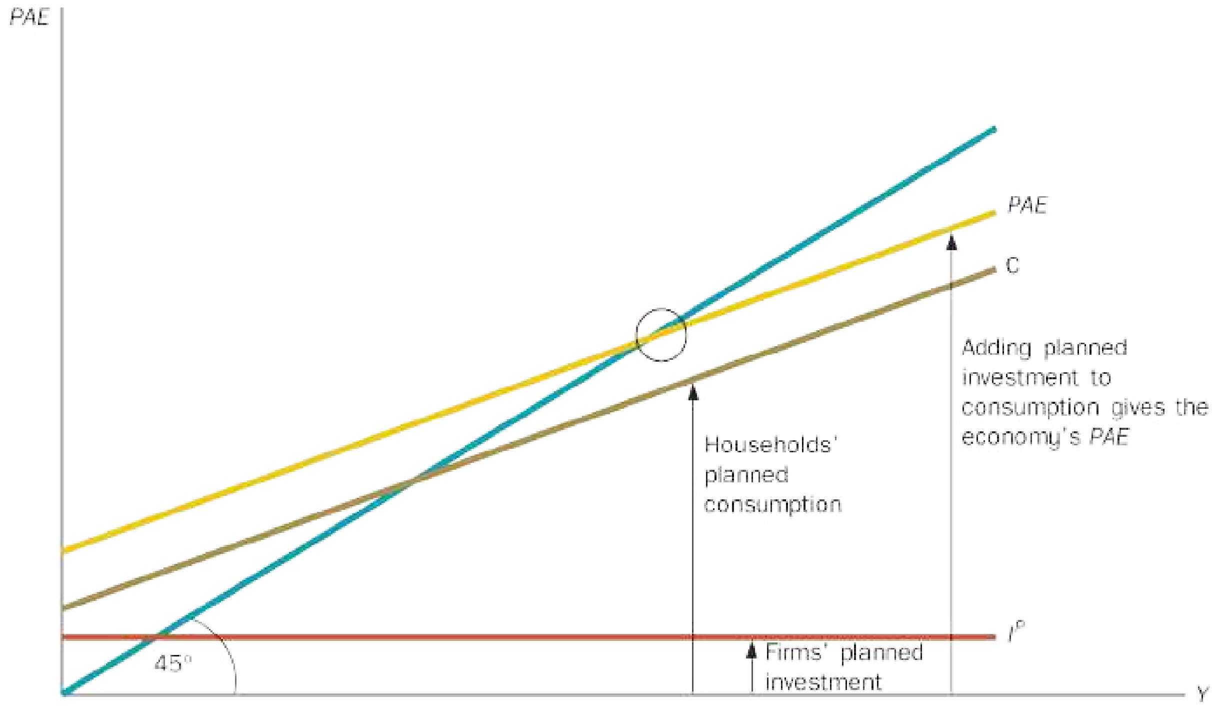

Figure 7.7 **The PAE schedule (two-sector economy)**

Note: Summing the spending plans of households and the spending plans of firms gives the economy's overall level of planned aggregate expenditure (PAE).

The point at which the PAE line crosses the 45-degree line has special significance. This point marks the economy's equilibrium *given the current spending plans of households and firms*. At that point, since it lies on the 45-degree line, the spending plans of households and firms match the economy's actual level of production. Firms' investment in inventories will be as firms expected, neither higher (as would be the case if production exceeded planned spending) nor lower (as would be the case if planned spending exceeded production).

▹▹ RECAP

The 45-degree diagram shows:

1. the economy's planned levels of expenditure, which increase as GDP increases because of induced consumption
2. all points of possible equilibrium in the economy, which are represented by the 45-degree line.

Given the current level of planned aggregate expenditure, the economy's actual equilibrium point is found from where the PAE schedule cuts the 45-degree line.

7.7 WITHDRAWALS AND INJECTIONS

LO 7.5a–c

We can also illustrate the economy's equilibrium using the concepts of withdrawals and injections. Recall from Equations 7.5 to 7.10 that equilibrium in the economy occurs when planned injections equal withdrawals. In a two-sector model this coincides with the point where the economy's saving function intersects the economy's planned investment function. Such an equilibrium is illustrated in Figure 7.8.

Example 7.3 illustrates how the equilibrium is achieved.

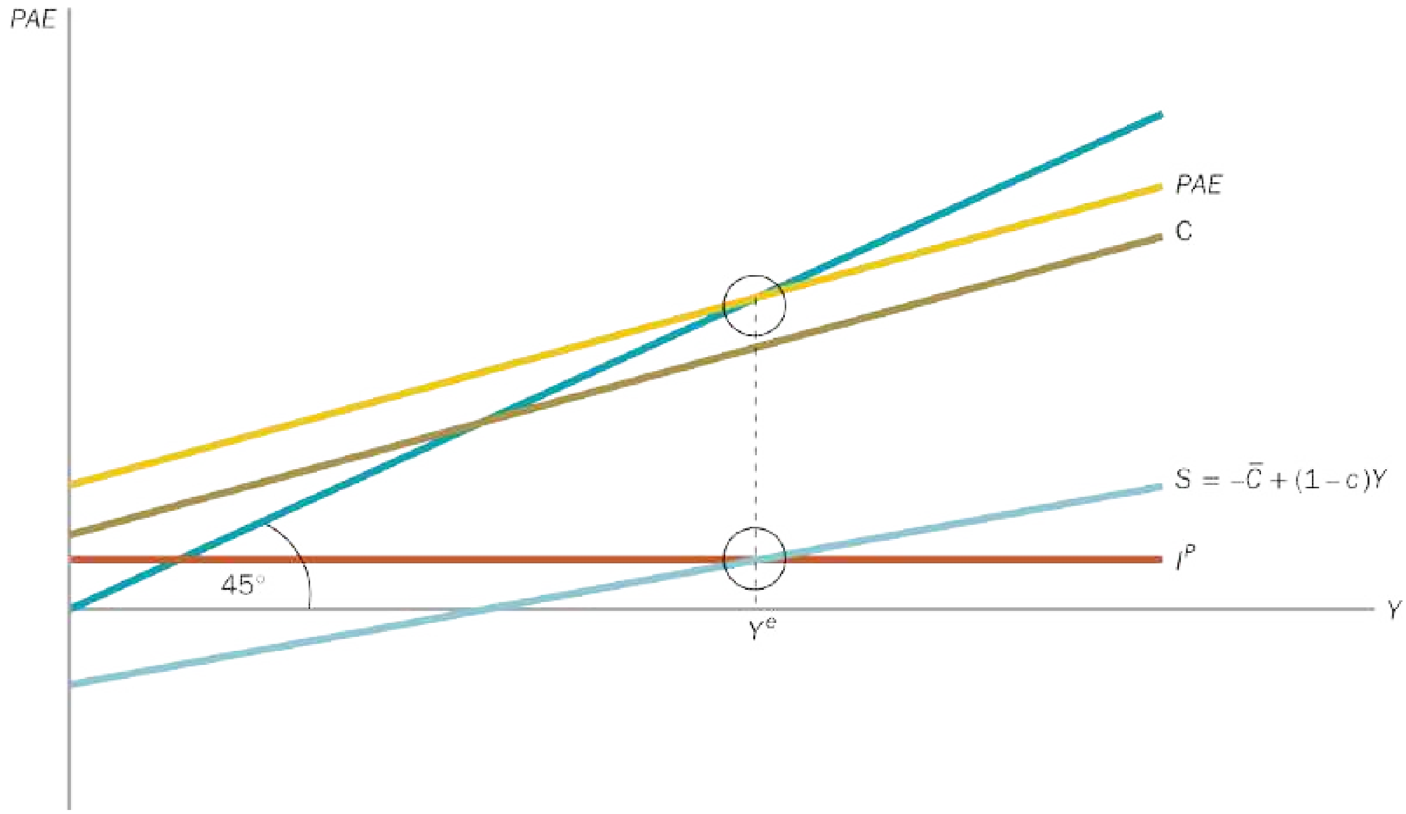

Figure 7.8 **The economy’s equilibrium (two-sector economy)**

Note: The economy will be in equilibrium when savings equals investment. The level of GDP associated with this equilibrium is Y^e.

EXAMPLE 7.3 – HOW DOES THE ECONOMY ARRIVE AT THE EQUILIBRIUM?

The easiest way to derive the answer to this question is to suppose that the economy, for some reason, is not at its equilibrium. For example, in Figure 7.9**, suppose that the economy’s current level of GDP is *Y′*, a level that is greater than the level of GDP associated with**

equilibrium, Y^e. As you can see from the figure, such a situation implies that saving is larger than planned investment. You can also see from the figure that at aggregate income of *Y′*, the corresponding consumption and planned investment together give planned aggregate expenditure of *PAE′*, which is less than *Y′*.**

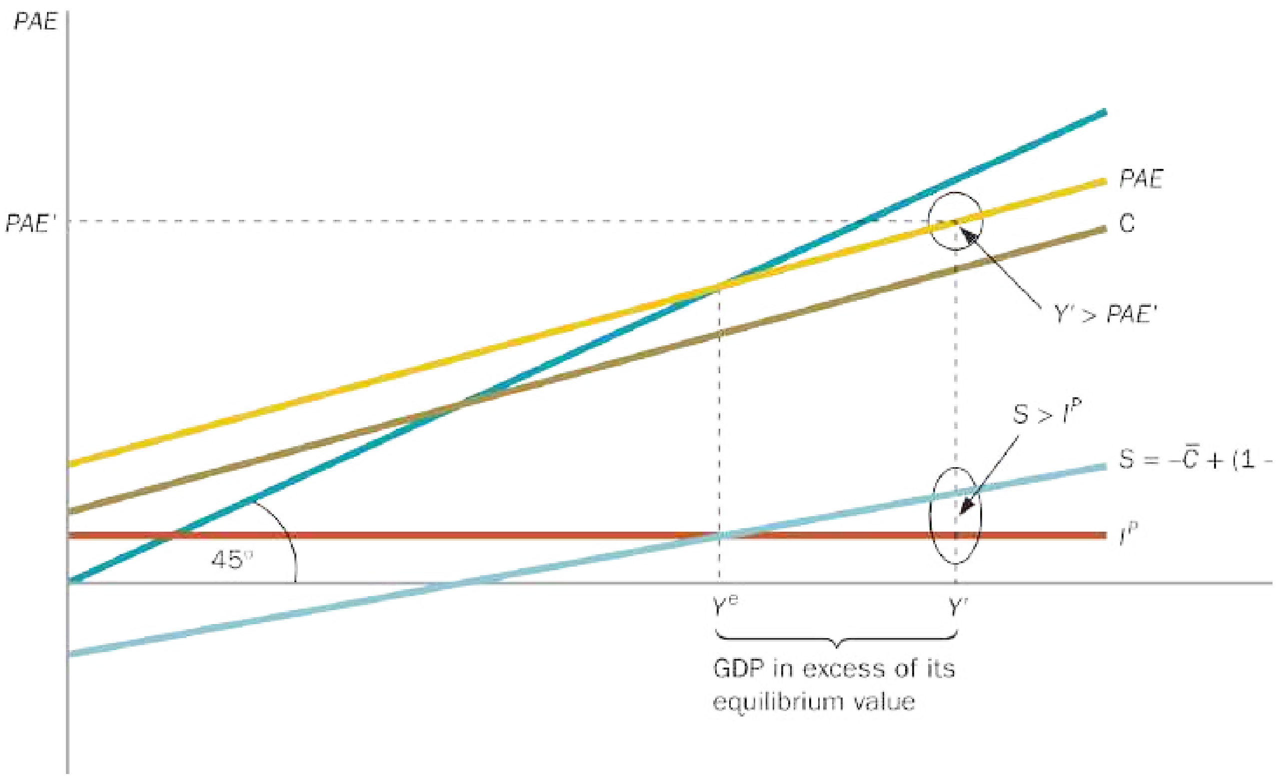

Figure 7.9 **The economy out of equilibrium (two-sector economy)**

Note: The economy will be in equilibrium when planned aggregate expenditure equals GDP, and, equivalently, when saving equals investment. However, here we have disequilibrium, where planned aggregate expenditure is below GDP and saving is larger than investment.

What are the economic implications of this disequilibrium? We know that this means that the economy's withdrawals are larger than planned injections. Recall that in the two-sector model, $S = Y - C$. So at Y', we must have a situation in which $S = Y' - C > I^P$. This implies that $Y' > C + I^P$. The left-hand side of this expression measures the flow of output that the economy is producing currently. The right-hand side measures the flow of expenditure that firms and households are planning to make. Clearly, there is a problem for the economy. The expenditure plans of households and firms fall short of the amount that is being produced; firms will not be able to sell all that they make. This is sometimes known by the term *excess supply*.

Economists often predict that a situation in which firms face an excess supply would be eliminated by a fall in price. But we are dealing with an economy *operating in the short run*, *a period in which prices do not change*. We cannot rely on a fall in price to bring the economy's expenditure plans into line with firms' production. Any adjustment, therefore, has to involve firms' production changing to match the economy's planned expenditure.

What happens? Firms find that they are unable to sell all they produce. As a result, their inventory of unsold stock increases (their actual investment, which includes inventories, is larger than their planned investment). Carrying unsold stock is an expensive activity for firms. For example, storage facilities need to be found for that stock. To avoid some of these costs, firms cut back their production. This translates into a fall in the economy's GDP. Given that income is ultimately derived from GDP, and that saving is related to income, we also find that saving falls. In addition, we know from the consumption function that households will also cut back on their expenditure. Note that planned investment does not change. This is a direct implication of the assumption that planned investment expenditure is unaffected by changes in GDP. All of this is illustrated in Figure 7.10, which shows a movement back from GDP of Y' to equilibrium GDP, Y^e—falling production levels induce falls in saving and consumption until the equilibrium condition, saving equals planned investment (or equivalently planned aggregate expenditure equals GDP), is met.

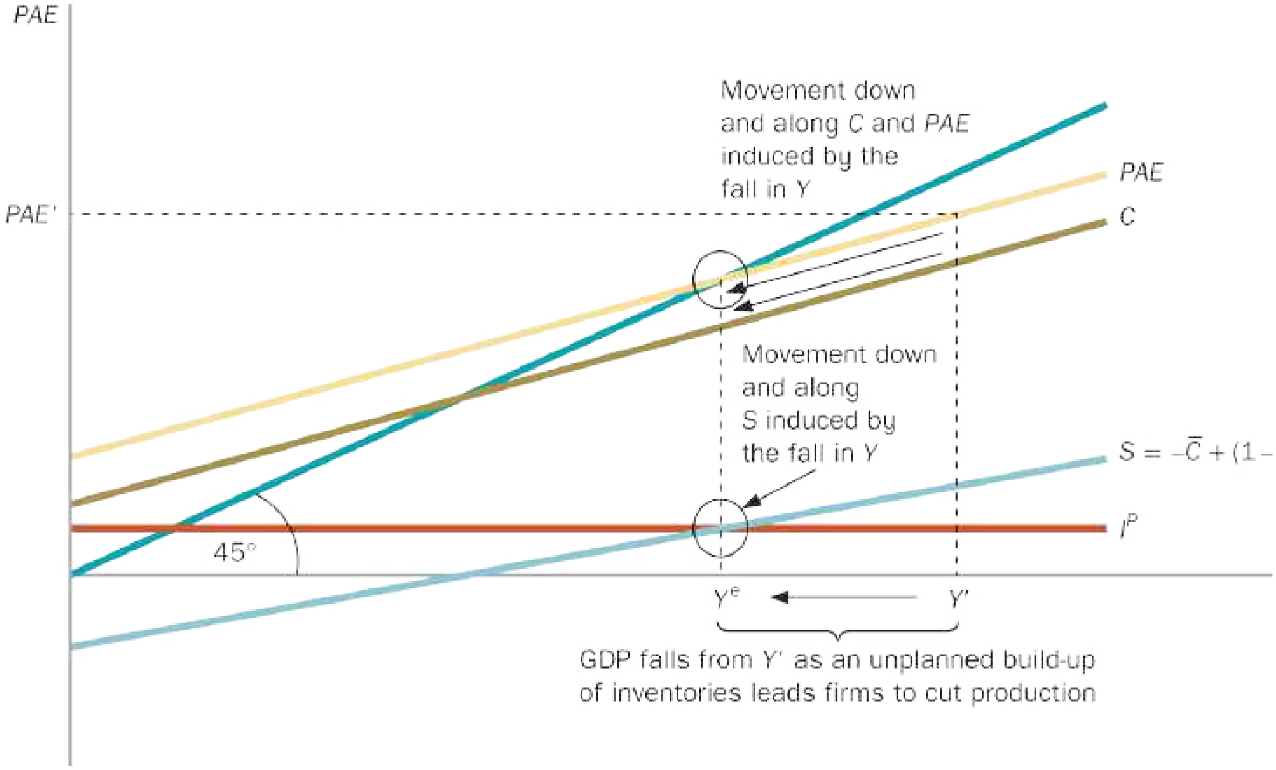

Figure 7.10 **The economy out of equilibrium (two-sector economy)**

Note: The economy will be in equilibrium when savings equals investment. To get to this point, when actual GDP is larger than the GDP associated with equilibrium, firms respond to a build-up of unsold inventory by cutting back on production.

▹▹ RECAP

A disequilibrium in which withdrawals are larger than injections (or equivalently, planned aggregate expenditure is less than GDP), results in a fall in production. This *induces* a fall in withdrawals, a process that continues to the equilibrium point where withdrawals equals injections. Equivalently, the fall in production induces a fall in consumption until planned aggregate expenditure equals GDP.

CONCEPT CHECK 7.1

Explain the process by which the economy achieves equilibrium if it currently faces a situation in which GDP is below its equilibrium level.

EXAMPLE 7.4 – THE PARADOX OF THRIFT

One of the surprising implications of the basic Keynesian model concerns the macroeconomic effects of increased saving. Specifically, we can show in the context of the basic two-sector Keynesian model that:

1. an attempt by the community to increase its saving will fail
2. the economy, overall, will be worse off because of that attempt.

Before demonstrating this remarkable result, it is important to keep in mind the special nature of this simple Keynesian model. It is a model of the short run in which important macroeconomic factors, such as the price level and the interest rate, are held constant. The result we are about to demonstrate does not mean that increased saving will necessarily be harmful for the economy over longer periods of time. In fact, there are good reasons for believing otherwise (and we will outline these in Chapters 13 to 15 when we consider the long-run behaviour of the economy).

Increased saving (or thriftiness) by the community means that people increase their level of saving at each level of income. In terms of the consumption and saving functions, this can be represented by a downward shift in the vertical intercept of the consumption function matched by an equivalent upward shift in the vertical intercept of the saving function. The effects of these movements are shown in Figure 7.11. From Figure 7.11, it can be seen that the result of an upward shift in the saving function, from S^0 to S^1, and a downward shift in the consumption function, from C^0 to C^1, is a reduction in the level of planned aggregate expenditure at every level of GDP, from PAE^0 to PAE^1. Equilibrium, where planned aggregate spending matches aggregate production and where planned investment equals saving, moves from Y_0^e to Y_1^e. This is the first key result: the attempt to increase aggregate saving means a fall in planned expenditure and hence a lower equilibrium level of GDP for the economy. The second key result is that the attempt to increase saving has failed. Equilibrium occurs where saving matches planned investment spending. Since firms' spending plans have not changed, we know that, ultimately, the aggregate level of saving will be equal to the unchanged level of planned investment. *It is the fall in income associated with the reduction in GDP that ensures saving once again matches planned investment*.

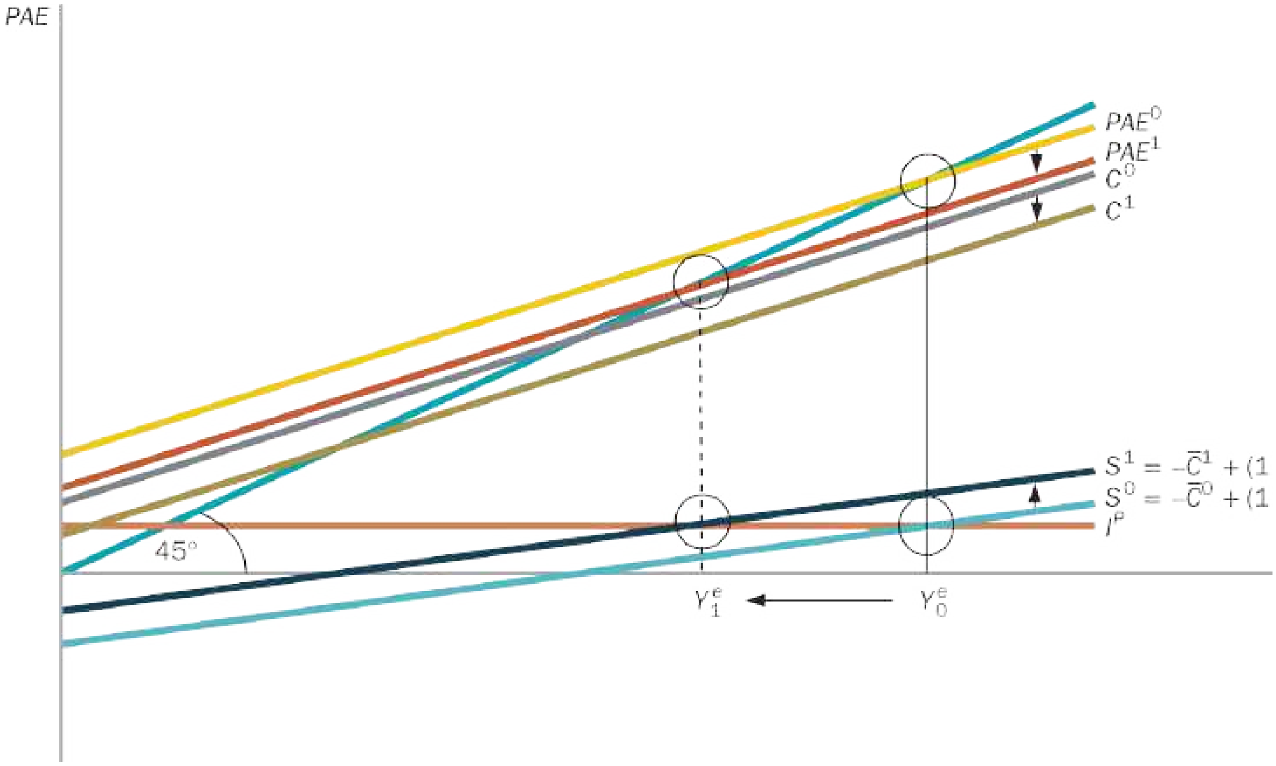

Figure 7.11 **The paradox of thrift**

Note: An exogenous increase in savings leads to a lower level of equilibrium GDP.

7.8 THE FOUR-SECTOR MODEL

The analysis described above extends easily to the more realistic case of the four-sector economy. In this more general model, we recognise the existence of the government and overseas sectors. In Chapter 8 we look at the role of the government in the macroeconomy in much more detail. The overseas sector will be the focus of Chapters 16 to 18. Here, we look at the key changes to our model brought about by introducing the government and overseas sectors.

Planned aggregate spending is now $PAE = C + I^P + G + NX$, where G represents government spending and NX is net exports. We need to make some additional assumptions to reflect the existence, in the four-sector model, of taxation collected by the government and of exports and imports. These assumptions are:

1. Net taxes consist of two components. The first is an exogenous component, $\overline{T}$, that is unrelated to income. For example, everyone who drives a car in Australia is required to pay a licence fee to the government regardless of their level of income. The second component is proportional to income. For example, suppose 30 per cent of income is paid to the government as taxes. In this case, t, the tax rate, would equal 0.3. In symbols, we write this as:

$$T = \overline{T} + tY$$

2. Consumption depends on after-tax income. This means the consumption

function would look like this, after we take into account the tax system described in point 1:

$$C = \overline{C} + c(Y - T) = \overline{C} + c\left(Y - \overline{T} - tY\right) = \overline{C} + c\overline{T} + c(1 - t)Y$$

3. Imports are proportional to income. For example, it may be the case that 5 per cent of income is spent on imported goods and services. We can write this in symbols as $M = mY$, where m, which is called the marginal propensity to import, shows what proportion of each dollar is spent on imports. If 5 per cent of income is spent on imported goods and services, for example, $m = 0.05$.
4. Planned investment, government spending and exports are all assumed to be exogenous. Each is assumed to depend on factors that are not within the model and therefore do not vary when income varies.

Withdrawals comprise saving, taxation and spending on imports. Each of these represents a withdrawal from the economy's circular flow of income. These withdrawals are assumed to respond positively to the economy's level of GDP. Total withdrawals increase if the economy's GDP increases; this is because each component—saving, taxation and imports—increases in line with aggregate income.

Planned injections are firms' planned investment, government expenditure and exports. Each of these components is *assumed* to be exogenous. This means that each can change, but for reasons unrelated to the economy's level of GDP.

With these new assumptions in place, the economy's total level of planned aggregate expenditure on domestically produced commodities, at every level of aggregate income, can be calculated from the following equation:

$$\begin{aligned} PAE &= C + I^P + G + NX \\ &= \overline{C} - c\overline{T} + I^P + G + X + [c(1-t) - m]Y \end{aligned}$$

Equation 7.15

What does not change in the four-sector model is the interpretation of the economy's equilibrium. This is still the point at which:

1. planned aggregate spending equals aggregate output (except that *PAE* now includes *G* and *NX*, in addition to *C* and I^P)
2. withdrawals equal planned injections ($S + T + M = I^P + G + X$).

The 45-degree diagram for the four-sector model is shown in Figure 7.12.

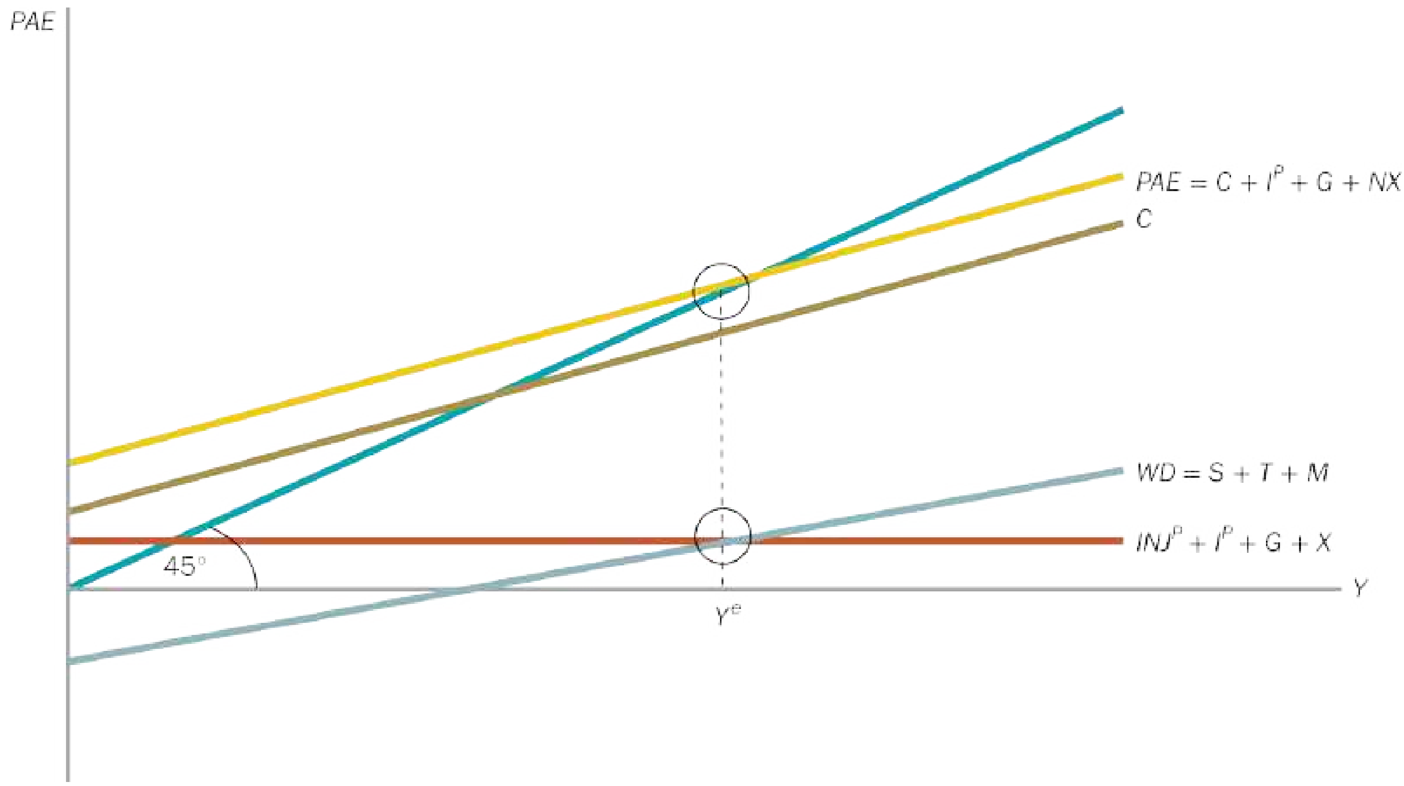

Figure 7.12 **Equilibrium in the four-sector economy**

Note: In the four-sector model, equilibrium occurs when the spending plans of households, firms, the government and the foreign sector coincide with the economy's level of GDP. Alternatively, equilibrium is where the total level of withdrawals in the economy (savings, taxation and imports) equal total planned injections (planned investment, government spending and exports). Here the economy's equilibrium is shown by Y^e.

CONCEPT CHECK 7.2

Consider Figure 7.12. Suppose the economy's actual level of GDP was larger than Y^e. Describe the economy's adjustment back to equilibrium. Repeat the exercise for the case where the actual level of GDP was less than Y^e.

▹▹ RECAP

The basic four-sector Keynesian model adds the government and foreign sectors to the basic two-sector Keynesian model. Government expenditure, planned investment and exports are assumed to be exogenous. Imports, saving and taxation are induced as they are assumed to increase with increases in GDP. Equilibrium occurs when planned injections equal withdrawals, or equivalently when planned aggregate expenditure equals aggregate output.

7.9 PLANNED SPENDING AND THE OUTPUT GAP

LO 7.5d

We are now ready to use the basic Keynesian model to show how insufficient spending in the economy can lead to a contraction. Example 7.5 shows how a fall in planned aggregate expenditure can lead to a contraction.

EXAMPLE 7.5 – A FALL IN PLANNED SPENDING LEADS TO A CONTRACTION

Suppose, in a hypothetical economy, we have that the marginal propensity to consume, *c*, is 0.86, the marginal propensity to import, *m*, is 0.01 and the tax rate, *t*, is 0.06 (in this example we will assume that the exogenous component of taxation, $\overline{T}$, equals zero). In other words, 86 cents of every extra dollar that is earned is spent on goods and services, noting that 1 cent is spent on imported goods and services. Further, we will assume that the combined total of exogenous consumption, planned investment, government expenditure and exports is 960. Then from Equation 7.15 we can write the expression for planned aggregate expenditure as $PAE = 960 + 0.8Y$. In

equilibrium, we know that *PAE* = Y^e. Hence, we can substitute Y^e for *PAE* on the left-hand side to give Y^e = 960 + 0.8Y^e. Solving for Y^e, we find that this economy has an equilibrium level of GDP equal to 4800. Assume also that potential output, *Y, equals 4800, so that the output gap $100 \times \left(\frac{Y - Y^*}{Y}\right)$ equals 0. Given that this equilibrium is the economy's potential output, this will be associated with full employment of the labour force (cyclical unemployment will be zero).**

Suppose, though, that the government cuts its expenditure by 250 units. To be specific, suppose that *G* falls by 250 units, which in turn implies a decline in exogenous expenditure of 250 units. What is the effect of this reduction in planned spending on the economy?

We can see the effects of the decline in government spending on the economy using the Keynesian cross diagram. Figure 7.13 shows the original short-run equilibrium point of the model (*E*), at the intersection of the 45-degree line, along which *Y* = *PAE*, and the original planned expenditure line, representing the equation *PAE* = 960 + 0.8*Y*. (In the interests of simplifying the analysis, we have not shown the withdrawals and injections schedules in Figure 7.13—you should check your understanding of the analysis by repeating this example in terms of injections and withdrawals.) The initial value of short-run equilibrium output is 4800, which we have now assumed also corresponds to potential output, Y^*. But what happens if G declines by 250, reducing exogenous expenditure by 250 as well?

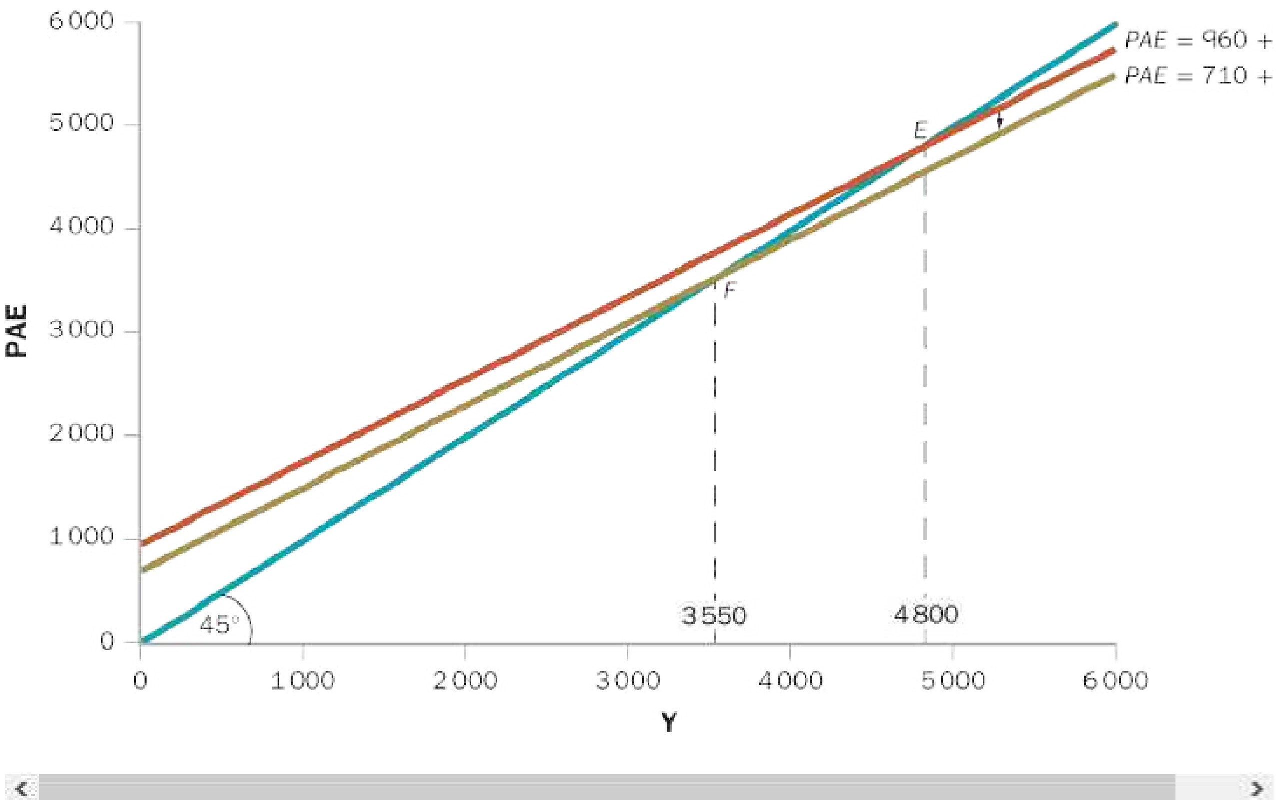

Figure 7.13 **A decline in planned spending leads to a contraction**

Note: A decline in consumers' willingness to spend at any current level of disposable income reduces planned exogenous expenditure and shifts the expenditure line down. The short-run equilibrium point drops from *E* to *F*, reducing output and opening up a contractionary gap.

Originally, exogenous expenditure in this economy was 960, so a decline of 250 units causes it to fall to 710. Instead of the economy's planned spending being described by the equation $PAE = 960 + 0.8Y$, as initially, it is now given by $PAE = 710 + 0.8Y$. Since the intercept of the planned expenditure line (equal to exogenous expenditure) has decreased from 960 to 710, the effect of the decline in consumer spending will be to shift the expenditure line down in parallel fashion, by 250 units. Figure 7.13 indicates this downward shift in the expenditure line. The new short-run equilibrium point is at point *F*, where the new, lower expenditure line intersects the 45-degree line.

Point *F* is to the left of the original equilibrium point *E*, so we can see that output and spending have fallen from their initial levels. Since output at point *F* is lower than potential output, 4800, we see that the fall in government spending has resulted in a contractionary gap in the economy. More generally, starting from a situation of full employment (where output equals potential output), any decline in exogenous expenditure leads to a contraction and, from Okun's law, the emergence of cyclical unemployment.

Numerically, how large is the contractionary gap in Figure 7.13? At the new equilibrium, point *F*, you should be able to establish that $Y = 3550$. Relative to the original equilibrium at point *E*, this implies a contractionary output gap of 26 per cent.

Example 7.5 showed that a decline in exogenous expenditure, arising from decreased government expenditure, causes short-run equilibrium output to fall and opens up a contractionary gap. The same conclusion applies to declines in exogenous expenditure arising from other sources. Suppose, for example, that firms become disillusioned with new technologies and cut back their planned investment in new equipment. In terms of the model, this reluctance of firms to invest can be interpreted as a decline in planned investment spending, I^P. Under our assumption that planned investment spending does not depend on output, planned investment is part of exogenous expenditure. A decline in planned investment spending depresses exogenous expenditure and output in precisely the same way that a decline government spending does. Similar conclusions apply to declines in other components of exogenous expenditure, such as exogenous consumption and exports, as we will see in later applications.

CONCEPT CHECK 7.3

Repeat the analysis of Example 7.5, but assuming that consumers become *more* confident about the future. As a result, $\overline{C}$ rises by 10 units, which in turn raises exogenous expenditure by 10 units. Find the numerical value of the expansionary output gap.

THINKING AS AN ECONOMIST 7.2

What caused the early 1990s recession?

As discussed in Chapter 5, the early 1990s recession was one of the worst on record. What factors caused the output of the Australian economy to fall below its potential during that period? High interest rates played an important part in the recession. This increase in the cost of credit made it difficult for many borrowers, especially small and medium-sized firms, to justify taking out loans. These firms could not make capital investments, reducing planned spending and, hence, output. In terms of the model presented in this chapter, a decline in planned investment spending brought about by high interest rates can be thought of as a fall in planned investment spending, I^P. Like the decline in G, illustrated in Example 7.5, a fall in I^P reduces planned expenditure and hence short-run equilibrium output.

A second factor was a *decline in consumer confidence*. There are various surveys of consumer sentiment carried out by organisations in Australia. One of the most widely reported of these is the Westpac–Melbourne Institute's Index of Consumer Sentiment, in which people are asked their views about the future of the economy in general and their own fortunes in particular. Consumer responses are then summarised in measures of consumer confidence. A high level of confidence implies that people are optimistic about both their own economic futures and the future of the economy in general. Economists have found that when consumers are optimistic they are more likely to spend, particularly on big-ticket items such as cars and holidays. In December 1990 the Westpac–Melbourne Institute's index stood at a value of 70.7, a fall of 34 per cent, compared to its value of 107.9 in December 1988. This plunge in consumer sentiment impacted on planned aggregate expenditure and contributed to the size of the contractionary gap.

THINKING AS AN ECONOMIST 7.3

Why was the deep Japanese recession of the 1990s bad news for the rest of East Asia?

During the 1990s Japan suffered a prolonged economic slump. Japan's economic problems were a major concern not only of the Japanese but also of policymakers in other East Asian countries such as Thailand and Singapore. Why did East Asian policymakers worry about the effects of the Japanese slump on their own economies?

Although the economies of Japan and its East Asian neighbours are intertwined in many ways, one of the most important links is through trade. Much of the economic success of East Asia has been based on the development of export industries and, over the years, Japan has been the most important customer for East Asian goods. When the economy slumped in the 1990s, Japanese households and firms reduced their purchases of imported goods sharply. This fall in demand dealt a major blow to the export industries of other East Asian countries.

Not just the owners and workers of export industries were affected; as wages and profits in export industries fell, so did domestic spending in the East Asian nations. The declines in domestic spending reduced sales at home as well as abroad, further weakening the East Asian economies. In terms of the model, the decline in exports to Japan reduced exports, *X*, and thus exogenous expenditure, in East Asian countries. The fall in exogenous expenditure led to a contractionary gap, much like that shown in Figure 7.13.

THINKING AS AN ECONOMIST 7.4

Why did the Global Financial Crisis cause a recession in the United States and other countries?

As discussed in Chapter 6, house prices grew very rapidly in the United States leading up to the Global Financial Crisis. The upward trend in house prices ended in July 2006 and this set off a chain of events that led to severe financial crisis in the United States in August 2007 and a worldwide financial panic in late 2007 and early 2008. These financial crises led to sharp declines in aggregate demand throughout the world, pushing the global economy into a deep recession.

We first focus on two questions. First, how was the fall in US house prices transmitted to the financial markets? Second, why did financial markets stop functioning in early 2008?

The key connection between the decline in home prices and the meltdown in financial markets is a financial instrument known as a mortgage-backed security. A mortgage-backed security is a bond whose value is determined by a pool of home mortgages. As the value of the mortgages rises the value of the security rises, and when the value of the mortgages falls the value of the security falls as well. The advantage of these securities is that they allow investors to spread their risk. That is, instead of a bank holding on to every mortgage that it writes, it can sell the mortgage to another financial intermediary, which then packages together many mortgages into a mortgage-backed security. Insurance companies, investment banks and other commercial banks purchased these securities because they were thought to be relatively safe investments. After all, the securities were backed by mortgages, and mortgages were secured by real estate that could always be sold to pay off the bond holders.

Mortgage-backed securities were not entirely without risk, however. In order to protect themselves from the riskiness of the securities, financial institutions purchased a form of insurance called a credit-default swap. It works like this: suppose you hold a security that has a risk of default. For a small fee, a company offers to pay you if the security's issuer actually does default. If the security reaches maturity and is paid off, the company gets to keep the fee. Unlike true insurance policies, however, the government did not require issuers of swaps to put aside any reserves to cover defaults.

This would come back to haunt the financial markets, as we will see in the next section.

The stage was now set for declining house prices to affect the financial markets in a big way. As US house prices began to fall in 2006 and 2007, holders of mortgage-backed securities started to sell their bonds since they (correctly) thought that the value of these bonds would start to fall. This resulted in an increase in the supply of mortgage-backed securities for sale, which decreased the price of the securities and actually made them less valuable to those who continued to hold them. All of the financial intermediaries who held mortgage-backed securities saw the value of their assets shrink as the value of the mortgage-backed securities they held declined, so they started selling these securities even more quickly in order to get them off their books, depressing the prices further.

The first signs of the trouble caused by mortgage-backed securities appeared in August 2007. A number of financial intermediaries in Europe and the United States reported losses due to the declining value of mortgage-backed securities in their portfolios. A large British bank, Northern Rock, failed, setting off a banking panic in the United Kingdom. Northern Rock had aggressively purchased real estate debt (both mortgages and mortgage-backed securities), and financial market participants started to ask questions about the viability of other financial institutions that had made similar investments. Their attention soon focused on even larger investment banks like Bear Stearns, Lehman Brothers and Merrill Lynch.

The first of these institutions to collapse was Bear Stearns, in March 2008. Bear Stearns's share price had been falling since mid-2007, when two of its hedge funds collapsed due to the decline in the value of mortgage-backed securities.

By early March, Bear Stearns's share price was rapidly approaching zero, and officials at the US Federal Reserve became concerned that a Bear Stearns bankruptcy would have ripple effects throughout Wall Street and the global financial system. As a result, the Federal Reserve arranged financing and loan guarantees so that fellow bank JP Morgan Chase could purchase Bear Stearns and help it avoid bankruptcy.

Many observers at the time thought this then unprecedented deal would be the end of the problem. A major investment bank had failed but the system was intact, and the Federal Reserve had proven that it would take strong action to prevent a financial crisis. But investor confidence was still far from solid when a second problem hit: on top of the declines in home prices, the US economy suffered a record rise in crude oil prices. Figure 7.14 shows the magnitude of this oil price shock. Because supply in the oil industry had been largely stagnant in the face of sharply rising global demand from China, India and elsewhere, crude oil prices shot upward. In 2007, this increase in oil prices accelerated, more than doubling in the year and a half between January 2007 and July 2008.

Figure 7.14 **Monthly real crude oil prices, January 2000–July 2018**

Note: Problems in the US housing industry were exacerbated by a significant increase in the real price of oil.

Source: US Energy Information Administration 2018, 'Short-term energy outlook', https://www.eia.gov/outlooks/steo/realprices/.

The effect of this oil price shock on financial markets was immediate. Many companies that were dependent on oil for production and sales faced severe challenges; General Motors, Ford and Chrysler, for example, saw slumping demand for their large cars and trucks as consumers tried to cut back on petrol expenditures. Further, higher oil prices made new home construction even less attractive, especially in far-flung places that required long commutes to work. The prices of these homes, already in decline, fell even faster as a result of diminished demand.

As prices of homes fell and prices of oil-dependent activities rose, even more individuals began to default on their home loans. Two pillars of the mortgage finance industry in the United States—Fannie Mae (the Federal National Mortgage Association) and Freddie Mac (the Federal Home Loan Mortgage Corporation)—had been driven to the brink of bankruptcy by defaults. Fannie Mae and Freddie Mac were US Government-sponsored private corporations that were the largest issuers of private home mortgage loans in the world; the far-reaching implications of their potential failure caused the government to take the extraordinary move of seizing operating control of the corporations on 7 September 2008.

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One week later, the US Government again had a tough decision to make. Lehman Brothers, one of the oldest investment banks in the United States, had been a heavy investor in mortgage-backed securities; as the value of these securities declined drastically, so did the company’s solvency.

On 14 September 2008, the Treasury Department and the Federal Reserve allowed Lehman Brothers to enter bankruptcy. This unprecedented decision set off a panic in the financial markets. Previously, many in the industry had assumed that the government would automatically rescue troubled financial giants. If Lehman could fail, who was next?

The answer came quickly. American International Group (AIG) was the largest issuer of credit-default swaps. If these contracts had been true insurance contracts, government regulations would have required that AIG put a minimum amount of money in reserve to cover losses if one of their contracts failed. But sellers of credit-default swaps like AIG were not required to hold assets in reserve to cover future claims, so many did not; when mortgage-backed securities began to fail and AIG's default-swap clients demanded payment virtually all at once, the company quickly ran out of money.

Because AIG's debts to other financial firms were so large, policymakers feared that allowing it to go bankrupt could touch off a chain of additional bankruptcies, resulting in a meltdown of the global financial system—a meltdown far beyond the panic caused by the failure of Lehman Brothers. The government felt that it had no choice but to intervene. On 16 September, just two days after the failure of Lehman

Brothers, the US Government announced that it would provide US$20 billion (later increased to US$150 billion) in financing for AIG to prevent a domino-effect bankruptcy catastrophe.

At this point, it became startlingly clear that many of the United States' oldest and largest financial firms were on the brink of insolvency. On 18 September then US Treasury Secretary Henry Paulson proposed the Troubled Asset Relief Program (TARP), under which the government would use public funds to buy mortgage-backed securities and other 'troubled' assets from banks. If the banks no longer held these problematic assets, the theory went, then they should be in a stronger financial position to weather the turmoil successfully.

Public opinion was sharply divided on the merits of this 'bank bailout' plan. Many critics were understandably reluctant to commit taxpayer dollars; others felt that not interceding would have even worse repercussions. The debate raged on; by the time the US Senate and the House agreed on a modified version of the plan on 3 October, the financial markets had almost ceased to function.

Since the beginning of the economic downturn, the US Federal Reserve had acted aggressively in an effort to inject additional liquidity into the banking system to keep funds flowing for large corporate investors as well as the average consumer. These measures, however, did little to defuse the economic crisis in the short run. Banks were still charging three percentage points above the interest rate on US Treasury bills on loans to each other; typically, the fee is 0.25, to 0.5, per cent. Companies that relied on short-term debt could not get credit, and banks stopped making loans to even their most creditworthy customers.

The effects of the panic trickled down from the major investment banks and financial markets to everyday workers. It became difficult, if not impossible, for firms to hire new workers (or, in some cases, even pay existing ones), purchase necessary capital, cover operating costs and produce goods and services at the same rates as they had been able to in the past.

The bursting of the housing bubble and the panic of 2008 caused both businesses and households to cut back on their spending in two ways. First, the financial market disruptions made it difficult for businesses to borrow funds for investment spending and for consumers to borrow funds for purchasing houses and cars. Second, the financial crisis increased the level of uncertainty about the future, which led to a reduction in exogenous spending, or spending independent of output. Analytically, this situation can be represented as a downward shift in the planned aggregate expenditure (*PAE*) line shown in Figure 7.15, from PAE^0 to PAE^1. Suppose the economy was initially at point *E*. After the shift in the *PAE* schedule, the economy is in a situation where PAE is less than actual output; the natural response of businesses is to reduce production until their output again meets demand, moving the economy to point *F* in Figure 7.15. At *F*, the economy is in a recession, with output well below potential. Further, since output is below potential, Okun’s law tells us that unemployment has now risen above the natural rate.

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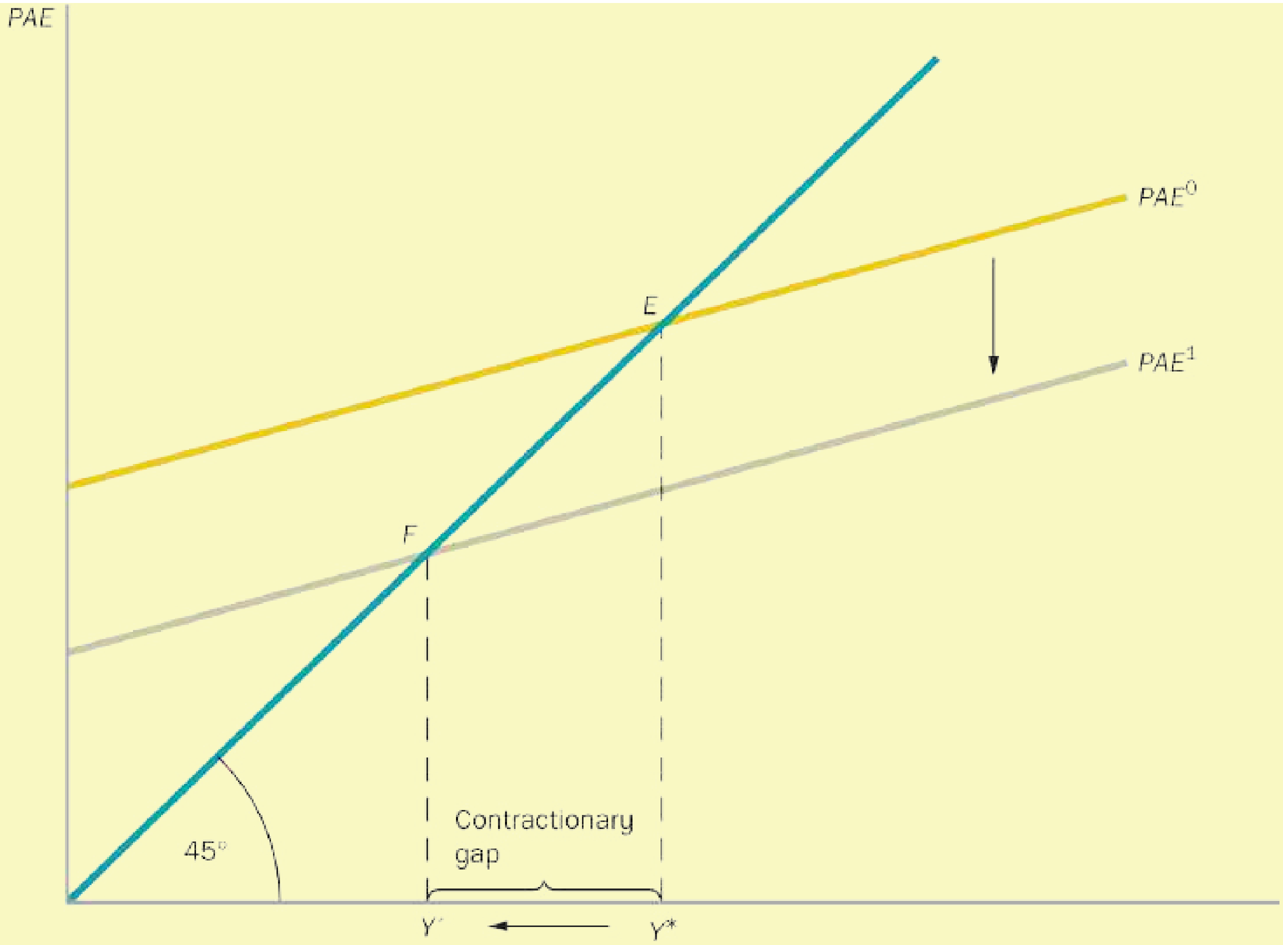

Figure 7.15 **The end of the US house price bubble**

Note: The bursting of the US housing bubble and the subsequent panic in financial markets led to a decline in planned aggregate expenditure.

▹▹ RECAP

Contractions and recessions, in the Keynesian model, are the result of exogenous falls in planned expenditure that lead to an equilibrium level of GDP that is below the economy's potential level of GDP.

7.10 THE MULTIPLIER

LO 7.5e

FIND ONLINE

In Example 7.5 we analysed a case in which the initial decline in government spending (as measured by the fall in *G*) was only 250 units, and yet short-run equilibrium output fell by 1250 units. Why did a decline in government spending lead to a much larger fall in output?

The reason is that a fall in consumer spending not only reduces the sales of consumer goods directly; it also reduces the incomes of workers and owners in the industries that produce consumer goods. As their incomes fall, these workers and capital owners reduce their spending, which reduces the output and incomes of *other* producers in the economy. These reductions in income lead to still further cuts in spending. Ultimately, these successive rounds of declines in spending and income lead to a decrease in planned aggregate expenditure, and output that is significantly greater than the change in spending that started the process.

The effect on short-run equilibrium output of a one-unit increase in exogenous expenditure is called the **income–expenditure multiplier**, or the *multiplier* for short. In the economy of Example 7.5 the multiplier is 5. That is, each one-unit change in exogenous expenditure leads to a five-unit change in short-run equilibrium output in the same direction. The idea that a change in spending may lead to a significantly larger change in short-run equilibrium output is a key feature of the basic Keynesian model.

What determines how large the multiplier will be? To see this, it will be useful to consider Example 7.5 again, this time to derive a simple mathematical formula for the value of the economy's multiplier. The initial decrease of 250 in government spending (more precisely, in the value of G) in Example 7.5 has two effects. First, the fall in government spending directly reduces planned aggregate expenditure by 250 units. Second, the fall in spending also reduces by 250 units the incomes of producers (workers and firm owners) of goods purchased by the government. Under the assumptions of Example 7.5, that the marginal propensity to consume is 0.86; the tax rate is 0.06 and the marginal propensity to import is 0.01, the producers of government purchased goods will therefore reduce *their* consumption spending on *domestically* produced goods and services by 200 units, or 0.8 times their income loss of 250. This reduction in spending cuts the income of *other* domestic producers by 200 units, leading them to reduce their spending on domestic goods and services by 160, or 0.8 times their income loss of 200 units. These income reductions of 160 lead still other producers to cut their spending by 128, or 0.8 times 160 and so on. In principle this process continues indefinitely, although after many rounds of spending and income reductions the effects become quite small.

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When all these 'rounds' of income and spending reductions are added, the *total* effect on planned spending of the initial reduction of 250 in consumer spending is:

$$250 + 200 + 160 + 128 \; + \; \ldots$$

The three dots indicate that the series of reductions continues indefinitely. The total effect of the initial decrease in consumption can also be written as:

$$250\left[1 + 0.8 + (0.8)^2 + (0.8)^3 + \; \ldots\right]$$

This expression highlights the fact that the spending on domestically produced goods and services that takes place in each round is 0.8 times the spending on domestic goods and services in the previous round.

A useful algebraic relationship, which applies to any number x greater than 0 but less than 1, is:

$$1 + x + x^2 + x^3 + \; \ldots = \frac{1}{1 - x}$$

If we set $x = 0.8$, this formula implies that the total effect of the decline in consumption spending on aggregate demand and output is $250 \times 5 = 1250$.

This answer is consistent with our earlier calculation, which showed that short-run equilibrium output fell by 1250 units, from 4800 to 3550.

By a similar analysis we can also find a general algebraic expression for the multiplier in the basic Keynesian model. Let $k = c(1 - t) - m$ be the coefficient in front of GDP in the economy's planned aggregate expenditure equation (see Equation 7.15). You can think of k as the economy's overall *marginal propensity of expenditure* on domestically produced goods and services; that is, k is the proportion of any increase in aggregate income that is spent on domestic goods and services, allowing for the fact that part of any income increase will be paid to the government as taxation and to foreign residents as payment for imports. This means that a one-unit increase in exogenous expenditure, for example, will raise spending and income by one unit in the first round; by $k \times 1 = k$ units in the second round; by $k \times k = k^2$ units in the third round; by $k \times k^2 = k^3$ units in the fourth round; and so on. Thus the total effect on short-run equilibrium output of a one-unit increase in exogenous expenditure is given by:

$$1 + k + k^2 + k^3 + \ldots$$

Applying the algebraic formula given above, and noting that $0 < k < 1$, we can rewrite this expression as $1/(1 - k)$. Thus, in a basic Keynesian model with a marginal propensity of expenditure of k, the multiplier equals $1/(1 - k)$. Note that if $k = 0.8$, then $1/(1 - k) = 1/(1 - 0.8) = 5$, which is the same value of the multiplier we found numerically above. Note also that in the special case of a two-sector model, the value of k will be equal to the economy's marginal propensity to consume, c, and the value of the multiplier will be $1/(1 - c)$.

An important point to note about the multiplier is that the larger the value of k, the larger the multiplier. Look at the formula that determines the value of k, $k = c\,(1 - t) - m$. From this expression it is clear that an important factor determining the value of k is the marginal propensity to consume out of income, *c*. If the marginal propensity to consume is large, then falls in income will cause people to reduce their spending sharply, and the multiplier effect will then also be large. If the marginal propensity to consume is small, then people will not reduce spending so much when income falls, and the multiplier will also be small.

Note also that for a given value of the marginal propensity to consume, the value of the multiplier will be smaller the higher the tax rate, *t*. This makes sense. If the government sets a high tax rate, a change in domestic income will not flow through to expenditure on domestically produced goods and services to as great an extent as when the tax rate is low.

The propensity to import will also affect the multiplier. Suppose the marginal propensity to import increased. This would mean that a smaller proportion of any extra dollar of disposable income would be spent on domestic goods and services. In other words, an increase in the marginal propensity to import, *m*, would imply fall in the value of the multiplier.

▹▹ RECAP

Short-run equilibrium output is the level of output at which output equals planned aggregate expenditure or, in symbols, $Y = PAE$.

The graphical solution is based on a diagram called the Keynesian cross. The Keynesian cross diagram includes two lines: a 45-degree line that represents the condition $Y = PAE$, and the planned expenditure line, which shows the relationship of planned aggregate expenditure to output. Short-run equilibrium output is determined at the intersection of the two lines; if short-run equilibrium output differs from potential output, an output gap exists.

Increases in exogenous expenditure shift the planned expenditure line upwards, increasing short-run equilibrium output; decreases in exogenous expenditure shift the expenditure line downwards, leading to declines in short-run equilibrium output. Decreases in exogenous expenditure that drive actual output below potential output are a source of contractions and recessions.

Generally, a one-unit change in exogenous expenditure leads to a larger change in short-run equilibrium output, reflecting the working of the multiplier. The multiplier arises because a given initial change in spending changes the incomes of producers, which leads them to adjust their spending, changing the incomes and spending of other producers, and so on.

7.11 STABILISING PLANNED SPENDING: THE ROLE OF FISCAL AND MONETARY POLICIES

According to the basic Keynesian model, inadequate spending is an important cause of contractions and recessions. To fight contractions—at least, those caused by insufficient demand rather than slow growth of potential output—policymakers must find ways to stimulate planned spending. Policies that are used to affect planned aggregate expenditure, with the objective of eliminating output gaps, are called stabilisation policies. Policy actions intended to increase planned spending and output are called **expansionary policies**; expansionary policy actions are normally taken when the economy is in contraction. It is also possible for the economy to be 'overheated', with output greater than potential output (an expansionary gap). The risk of an expansionary gap is that it may lead to an increase in inflation. To offset an expansionary gap, policymakers will try to reduce spending and output. **Contractionary policies** are policy actions intended to reduce planned spending and output.

The two major tools of stabilisation policy are *monetary policy* and *fiscal policy*. Recall that monetary policy refers to decisions about the level of interest rates, whereas fiscal policy refers to decisions about the government's budget—how much the government spends and how much tax revenue it collects. In Chapter 8, we will discuss the role of fiscal policy in managing the macroeconomy. Monetary policy will be discussed in Chapters 9 and 10.

SUMMARY

- The basic Keynesian model shows how fluctuations in planned aggregate expenditure, or total planned spending, can cause actual output to differ from potential output. Too little spending leads to a contractionary output gap; too much spending creates an expansionary output gap. This model relies on the crucial assumption that firms do not respond to every change in demand by changing prices. Instead, they typically set a price for some period then meet the demand forthcoming at that price. Firms do not change prices continually because changing prices entails costs, called menu costs.
- *Planned aggregate expenditure* is total planned spending on final domestic goods and services. The four components of total spending are consumption, investment, government purchases and exports. Planned and actual consumption, government purchases and exports are generally assumed to be the same. Actual investment may differ from planned investment, because firms may sell a greater or lesser amount of their production than they expected. If firms sell less than they expected, for example, they are forced to add more goods to inventory than anticipated. And because additions to inventory are counted as part of investment, in this case actual investment (including inventory investment) is greater than planned investment.
- Consumption on domestically produced goods and services is

related to disposable, or after-tax, income by a relationship called the *consumption function*. The amount by which desired consumption rises when disposable income rises by one dollar is called the *marginal propensity to consume (MPC*, or *c)*. The marginal propensity to consume is always greater than zero but less than one (that is, $0 < c < 1$).

- An increase in real output raises planned aggregate expenditure, since higher output (and, equivalently, higher income) encourages households to consume more. Planned aggregate expenditure can be broken down into two components, exogenous expenditure and induced expenditure. *Exogenous expenditure* is the portion of planned spending that is independent of output; *induced expenditure* is the portion of spending that depends on output.
- In the period in which prices are fixed, *short-run equilibrium output* is the level of output that just equals planned aggregate expenditure. Equivalently, it is the level of output at which planned injections equals withdrawals. Short-run equilibrium output can be determined graphically in a Keynesian cross diagram, drawn with planned aggregate expenditure on the vertical axis and output on the horizontal axis. The Keynesian cross contains two lines: an expenditure line, which relates planned aggregate expenditure to output, and a 45-degree line, which represents the condition that short-run equilibrium output equals planned aggregate expenditure. Short-run equilibrium output is determined at the point at which these two lines intersect. Alternatively, equilibrium is the point at which the planned injections schedule intersects the

positively sloped withdrawals schedule.

- Changes in exogenous expenditure will lead to changes in short-run equilibrium output. In particular, if the economy is initially at full employment, a fall in exogenous expenditure will create a contractionary gap and a rise in exogenous expenditure will create an expansionary gap. The amount by which a one-unit increase in exogenous expenditure raises short-run equilibrium output is called the *multiplier*. An increase in exogenous expenditure not only raises spending directly, it also raises the incomes of producers, who in turn increase their spending, and so on. Hence the multiplier is greater than 1; that is, a one-dollar increase in exogenous expenditure tends to raise short-run equilibrium output by more than one dollar.
- To eliminate output gaps and restore full employment, the government employs *stabilisation policies*. The two major types of stabilisation policy are monetary policy and fiscal policy. Stabilisation policies work by changing planned aggregate expenditure and hence short-run equilibrium output. For example, an increase in government purchases raises exogenous expenditure directly, so it can be used to reduce or eliminate a contractionary gap. Similarly, a cut in taxes or an increase in transfer payments increases the public's disposable income, raising consumption spending at each level of output by an amount equal to the marginal propensity to consume times the cut in taxes or increase in transfers. Higher consumer spending, in turn, raises short-run equilibrium output.

KEY TERMS

45-degree diagram 167

circular flow of income 166

consumption function 163

contractionary policies 185

disequilibrium 167

disposable income 163

entrepreneurs' expectations 169

exogenous expenditure 165

exogenous variable 163

expansionary policies 185

four-sector model 168

income–expenditure multiplier 183

induced expenditure 165

injections 166

marginal propensity to consume (MPC) 163

menu costs 159

planned aggregate expenditure (PAE) 161

real interest rate 169

short-run equilibrium output 166

stabilisation policies 159

two-sector model 168

wealth effect 163

withdrawals 166

REVIEW QUESTIONS

1. What is the key assumption of the basic Keynesian model? Explain why this assumption is needed if one is to accept the view that aggregate spending is a driving force behind short-term economic fluctuations. LO 7.1 **EASY**
2. Give an example of a good or service whose price changes very frequently and one whose price changes relatively infrequently. What accounts for the difference? LO 7.1 **EASY**
3. Define *planned aggregate expenditure* and list its components. Why does planned spending change when output changes? LO 7.2 **EASY**
4. Explain how planned spending and actual spending can differ. Illustrate with an example. LO 7.2 **EASY**
5. Sketch a graph of the consumption function, labelling the axes of the graph. Discuss the economic meaning of:
   a) a movement from left to right along the graph of the consumption function
   b) a parallel upward shift of the consumption function. Give an example of a factor that could lead to a parallel upward shift of the consumption function. LO 7.3 **EASY**
6. Sketch the Keynesian cross diagram. Explain in words the economic significance of the two lines graphed in the diagram. Given only this diagram, how could you determine exogenous expenditure, induced expenditure, the marginal propensity of expenditure and short-run

equilibrium output? LO 7.4 **MEDIUM**

7. Using the Keynesian cross diagram, illustrate the two causes of the early 1990s recession discussed in Thinking as an economist 7.2. LO 7.4 **MEDIUM**
8. Define the *multiplier*. In economic terms, why is the multiplier greater than 1? LO 7.5 **EASY**

PROBLEMS

1. Acme Manufacturing is producing $4 020 000 worth of goods this year and expects to sell its entire production. It is also planning to purchase $1 500 000 in new equipment during the year. At the beginning of the year the company has $500 000 in inventory in its warehouse. Find actual investment and planned investment if:

a) Acme actually sells $3 850 000 worth of goods.

b) Acme actually sells $4 000 000 worth of goods.

c) Acme actually sells $4 200 000 worth of goods.

Assuming that Acme's situation is similar to that of other firms, in which of these three cases is output equal to short-run equilibrium output? LO 7.4 **MEDIUM**

2. Data on before-tax income, taxes paid and consumption spending (on domestic goods and services) for the Smith family in various years are given below.

BEFORE-TAX INCOME ($)	TAX PAID ($)	CONSUMPTION SPENDING ($)
25 000	3000	20 000
27 000	3500	21 350
28 000	3700	22 070
30 000	4000	23 600

a) Graph the Smith's consumption function and find their household's marginal propensity to consume.

b) How much would you expect the Smiths to consume if their income was $32 000 and they paid taxes of $5000?

c) John Smith wins a lottery prize. As a result, the Smith family increases its consumption by $1000 at each level of after-tax income. ('Income' does not include the prize money.) How does this change affect the graph of their consumption function? How does it affect their marginal propensity to consume? LO 7.3

MEDIUM

3. An economy is described by the following equations:

$C = 1500 + 0.75(Y - T)$

$I^P = 800$

$G = 1500$

$X = 100$

$M = 0$

$\overline{T} = 1500$

$t = 0$

$Y^* = 12\,000$

a) Find a numerical equation linking planned aggregate expenditure to output.

b) Find exogenous expenditure and induced expenditure in this economy. LO 7.4 **HARD**

4. For the economy described below:

$C = 1800 + 0.6(Y - T)$

$I^P = 900$

$G = 1500$

$X = 100$

$M = 0$

$\overline{T} = 1500$

$t = 0$

$Y^* = 12\,000$

a) Construct a table showing actual output and planned aggregate expenditure. Find short-run equilibrium output. Consider possible values for short-run equilibrium output ranging from 8200 to 9000.

b) Show the determination of short-run equilibrium output for this economy using the Keynesian cross diagram.

c) What is the output gap for this economy? If the natural rate of unemployment is 4 per cent, what is the actual unemployment rate for this economy (use Okun's law)? LO 7.5 **HARD**

5. For the economy described in Problem 4, find the effect on short-run equilibrium output of:

a) an increase in government purchases from 1500 to 1600

b) a decrease in tax collections from 1500 to 1400 (leaving government purchases at their original value)

c) a decrease in planned investment spending from 900 to 800.

Assume each of these changes is a change in exogenous expenditure. Take as given that the multiplier for this economy is 2.5. In each case, illustrate your answer using the 45-degree diagram. LO 7.5 **HARD**

REFERENCES

Keynes JM 1919, *The Economic Consequences of the Peace*, London, Macmillan.

Keynes JM 1936, *The General Theory of Employment*, *Interest and Money*, London, Macmillan.

Winch D 1969 *Economics and Policy: A Historical Survey*, Fontana, pp. 187.

US Energy Information Administration 2018, 'Short-term energy outlook', https://www.eia.gov/outlooks/steo/realprices/.

CHAPTER 8

Fiscal policy

After reading this chapter, you should be able to answer the following questions.

8.1 By what means can fiscal policy be used to eliminate an output gap?

8.2 Why is there a difference between the macroeconomic effects of changes to government expenditure and changes to taxes and transfer payments?

8.3 What are the three limitations on the ability of fiscal policy to stabilise the economy?

8.4 How does fiscal policy impact on the distribution of income?

8.5 What effect will demographic change have on fiscal policy?

8.6 How is fiscal policy related to the level of public debt?

SETTING THE SCENE

One of Charles Dickens' immortal characters, Mr Micawber, is often remembered for what has become known as the 'Micawber principle’:

Annual income twenty pounds, annual expenditure nineteen and six, result happiness. Annual income twenty pounds, annual expenditure twenty pounds ought and six, result misery.

In the novel *David Copperfield*, Mr Micawber learns to his cost the consequences of living beyond his means—he is thrown into debtor’s prison.

Mr Micawber’s dilemma, balancing spending and income, is one we all face and manage. One of the aspects of a modern economy, however, that often causes commentators to invoke the Micawber principle, is the frequency with which governments’ fiscal policies lead to expenditure being well in excess of revenue. The Australian Government, for example, over the last 50 years, has violated the Micawber principle in 30 of those years, by spending more over the year than it received in taxation and other revenue. What allows the government to do this is its ability to borrow funds from the public. The consequence of this is the accumulation of government (or public) debt. In 2017–18, the Australian Government’s net debt was $466 301 million, around a quarter the value of Australia’s gross domestic product (GDP). While this seems a large number, by international standards, the Australian Government’s debt is relatively small—for example in 2017, the US net debt was over 80% of its GDP

(IMF 2018).

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There are many reasons why governments go into debt. One is the use of government expenditure and taxation as a means of managing the economy, to smooth out the fluctuations in economic activity associated with the business cycle, as discussed in Chapters 6 and 7. In times of economic contraction, this may require government expenditure to exceed its revenue. Other reasons include the need for governments to provide public goods and services that benefit society but are unable to be provided by the private sector. The need to provide a welfare safety net for disadvantaged citizens is another important reason underlying government spending and revenue decisions.

Due its size, and the influence its decisions have over the lives of all of us, there is always close scrutiny of the government's finances. A government that gets a reputation of being poor at managing its finances is often one that is not favoured by voters. And the effects of government spending and revenue decisions can be far reaching. Understanding why a government might go into debt, and what the implications of that decision may be, is therefore an important part of understanding the workings of a modern economy and being able to evaluate the performance of the government.

8.1 GOVERNMENT PURCHASES AND PLANNED SPENDING

LO 8.1

Decisions about government spending represent one of the two main components of fiscal policy, the other being decisions about taxes and transfer payments. As was mentioned in the previous chapter, Keynes himself felt that changes in government purchases were probably the most effective tool for reducing or eliminating output gaps. His basic argument was straightforward: government purchases of goods and services, being a component of planned aggregate expenditure, directly affect total spending. If output gaps are caused by too much or too little total spending then the government can help to guide the economy towards full employment by changing its own level of spending. Keynes's views seemed to be vindicated by the events of the 1930s, notably the fact that the Great Depression did not finally end until governments greatly increased their military spending in the latter part of the decade.

Example 8.1 shows how increased government purchases of goods and services can help to eliminate a contractionary gap.

EXAMPLE 8.1 – AN INCREASE IN THE GOVERNMENT'S PURCHASES ELIMINATES A CONTRACTIONARY GAP

In Example 7.5 (see Chapter 7) we found that a drop of 250 units in government spending creates a contractionary gap of 1250 units. How can the government eliminate the output gap and restore full employment by changing its purchases of goods and services *G*?

In Example 7.5 we found that planned aggregate expenditure was given by the equation $PAE = 960 + 0.8Y$, so that exogenous expenditure equalled 960. The 250-unit drop in G implied a 250-unit drop in exogenous expenditure, to 710. Because the multiplier in that sample economy equalled 5, this 250-unit decline in exogenous expenditure resulted in turn in a 1250-unit decline in short-run equilibrium output.

To offset the effects of the decline in government spending, the government would have to restore exogenous expenditure to its original value, 960. Under our assumption that government purchases are simply given and do not depend on output, government purchases are part of total exogenous expenditure, and changes in government purchases change exogenous expenditure one-for-one. Thus, to increase exogenous expenditure from 710 to 960, the government should simply reverse its previous decision and increase its purchases by 250 units (e.g. by increasing spending on military defence or road construction). According to the basic

Keynesian model, this increase in government purchases should return exogenous expenditure and hence output to their original levels.

The effect of the increase in government purchases is shown graphically in Figure 8.1. After the 250-unit decline in government expenditure, *G*, the economy is at point *F*, with a 1250-unit contractionary gap. A 250-unit increase in government purchases raises exogenous expenditure by 250 units, raising the intercept of the expenditure line by 250 units and causing the expenditure line to shift upwards in parallel fashion. The economy returns to point *E*, where short-run equilibrium output equals potential output ($Y = Y^* = 4800$) and the output gap has been eliminated.

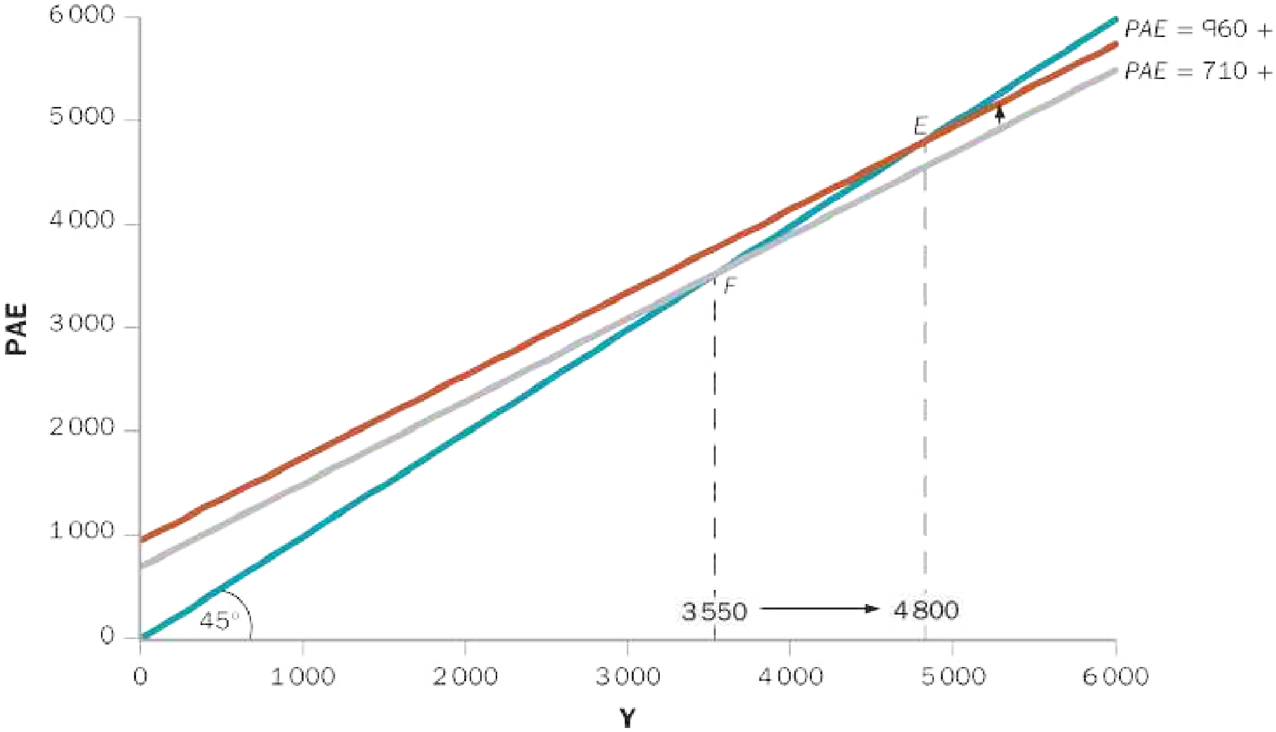

Figure 8.1 **An increase in government purchases eliminates a contractionary gap**

Note: After a 250-unit decline in exogenous expenditure, the economy is at point *F*, with a contractionary gap of 1250. A 250-unit increase in government purchases raises exogenous expenditure by 250 units, shifting the expenditure line back to its original position and raising the equilibrium point from *F* to *E*. At point *E*, where output equals potential output ($Y = Y^* = 4800$), the output gap has been eliminated.

CONCEPT CHECK 8.1

Suppose consumers become more confident about their future economic prospects. Show how this might lead to an expansionary output gap. Discuss how a change in government purchases could be used to eliminate this output gap. Show your analysis graphically.

To this point we have been considering the effect of fiscal policy on a hypothetical economy. Thinking as an economist 8.1 and 8.2 illustrate the application of fiscal policy in real economies.

THINKING AS AN ECONOMIST 8.1

Why did Japan spend $1 trillion on public works?

Japan spent the 1990s in a deep economic slump. In response, the Japanese Government periodically initiated large spending programs to try to stimulate the economy. Indeed, during the 1990s the Japanese Government spent more than A$1 trillion on public works projects. More than $10 billion was spent on the Tokyo subway system alone, an amount so far over budget that subway tokens will have to cost an estimated $9.50 each if the investment is ever to be recouped. Other examples of government spending programs include the construction of multi-million-dollar concert halls in small towns, elaborate tunnels where simple roads would have been adequate, and the digging up and re-laying of cobblestone footpaths. Despite all this spending, the Japanese slump dragged on.

The basic Keynesian model implies that increases in government spending such as those undertaken in Japan should help to increase output and employment. Japanese public works projects did appear to stimulate the economy, though not enough to pull Japan out of recession. Why was Japan's fiscal policy inadequate to the task? Some critics have argued that the Japanese Government was unconscionably slow in initiating the fiscal expansion, and that when spending was finally increased it was simply not enough, relative to the size of the Japanese economy and the depth of the recession. Another possibility, which lies outside the basic Keynesian model, is that the wasteful nature of much of the government spending demoralised Japanese consumers, who realised that, as taxpayers, they would at some point be responsible for the costs incurred in building roads nobody wanted to use. Reduced consumer confidence implies reduced consumption spending, which may to some extent have offset the stimulus from government spending. Very possibly, more productive investments of Japanese public funds would have had a greater impact on aggregate expenditure (by avoiding the fall in consumer confidence); certainly, they would have had a greater long-term benefit in terms of increasing the potential output of the economy.

THINKING AS AN ECONOMIST 8.2

Australia's experience in the Global Financial Crisis

Like almost every other country in the world, Australia was not immune to the global economic downturn. However, the magnitude of the downturn in Australia was comparatively mild. Figure 8.2 shows comparative data on the growth in real GDP for Australia and for other selected countries.
The contrast between Australia's experience and that of the rest of the world was quite stark. Australia was unusual in not experiencing negative economic growth. While the rest of the world's major economies contracted, Australia's economy continued to expand, albeit more slowly than was the case in previous years. Nonetheless, given the magnitude of the downturn elsewhere, this was a remarkable achievement.

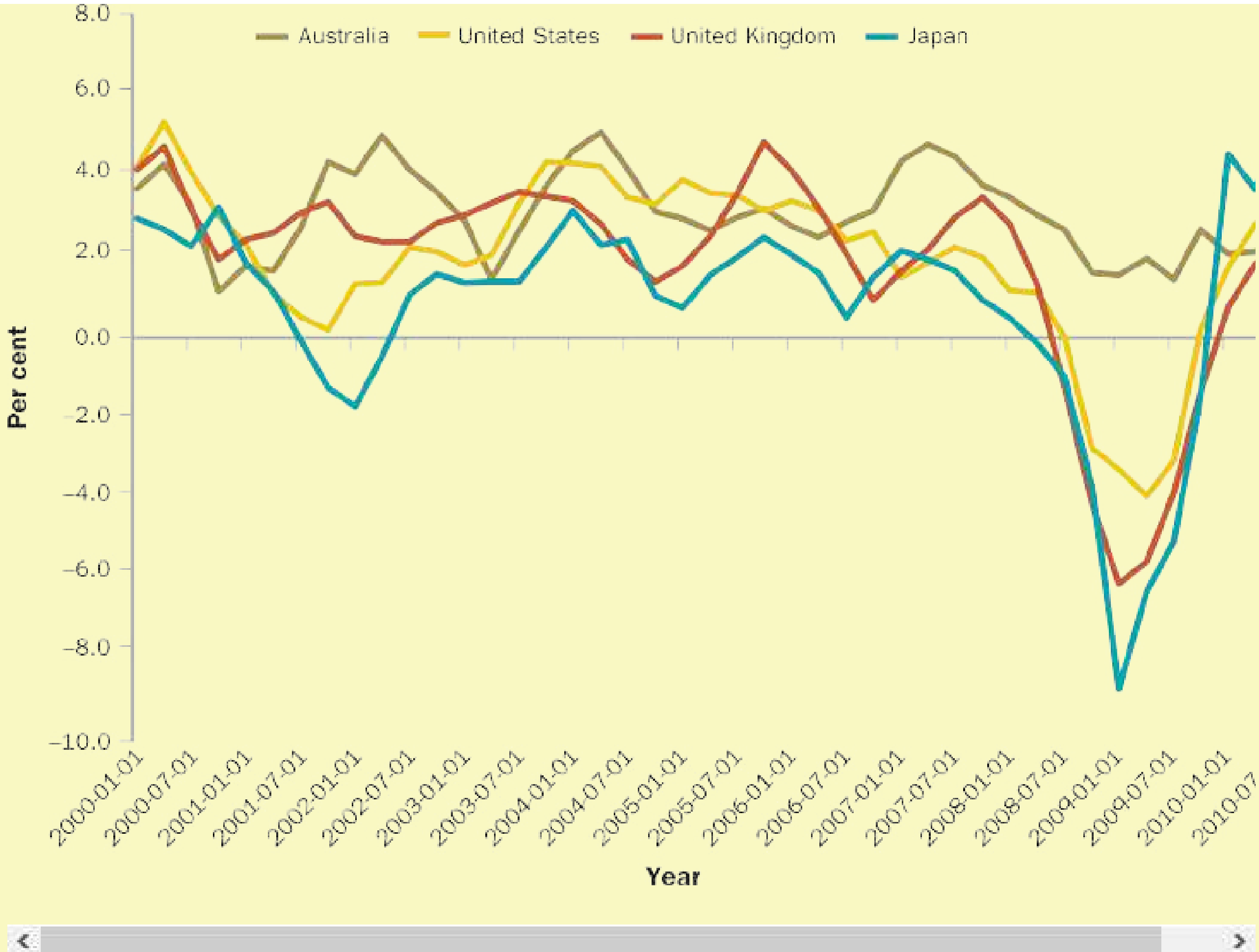

Figure 8.2 **Real GDP growth**

Note: The Global Financial Crisis led to negative growth in most countries in the world. Australia was an exception. While the growth rate of GDP slowed, the Global Financial Crisis did not lead to negative growth in Australia.

Source: Federal Reserve Bank of St Louis (FRED) 2018, Federal Reserve economic data, https://fred.stlouisfed.org.

WHAT EXPLAINED AUSTRALIA'S GOOD FORTUNE?

There were at least four reasons for Australia's good fortune. The first was that Australia's housing market did not collapse as in the United States and in many other countries. Figure 8.3 shows an index of Australian capital city house prices. While there was a decline in house prices towards the end of 2007, by 2009 this had been reversed and house prices continued their strong upward climb. There are many reasons for this relatively strong performance. However, the predominant short-term reason is that, unlike the United States, there have been comparatively few instances in Australia of people being unable to repay their loans and this meant Australia saw comparatively little increase in the stock of houses for sale (unlike the United States where forced sales of housing were a feature of the crisis). Combined with a general long-run increase in the demand for housing, this meant that the growth of Australian house prices quickly regained its momentum once the initial shock of the crisis passed.

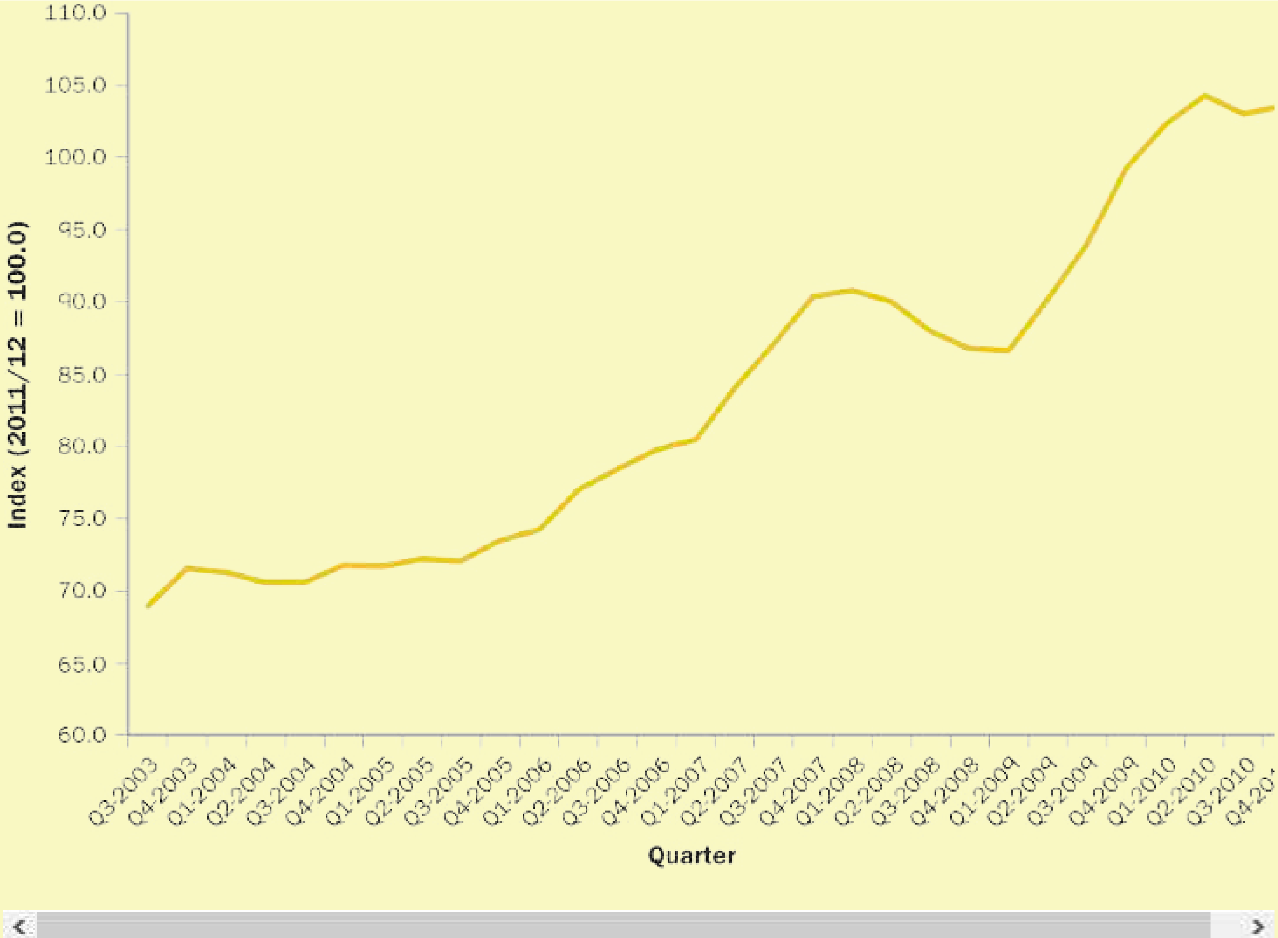

Figure 8.3 **House prices in Australia**

Note: The growth in house prices in Australia recovered quickly from a relatively mild downturn in the early stages of the Global Financial Crisis.

Source: Based on Australian Bureau of Statistics 2018, ‘Residential property price indexes: Eight capital cities’, Cat. no. 6416.0.

The second factor that contributed to Australia’s relatively strong performance was the strength of its financial system. Australian banks did not succumb to the excesses that many US financial institutions embraced—Australian banks did not hold as many ‘toxic’ assets on their books as their counterparts elsewhere. This is partly explained by Australian banks operating under a stricter system of prudential regulation than banks in the United States. It may also be that Australia’s banking system is less characterised by the scramble for market share that may have promoted excessive risk taking in the United States.

The third factor was Australia’s relatively strong export performance and the importance that exports have in promoting Australian economic growth. The key here was China and, to a slightly lesser extent, India. Both were, and continue to be, large purchasers of Australian exports, particularly primary commodities. Figure 8.4 plots Australian exports to China and India. For both countries, there was a short-term dip in their demand for exports that coincided with the worst of the crisis. However, demand for exports quickly recovered and there was no catastrophic collapse in the wake of the crisis. As exports are a significant component of aggregate expenditure in Australia, this helped to moderate any overall fall in planned aggregate expenditure.

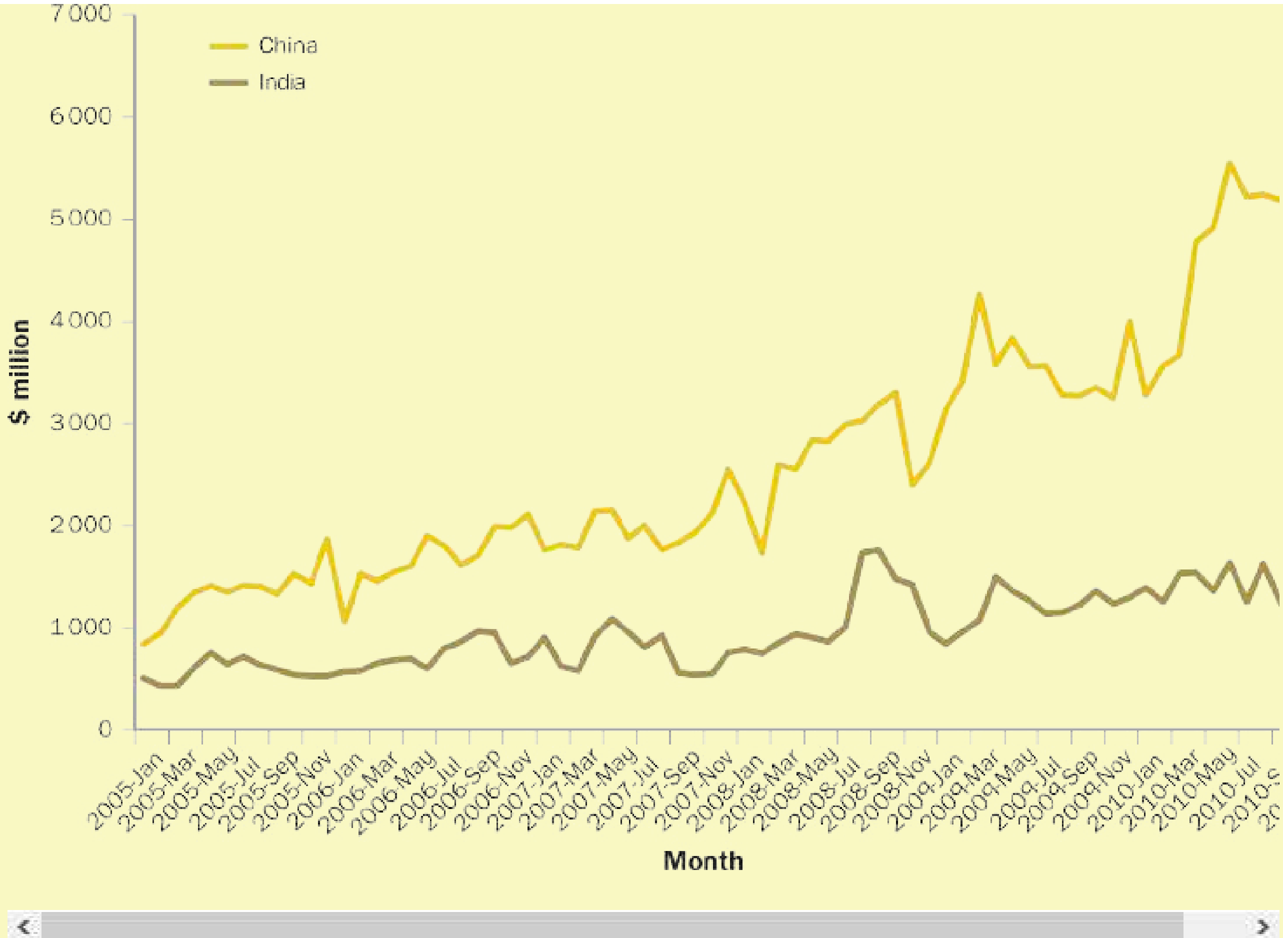

Figure 8.4 **Australian exports to China and India**

Note: Exports to China and India did not collapse in the Global Financial Crisis, which helped maintain Australia's level of planned aggregate expenditure.

Source: Based on Australian Bureau of Statistics 2009, 'International trade in goods and services, Australia', Cat. no. 5368.0.

The fourth factor was an unusually aggressive coordinated fiscal and monetary policy response. Here, we focus on fiscal policy. We will explain the monetary policy response in Chapter 10 .

In Australia, two major fiscal stimulus packages were introduced as a direct response to the Global Financial Crisis. The first was a $10.4 billion package of fiscal measures, roughly equivalent to 1 per cent of Australia's GDP. The bulk of the package comprised a cash bonus paid to pensioners and low-income families. Other measures included support for the housing and construction sectors, which were thought to be particularly vulnerable at the time. A second, even larger, package was also introduced. More than half of this package was earmarked for expenditure on roads, schools and housing.

We can visualise what the effects of these fiscal stimulus measures might be in the basic Keynesian model (Figure 8.5). Both fiscal policy packages were designed to shift the expenditure line upwards, causing short-run equilibrium output to rise from point *E* to point *F*, ultimately pushing the economy towards equilibrium closer to its potential output. As Nobel Laureate Paul Krugman (2008) observed in response to the question, 'What should be done about the effects of the global financial crisis on economic activity?', 'The answer, almost surely, is good old Keynesian fiscal stimulus'.

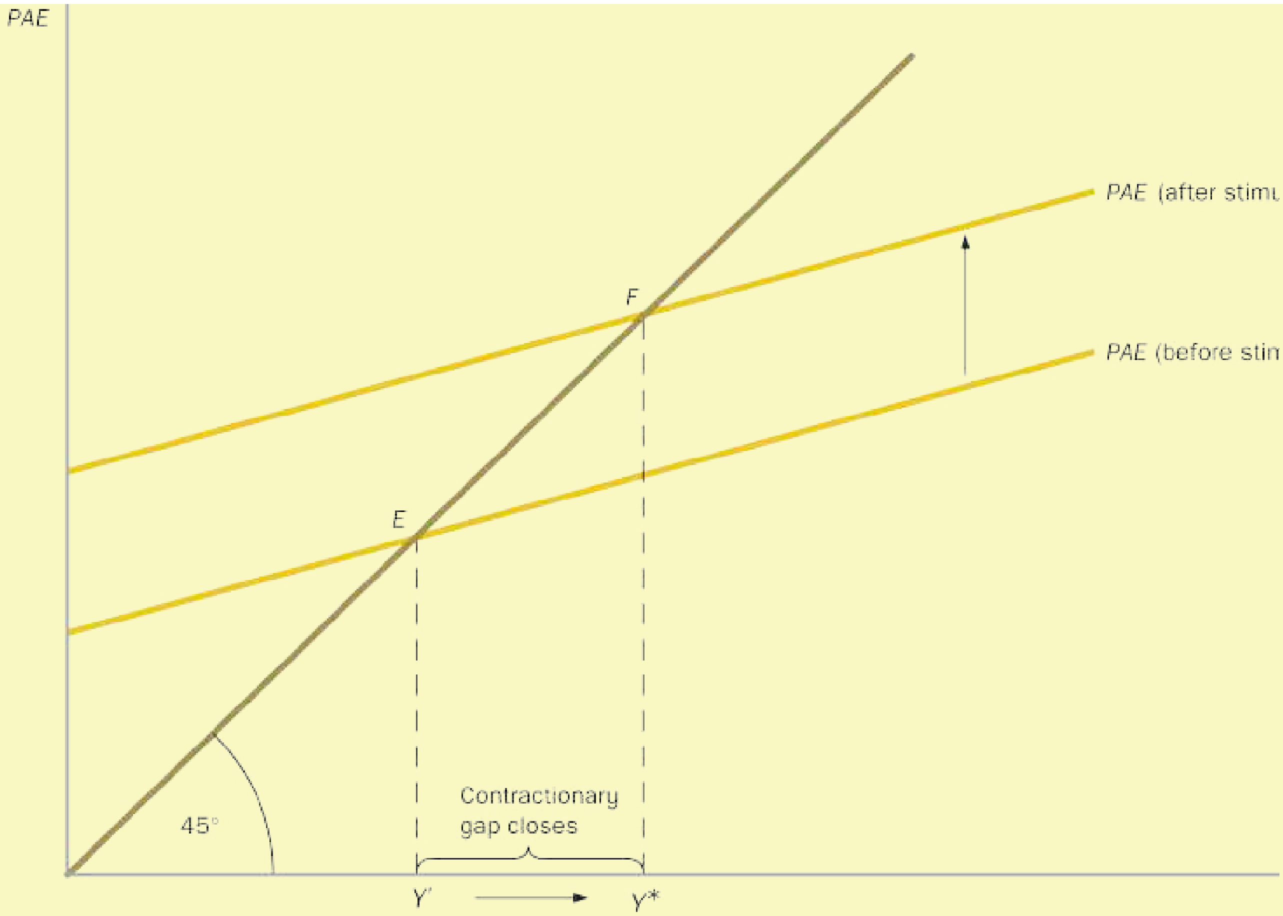

Figure 8.5 **The use of fiscal policy to fight the crisis**

Note: Australia's stimulus packages, by increasing planned aggregate expenditure, closed the contractionary output gap.

8.2 TAXES, TRANSFERS AND AGGREGATE SPENDING

LO 8.2

Besides making decisions about government purchases of goods and services, fiscal policymakers also determine the level and types of taxes to be collected and transfer payments to be made. (Transfer payments, recall, are payments made by the government to the public, for which no current goods or services are received. Examples of transfer payments are unemployment benefits, welfare benefits and income support payments to farmers. Once again, transfer payments are *not* included in government purchases of goods and services.) The basic Keynesian model implies that, like changes in government purchases, changes in the level of taxes or transfers can be used to affect planned aggregate expenditure and thus eliminate output gaps.

Unlike changes in government purchases, however, changes in taxes or transfers do not affect planned spending directly. Instead, they work indirectly, by changing disposable income in the private sector. For example, either a tax cut or an increase in government transfer payments increases disposable income, equal to $Y – T$. According to the consumption function, when disposable income rises households should spend more. Thus, a tax cut or increase in transfers should increase planned aggregate expenditure. Likewise, an increase in taxes or a cut in transfers, by lowering households' disposable income, will tend to lower planned spending. Example 8.2 illustrates the effects of a tax cut on spending and output.

EXAMPLE 8.2 – USING A TAX CUT TO CLOSE A CONTRACTIONARY GAP

Let us suppose that in a hypothetical economy, planned aggregate expenditure is given by the equation *PAE* = 50 + 0.7*Y*. In this economy, suppose the current tax rate is 10% (*t* = 0.1), the marginal propensity to consume is 0.8 and the marginal propensity to import is 0.02. What is the value of equilibrium GDP (assume this value of GDP is the same as the economy's potential output)? What happens to this value if planned investment spending falls by 10 units? Is there a change in the tax rate that would restore the original equilibrium value for GDP?

By setting *Y* equal to the initial planned expenditure given by 50 + 0.7*Y*, this economy's equilibrium GDP (which we have assumed equals potential GDP) is 166.67. After the fall in planned investment by 10 units, the economy's planned aggregate expenditure becomes *PAE* = 40 + 0.7*Y*. Setting this planned expenditure equal to GDP implies a new equilibrium of 133.33. Since this is less than the economy's potential output, there now exists a contractionary output gap. To eliminate this output gap requires an increase in planned aggregate expenditure. Previously, we have seen that an increase in exogenous government expenditure could in theory be used to achieve this aim. An alternative is to induce more planned expenditure by lowering the tax rate. From the consumption function, we know that a reduction in the tax rate raises disposable income—households are assumed to respond to this by increasing their expenditure. Suppose, then, that the tax rate Is reduced to 2.5% (t = 0.025). Planned aggregate expenditure would then be $PAE = 40 + 0.76Y$. Setting this new planned aggregate expenditure equal to Y gives an equilibrium of 166.667, which is equal to the economy's potential GDP. The contractionary gap caused by the fall in planned investment has been eliminated by changing the tax rate to induce a change in planned aggregate expenditure in such a way that the economy's equilibrium level of GDP coincides with its potential level of GDP.

The change in the tax rate needed to restore the economy's equilibrium to equal potential GDP is illustrated in Figure 8.6. With an exogenous level of spending equal to 40, what will be required is a cut in the tax rate that steepens the PAE schedule in such a way that the economy will achieve an equilibrium level of GDP of 166.67. As we've seen, in this example this can be achieved by cutting the tax rate from its original rate of 0.1 to the smaller rate of 0.025. With *c* equal to 0.8 and the tax rate, *t*, now equal to 0.025, the coefficient in front of *Y* in the equation for PAE is 0.76 (in other words, the slope of the PAE schedule is 0.76). You should check again that a PAE schedule given by the equation $PAE = 40 + 0.76Y$ implies an equilibrium level of GDP equal to 166.67.

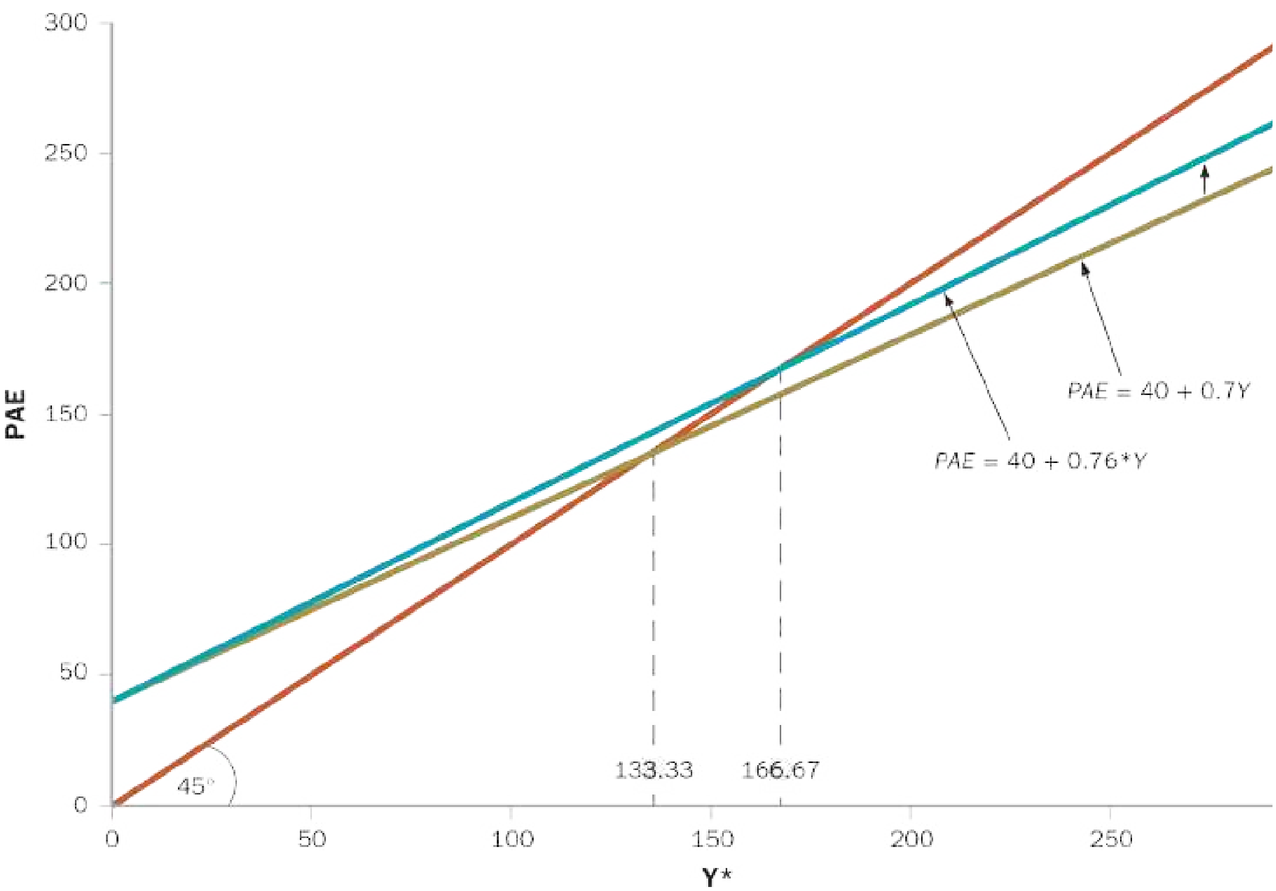

Figure 8.6 **A cut in the tax rate can eliminate a contractionary gap**

Note: A change in the tax rate affects the slope of the planned aggregate expenditure line, leading to a different equilibrium level of GDP.

CONCEPT CHECK 8.2

Explain intuitively why a cut in the tax rate leads to an increase in the economy's equilibrium level of GDP.

CONCEPT CHECK 8.3

In a particular economy, a 20-unit increase in planned investment moved the economy from an initial situation with no output gap to a situation with an expansionary gap. Describe two ways in which fiscal policy could be used to offset this expansionary gap.

Example 8.2 shows how a tax cut can be used to remove a contractionary gap. There are a variety of other fiscal policies that can also affect planned aggregate expenditure, sometimes in quite surprising ways. This is especially true when we start to think about the ways in which government expenditure can be financed (a topic we will deal with in more detail in Section 8.4.3). To give an illustration of this, we look in Thinking as an economist 8.3 at a particular type of transfer payment, a cash bonus, to illustrate a result known as the **balanced budget multiplier**.

THINKING AS AN ECONOMIST 8.3

What might be the macroeconomic effects of a bonus payment?

At various times, the Australian Government has made one-off cash payments to members of the public. One such instance occurred in 2002 when the government introduced a one-off payment to parents of a newborn baby. This payment was around $5000. Another instance was during the Global Financial Crisis, when significant payments were made to a great many Australian taxpayers. What would be the effect on the macroeconomy of such payments?

To keep the analysis simple, we will assume that 1000 people in the economy each receive a payment of $5000, giving a total payment of $5 million.

Recall that taxes, T, consist of an exogenous component, $\overline{T}$, and a component that is proportional to income, tY. A transfer payment such as the one we are considering can be thought of as a negative exogenous tax; that is, the payment reduces the level of the exogenous component of taxation, $\overline{T}$. Hence, the payment can be regarded as an exogenous tax cut equal to $5 million in total. Based on our discussion of the Keynesian 45-degree diagram, one might predict the following two outcomes:

1. The economy's planned aggregate spending would increase by $5 million.
2. There would be a greater than $5 million increase in the economy's equilibrium level of GDP, due to the operation of the multiplier. For example, if the economy's multiplier equals 5, the economy's equilibrium GDP would increase by $25 million.

It turns out that both of these predictions may be incorrect.

To see why the first is incorrect, recall Equation 7.15 from Chapter 7, which relates to the economy's planned aggregate expenditure and which we reproduce below:

$$\begin{aligned} PAE &= C + I^P + G + NX \\ &= \overline{C} - c\overline{T} + I^P + G + X + [c(1-t) - m]Y \end{aligned}$$

Equation 8.1

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You can see from Equation 8.1 that the economy's level of planned aggregate expenditure depends not on $\overline{T}$ but instead on $c\overline{T}$, the exogenous tax multiplied by the marginal propensity to consume. If the marginal propensity to consume were 0.85, for example, Equation 8.1 shows that the aggregate bonus of $5 million would increase planned aggregate expenditure by 0.85 × $5 million = $4.25 million (note that we are assuming here, for simplicity, that any cut in exogenous taxes is entirely spent on domestically produced goods and services). The remaining $0.75 million would be saved and therefore would have no effect on planned aggregate expenditure.

Does this mean that the effect on the economy's equilibrium GDP would be $4.25 million × 5 (where 5 is the value of the multiplier we are assuming for this discussion)? The answer might well be no. Suppose, for example, that the cut in exogenous taxation had been financed by a $5 million cut in other government spending programs. This cut in government spending, of itself, would have had acted to pull planned aggregate spending downwards (you can see this from Equation 8.1). In fact, the fall in planned aggregate expenditure of $5 million is greater than the increase in planned aggregate expenditure of $4.25 million caused by the bonus payment (remember, some of the bonus is saved and hence becomes part of the economy's withdrawals). This is an example of what is called the *balanced budget multiplier*. Treating the bonus payment as a tax cut of $5 million (i.e. a cut in the exogenous component of taxation), matched by a fall in government spending of $5 million, means there is no net effect on the government's budget (e.g. had there been a balance between tax revenue and government spending before the bonus payment, there would still be a balance after the payment of the bonus). Yet, as shown in Figure 8.7, the result is a fall in the economy's equilibrium level of GDP, since a part of the bonus is saved.

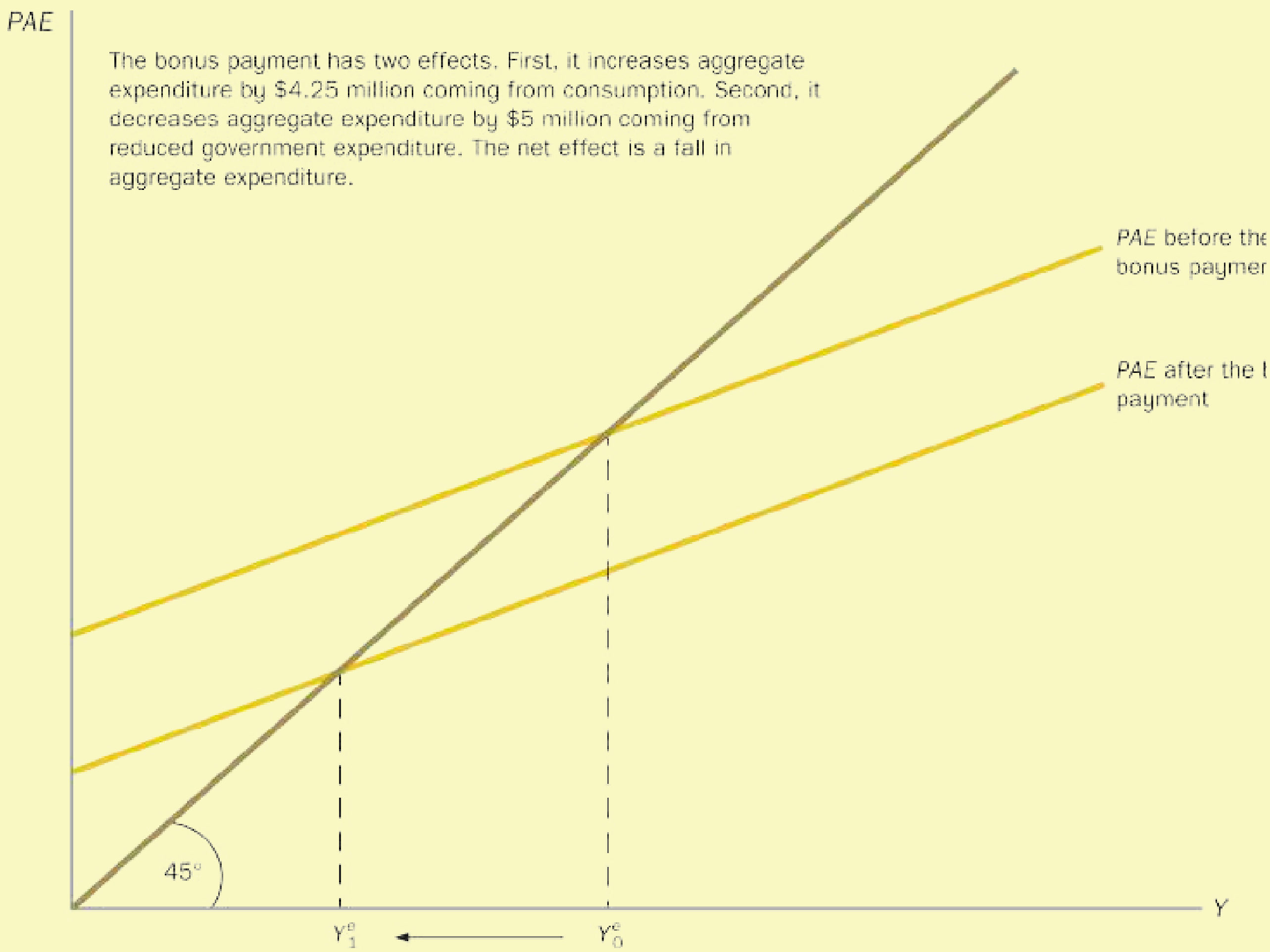


Figure 8.7 **The effect of a one-off bonus payment on PAE**

Note: A cash benefit like the baby bonus paid for through a reduction in government spending leads to a fall in PAE and means the economy will move to a lower level of equilibrium GDP.

▹▹ RECAP

Fiscal policy includes two general tools for affecting total spending and eliminating output gaps:

1. changes in government purchases
2. changes in taxes or transfer payments.

An increase in government purchases increases exogenous expenditure by an equal amount.

An exogenous reduction in taxes or an increase in transfer payments increases exogenous expenditure by an amount equal to the marginal propensity to consume times the reduction in taxes or increase in transfers. The ultimate effect of a fiscal policy change on short-run equilibrium output equals the change in exogenous expenditure times the multiplier. Accordingly, if the economy is in contraction, an increase in government purchases, a cut in taxes or an increase in transfers can be used to stimulate spending and eliminate the contractionary gap.

8.3 FISCAL POLICY AS A STABILISATION TOOL: THREE QUALIFICATIONS

LO 8.3

The basic Keynesian model might lead you to think that precise use of fiscal policy can eliminate output gaps. But, as is often the case, the real world is more complicated than economic models suggest. We now note three important qualifications about the use of fiscal policy as a stabilisation tool.

8.3.1 FISCAL POLICY AND THE SUPPLY SIDE

FIND ONLINE

We have focused so far on the use of fiscal policy to affect planned aggregate expenditure. However, most economists would agree that *fiscal policy may affect potential output as well as planned aggregate expenditure*. On the spending side, for example, investments in public capital, such as roads, airports and schools, can play a major role in the growth of potential output. On the other side of the ledger, tax and transfer programs may well affect the incentives, and thus the economic behaviour, of households and firms. For example, a high tax rate on interest income may reduce the willingness of people to save for the future, while a tax break on new investment may encourage firms to increase their rate of capital formation. Such changes in saving or investment will in turn affect potential output. Many other examples could be given of how taxes and transfers affect economic behaviour and thus possibly affect potential output as well.

Some critics of the Keynesian theory have gone so far as to argue that the *only* effects of fiscal policy that matter are effects on potential output. This was essentially the view of the so-called **supply-siders**, a group of economists and journalists whose influence reached a high point during the first Reagan term (1981–85) in the United States and who have had some, but not as great, influence in Australian public affairs. Supply-siders focused on the need for tax cuts, arguing that lower tax rates would lead people to work harder (because they would be allowed to keep a larger share of their earnings), to save more and to be more willing to innovate and take risks. Through their arguments that lower taxes would substantially increase potential output, with no significant effect on planned spending, the supply-siders provided crucial support for the large tax cuts that took place under the Reagan administration. Supply-siders' ideas also were used to support the long-term income tax cut passed under President George W Bush in 2001 and President Donald Trump in 2018.

A more balanced view is that fiscal policy affects *both* planned spending *and* potential output. Thus, in making fiscal policy, government officials should take into account not only the need to stabilise planned aggregate expenditure but also the possible effects of government spending, taxes and transfers on the economy's productive capacity.

8.3.2 THE PROBLEM OF DEFICITS

A second consideration for fiscal policymakers thinking about stabilisation policies is *the need to avoid large and persistent budget deficits*. Recall from Chapter 1 that the government's budget deficit is the excess of government spending over tax collections. Sustained government deficits can be harmful because they reduce national saving, which in turn reduces investment in new capital goods—an important source of long-run economic growth. The need to keep deficits under control may make increasing spending or cutting taxes to fight a slowdown a less attractive option, both economically and politically.

BACKGROUND BRIEFING 8.1

The implications of fiscal policy for public debt

This issue of budget deficits looms large over discussions of governments' responses to the Global Financial Crisis. Most countries responded to the crisis by adopting policies consistent with the analysis in Thinking as an economist 8.2, namely, introducing sizeable fiscal stimulus packages to ensure that equilibrium moved back to potential GDP. This resulted in large budget deficits, for many countries the largest deficits experienced since World War II. Figure 8.8, which shows data for the United States, is typical of many countries' experience.

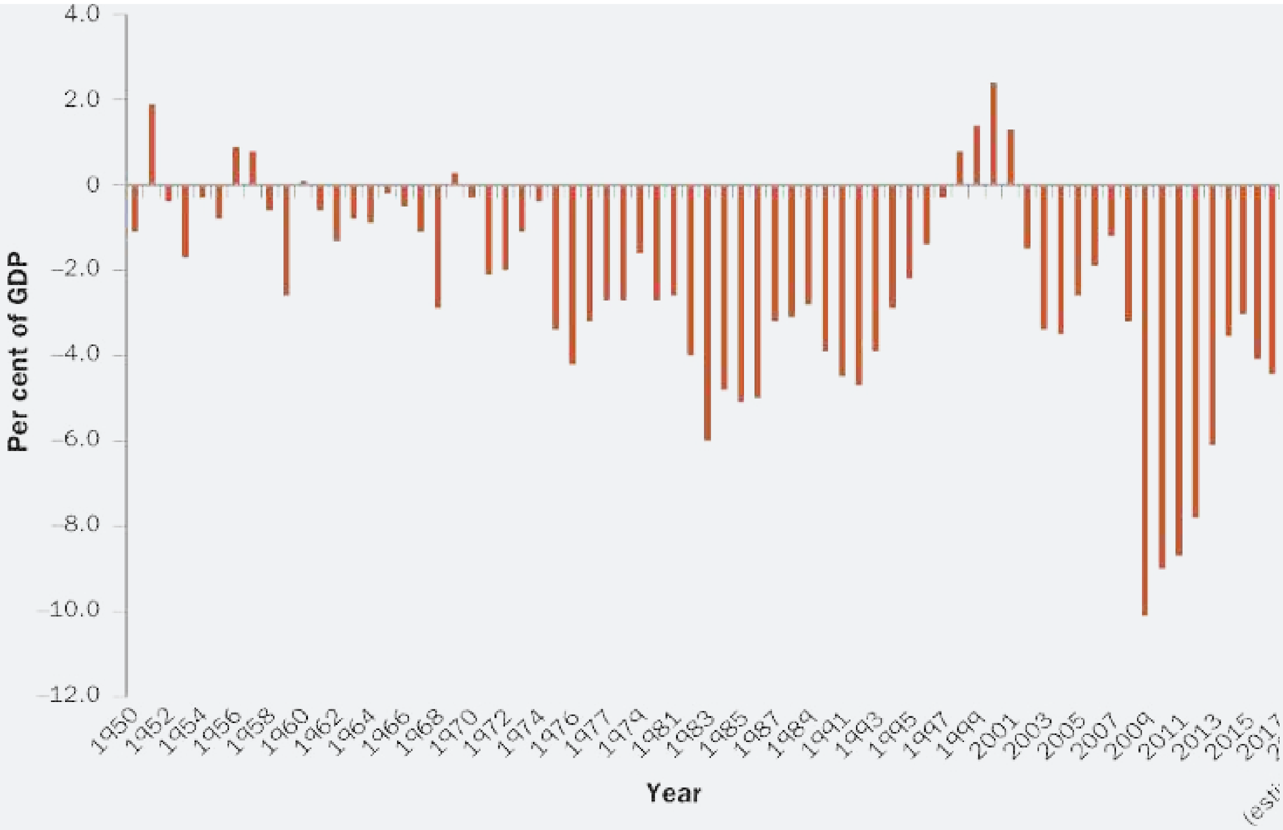


Figure 8.8 **US budget deficits**

Note: The US fiscal stimulus packages introduced in response to the Global Financial Crisis resulted in historically very large budget deficits.

Source: Based on data from the Economic Report of the President 2018, ‘Table B-18, Federal receipts, outlays, surplus or deficit, and debt, as percent of gross domestic product, fiscal years 1945–2017’, https://www.gpo.gov/fdsys/granule/ERP-2017/ERP-2017-table18, accessed November 2018.

Critics of the stimulus packages argued that while these policies might have been designed to achieve a short-term boost to economic activity to avoid a serious recession, there would be long-term effects that would pose problems for future policymakers. The issue concerns the financing of the deficit. Just as a household might borrow to finance expenditure in excess of income, so when governments run budget deficits they typically borrow the funds that are needed. This leads to public debt, a liability of governments that eventually will have to be repaid. Table 8.1 illustrates this for selected countries.

TABLE 8.1 **Overall budget deficits and gross public debt as a proportion of GDP**

		2009	2010	2011	2014
Australia	Deficit	−4.6	−5.1	−4.4	−2.9
	Public debt	16.8	20.5	24.2	34.1
US	Deficit	−12.7	−10.6	−9.3	−3.7
	Public debt	86.9	95.5	99.9	104.6
UK	Deficit	−10.1	−9.3	−7.5	−5.4
	Public debt	63.7	75.2	80.8	87.0
Japan	Deficit	−10.2	−9.5	−9.4	−5.6
	Public debt	201.0	207.9	222.1	236.1

Source: Compiled based on data from International Monetary Fund 2018, 'Fiscal monitor, October 2018', https://www.imf.org/en/Publications/FM/Issues/2018/10/04/fiscal-monitor-october-2018.

As Table 8.1 illustrates, the fiscal stimulus packages introduced by Australia, the United States, the United Kingdom and Japan led to relatively large budget deficits as a proportion of GDP and to significant increases in the stock of public debt, that is, the funds owed to creditors by governments.

Table 8.1 also highlights the differences that exist across countries with regard to their respective stocks of public debt. Even after the stimulus packages introduced by the Australian Government, the stock of public debt in Australia remained relatively low by international standards.

We will return to the issue of public debt in Section 8.4.3.

8.3.3 THE RELATIVE INFLEXIBILITY OF FISCAL POLICY

The third qualification about the use of *fiscal policy* is that *fiscal policy is not always flexible enough to be useful for stabilisation*. Our examples have implicitly assumed that the government can change spending or taxes relatively quickly to eliminate output gaps. In reality, changes in government spending or taxes must usually go through a lengthy legislative process, which reduces the ability of fiscal policy to respond in a timely way to economic conditions. For example, budget and tax changes proposed by the government are usually part of the government's budget, handed down in May of every year, and some time, often months, elapses before they go into effect. Another factor that limits the flexibility of fiscal policy is that fiscal policymakers have many other objectives besides stabilising aggregate spending, from ensuring an adequate national defence to providing income support to the poor. What happens if the need to strengthen the national defence requires an increase in government spending but the need to contain planned aggregate expenditure requires a decrease in government spending? Such conflicts can be difficult to resolve through the political process.

This lack of flexibility means that fiscal policy is less useful for stabilising spending than the basic Keynesian model suggests. Nevertheless, most economists view fiscal policy as an important stabilising force, for two reasons. The first is the presence of **automatic stabilisers**. Taxes and transfer payments, for example, respond automatically to output gaps: when GDP declines, income tax collections fall (because households' taxable incomes fall) while unemployment and other welfare benefits rise—all without any explicit action by the government. These automatic changes in government spending and tax collections help to increase planned spending during contractions and reduce it during expansions, without the delays inherent in the legislative process.

The second reason that fiscal policy is an important stabilising force is that although fiscal policy may be difficult to change quickly, it may still be useful for dealing with prolonged episodes of recession. The Great Depression of the 1930s, the Japanese slump of the 1990s and the recent Global Financial Crisis are three cases in point. However, because of the relative lack of flexibility of fiscal policy, in modern economies aggregate spending is more usually stabilised through monetary policy. The stabilising role of monetary policy is the subject of the next two chapters.

▹▹ RECAP

Fiscal policy is not often used these days to stabilise the economy. This is because:

1. Fiscal policy may have effects for the supply side of the economy that might have undesirable long-run consequences.
2. Expansionary fiscal policies may lead to large budget deficits that reduce national savings.
3. Fiscal policy is relatively inflexible as government expenditure and taxes are not able to be changed quickly.

8.4 CONTEMPORARY FISCAL POLICY

LO 8.4, 8.5

The arguments in Section 8.3 suggested that fiscal policy is not always well suited to the task of stabilising the macroeconomy. Yet virtually all economists would agree that fiscal policy is a vitally important component of the government's economic policies. How can these two statements be reconciled?

The answer is that fiscal policy plays many important roles in the economy; stabilising the macroeconomy is but one of those roles. In this section of the book we consider three key roles of fiscal policy as it is practised in Australia today: affecting the distribution of income, responding to demographic change and managing the public debt. As you will see, fiscal policy is called upon to fulfil many tasks in the Australian economy, tasks that may be at least as important as stabilising the economy in the short run.

8.4.1 THE DISTRIBUTION OF INCOME

Many people are concerned about the issue of equity in the distribution of income. Here, fiscal policy has a role to play. In fact, one of the key functions played by fiscal policy is to influence the distribution of income between households in the economy. Fiscal policy can affect the distribution of income since the total amount of disposable income available to households for the purposes of consumption and saving depends on net taxes. Recall that net taxes refer to the difference between the amount paid by households to the government as taxation and the amount received by households in the form of government transfer payments. By varying the amount of net taxes paid according to the level of income that households earn, the government can affect the distribution of after-tax income between households.

Like many countries, Australia has a system of **progressive income taxes**; progressive income taxes mean that the tax rate levied on an additional dollar earned increases as income increases. Historically, the progressive nature of Australia's income tax system has been an important means of influencing the distribution of income across households. In effect, it has allowed the relatively affluent to be taxed at a higher rate, with at least part of those funds then being transferred to the relatively less affluent through the welfare system.

Table 8.2 shows the rates of income tax in Australia at the time of writing.

TABLE 8.2 Income tax rates in Australia, 2018–19

TAXABLE INCOME	TAX ON THIS INCOME
$1–$18 200	Nil
$18 201–$37 000	19c for each $1 over $18 200
$37 001–$90 000	$3572 plus 32.5c for each $1 over $37 000
$90 001–$180 000	$20 797 plus 37c for each $1 over $90 000
$180 001 and over	$54 547 plus 45c for each $1 over $180 000

Source: © Australian Taxation Office for the Commonwealth of Australia 2018, 'Resident tax rates 2018–19', https://www.ato.gov.au/Rates/Individual-income-tax-rates/, accessed October 2018.

Based on the tax rates in Table 8.2, an individual earning $120 000 per year would pay $31 897 to the government as income tax. This represents an average tax rate of 26.6 per cent (the average tax rate is calculated as 100 × (tax paid/income)). However, an individual earning $60 000 would pay $11 047 as income tax, an average tax rate of 18.4 per cent. These calculations show how the proportion of income paid to the government as tax increases at higher income levels. This results in a less unequal distribution of post-tax income than if the same tax rate were applied to all individuals regardless of their income level. Another way of thinking about this is that the gap between the post-tax income of the person with the highest income in Australia and the person with the lowest income in Australia is smaller because of the progressiveness of the tax system, compared to what the size of this gap would have been had the tax system not been progressive.

Government transfer payments, like the bonus payments we discussed in Thinking as an economist 8.3, are also targeted towards low-income earners. Therefore, we would expect that these payments would also act to narrow the gap between the highest and lowest income earners in Australia.

It is important to note that fiscal policy is one of many factors that influence the distribution of income. Other factors that will be important include the distribution of workers across occupations (a workforce that is more concentrated in low-paying occupations may have more income inequality than one where the workforce is equally distributed across all occupations) and the state of the macroeconomy (in contractions, job losses are often concentrated among lower-paid workers).

What do we know about the state of income inequality in Australia? Do Australians live in an egalitarian society? Is Australia more or less egalitarian than we were 10 years ago? And how does Australia compare to other countries?

One way of answering questions such as these is to use a numerical measure of income inequality known as the **Gini coefficient**. This is a summary measure of income inequality introduced by the Italian statistician Corrado Gini (1912). The Gini coefficient is closely related to a graphical representation of income inequality known as the **Lorenz curve** (Lorenz

1905).

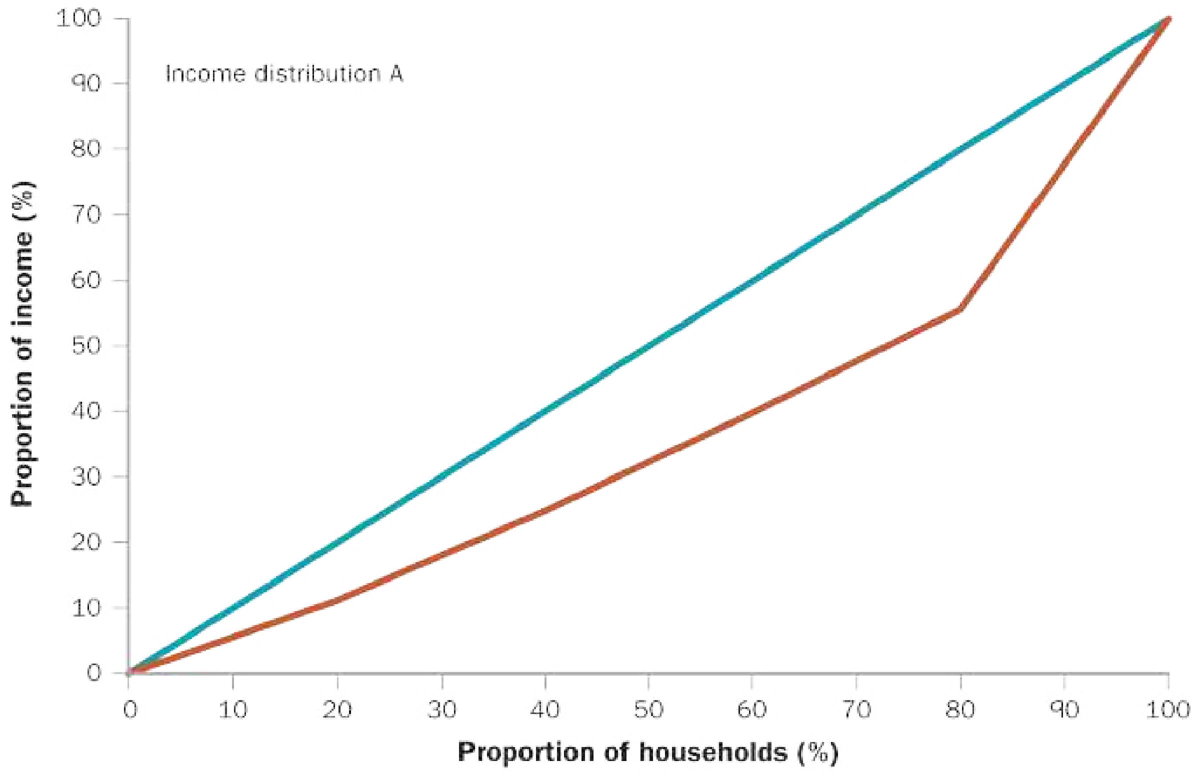
To illustrate these concepts, consider the two hypothetical income distributions illustrated in Table 8.3. In both cases we will assume there are 100 households in total, and that the total income to be distributed across those households is $2660. In the table we have arranged households according to their ranking in the overall distribution of income. For example, for Income distribution A, the poorest 20 per cent of households earn an average income of $15 a day, the next poorest 20 per cent earn an average income of $18 a day and so on until we get to the richest 20 per cent of households who earn an average income of $59 a day. For Income distribution B, the poorest 20 per cent of households earn an average income of $24 a day, the next poorest 20 per cent earn an average income of $25 a day and so on until we get to the richest 20 per cent of households who earn an average income of $30 a day.

TABLE 8.3 Two hypothetical income distributions

HOUSEHOLD GROUP (RANKING %)	INCOME DISTRIBUTION A ($ PER HOUSEHOLD)	INCOME DISTRIBUTION B ($ PER HOUSEHOLD)
81–100 (richest)	59	30
61–80	21	29
41–60	20	25
21–40	18	25
0–20 (poorest)	15	24

To draw the Lorenz curve associated with each of these income distributions we first calculate the cumulative income earned by various groupings of households. For example, using the data for Income distribution A, the first 20 per cent of households earn $300 from a total available amount of income of $2660; in other words, the bottom 20 per cent of the income distribution earns 100 × $300/$2660 = 11.3 per cent of the total income available in the economy. If we now look at the bottom 40 per cent of the income distribution, the corresponding figure is 100 × ($300 + $360)/$2660 = 24.8 per cent of the total income available in the economy. For Income distribution B, the corresponding figures are 18 per cent (for the bottom 20 per cent of the income distribution) and 36.8 per cent (for the bottom 40 per cent of the income distribution). Compare these numbers to what would be the case under a perfectly equal distribution of income; in this case, the bottom 20 per cent of the income distribution would earn 20 per cent of the available income, the bottom 40 per cent of the income distribution would earn 40 per cent of the available income and so on.

Figure 8.9 illustrates the Lorenz curves for the hypothetical income distributions shown in Table 8.3. Also shown on each diagram is the *line of equality*; this is the benchmark case of a perfectly equal distribution of income. What we can say is that the Lorenz curve for Income distribution B is much closer to the line of equality than is the Lorenz curve for Income distribution A. We would therefore say that the distribution of income is more equal under Income distribution B than under Income distribution A.


Income distribution A
Proportion of income (%)
Proportion of households (%)
0
10
20
30
40
50
60
70
80
90
100

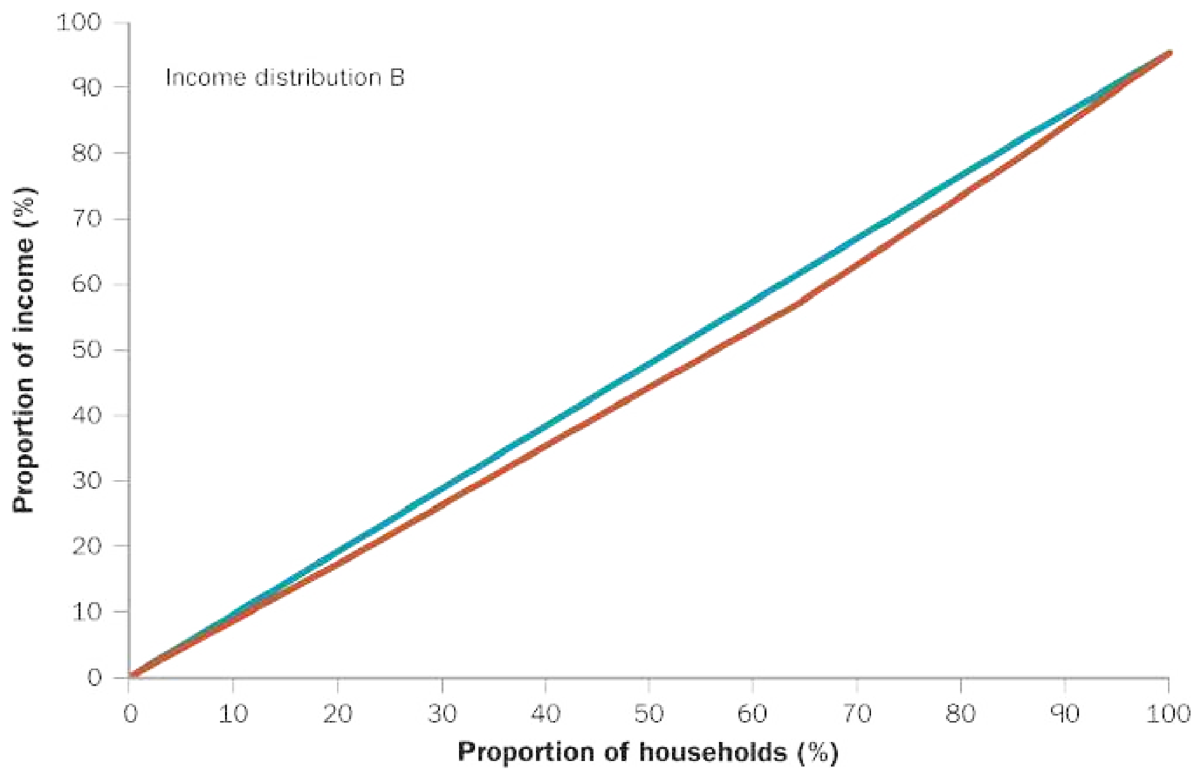

Income distribution B
Proportion of income (%)
Proportion of households (%)
0
10
20
30
40
50
60
70
80
90
100

Figure 8.9 **Lorenz curves**

Note: With perfect income equality, the Lorenz curve would be a straight line (equality). Where there is any income inequality, the Lorenz curve lies below the line of equality.

The Gini coefficient is a statistic that summarises the information about the distribution of income contained in the Lorenz curve. It is calculated using the formula:

Equation 8.2

$$\text{Gini} = \frac{\text{area between the line of equality and the Lorenz curve}}{\text{total area below the line of equality}}$$

For Income distribution A, the Gini coefficient is 0.274; for Income distribution B, the Gini coefficient is 0.048. In general, the lower the value of the Gini coefficient, the closer is the Lorenz curve to the line of equality and the more equal we would say is the distribution of income.

Table 8.4 shows actual Gini coefficients for a selection of countries. The most obvious feature of these Gini coefficients is that the extent of inequality appears to have increased over time in these countries (with perhaps Sweden being an exception). This is quite a widespread phenomenon in industrialised countries, not just those shown in Table 8.4 (see Gottschalk & Smeeding 1997). Indeed, recent data confirm an increase in income inequality throughout the 2000s in Australia, albeit with some reduction in inequality following the Global Financial Crisis (see ABS 2013).

TABLE 8.4 Selected Gini coefficients

AUSTRALIA		CANADA		UK		US		SWEDEN	
1981	0.281	1971	0.316	1969	0.267	1974	0.316	1967	0.26
1985	0.292	1975	0.289	1974	0.268	1979	0.310	1975	0.215
1989	0.304	1981	0.284	1979	0.27	1986	0.340	1981	0.197
1995	0.308	1987	0.283	1986	0.303	1991	0.346	1987	0.218
2001	0.317	1991	0.281	1991	0.336	1994	0.361	1992	0.229
2003	0.312	1994	0.284	1994	0.339	1997	0.360	1995	0.221
2008	0.333	1997	0.291	1995	0.344	2000	0.357	2000	0.252
2010	0.330	1998	0.311	2004	0.344	2004	0.364	2005	0.237
		2000	0.315	2007	0.339	2007	0.371		
		2004	0.318	2010	0.334	2010	0.367		
		2007	0.313	2013	0.330				
		2010	0.317						
		2013	0.321						

Source: LIS Cross-National Data Center in Luxembourg n.d., 'Inequality and poverty',www.lisdatacenter.org/data-access/key-figures/download-key-figures.

The interesting question is *why* this has occurred. This is an area of ongoing research by economists, and a variety of explanations have been suggested. A study for Australia by George Athanasopoulos and Farshid Vahid (2003) finds, for example, that growing inequality among those aged 70 years and over has contributed significantly to the overall growth of income inequality in Australia. Other studies point to an increased premium being paid for highly skilled workers resulting in a widening gap between the rewards to skilled and unskilled work (e.g. see Murphy & Welch 2001).

It should be noted that this finding of increased income inequality in Australia has been challenged by research conducted at the Melbourne Institute of Applied Economic and Social Research (Wilkins 2013); the argument is that changes in methodology and definition make comparisons of income inequality across years very problematic in the Australian context. Using an alternative data source, this research finds a much lower degree of income inequality in Australia.

What is clear from the research literature is that the extent of inequality in incomes across households is reduced through the operation of the tax and transfer system; Gottschalk and Smeeding (1997), for example, find that disposable income is more equally distributed than pre-tax and pre-transfer income in all of the countries that belong to the Organization of Economic Cooperation and Development (OECD). Fiscal policy does have an important role to play in affecting the degree of income inequality.

8.4.2 MANAGING DEMOGRAPHIC CHANGE

Demographic change is a key factor that will influence fiscal policy over the coming decades. Most industrialised countries are now experiencing significant changes to the structure of their populations. This has been caused by a decline in fertility rates combined with an increase in longevity; as a result, elderly dependency ratios are expected to increase significantly in industrial countries over the first five decades of the twenty-first century. (The elderly dependency ratio is defined as the population aged 65 years and over as a ratio of the population aged between 15 and 64 years.) This has raised concerns about the impact of an ageing population on governments' fiscal positions.

An ageing population has implications for government revenue, since there will be a smaller pool of income-tax-paying individuals, and for government expenditure, since the old and the young need different types of publicly provided goods and services. Healthcare, in particular, is very expensive as the population ages. A report prepared for the OECD, for example, shows that government expenditure on health directed towards the elderly (75+ years) is almost five times as great as expenditure directed towards those aged between 0 and 64 years (OECD 1996).

Debate about the implications of an ageing population in Australia was sparked by the findings of the first *Intergenerational Report* prepared by the

Australian Government as part of its 2002–03 budget. A second *Intergenerational Report* was released in 2007 with further reports in 2010 and 2015. The government is required to prepare these reports under an Act of Parliament, the *Charter of Budget Honesty Act 1998* (Cwlth), which provides a legislative framework for the manner in which the government's fiscal policy will be conducted.

Some idea of the magnitude of the fiscal challenges that face the government can be appreciated by looking at projections of what will happen to the structure of Australia's population by the middle of this century. The first thing to note is that the overall population is expected to increase. According to figures prepared for the *Intergenerational Report* (Australian Government 2015) the total Australian population is expected to grow to around 40 million people in 2054–55, an increase of 60 per cent compared to the population in 2018. Perhaps of more significance for the government's fiscal policy is that over that same time period, the proportion of the population aged 65 years and over is likely to double.

What implications will these demographic trends have for government spending? Figure 8.10, which is taken from data in the government's *Intergenerational Report 2015*, compares expected government spending across some key areas projected forward to 2054–55. Not surprisingly, those areas of spending that are likely to be sensitive to the ageing of the population—health and aged care—show relatively large increases. Education spending, however, falls, not surprising given the expected lower proportion of young people in the population.

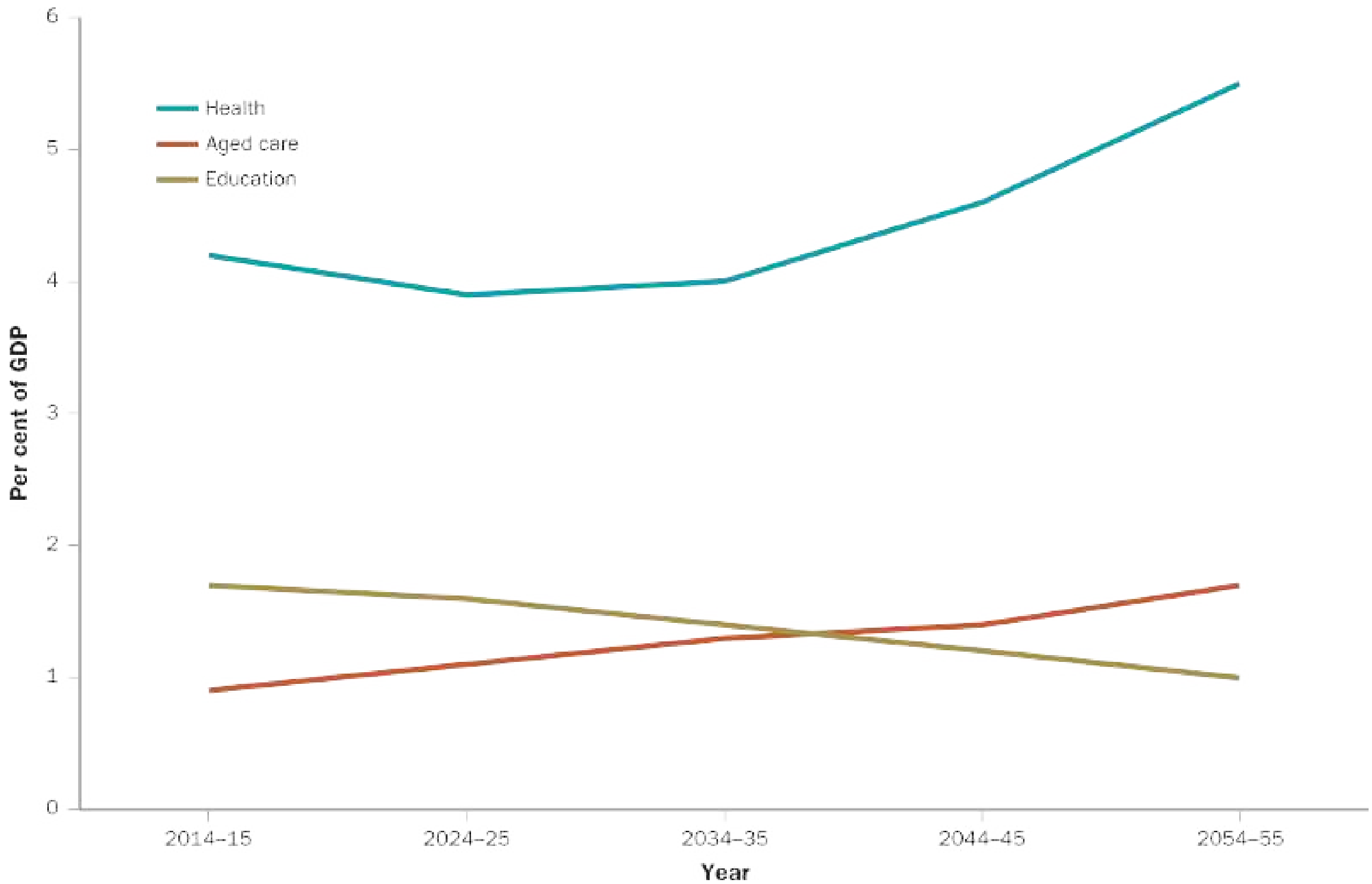


Figure 8.10 **Projections of Australian government spending (as a proportion of GDP)**

Note: The ageing of the Australian population will have a significant impact on many components of government expenditure.

Source: Based on Commonwealth of Australia data. Australian Government 2015, *Intergenerational Report*, available at https://treasury.gov.au/publication/2015-intergenerational-report/.

Figure 8.11 shows forecasts for the government's primary budget balance (the primary balance excludes interest paid by the government on its debt together with some non-discretionary payments that the government is obliged to make). Figure 8.11 shows that smaller budget surpluses are likely to characterise Australia's fiscal policy from around 2035 onwards.

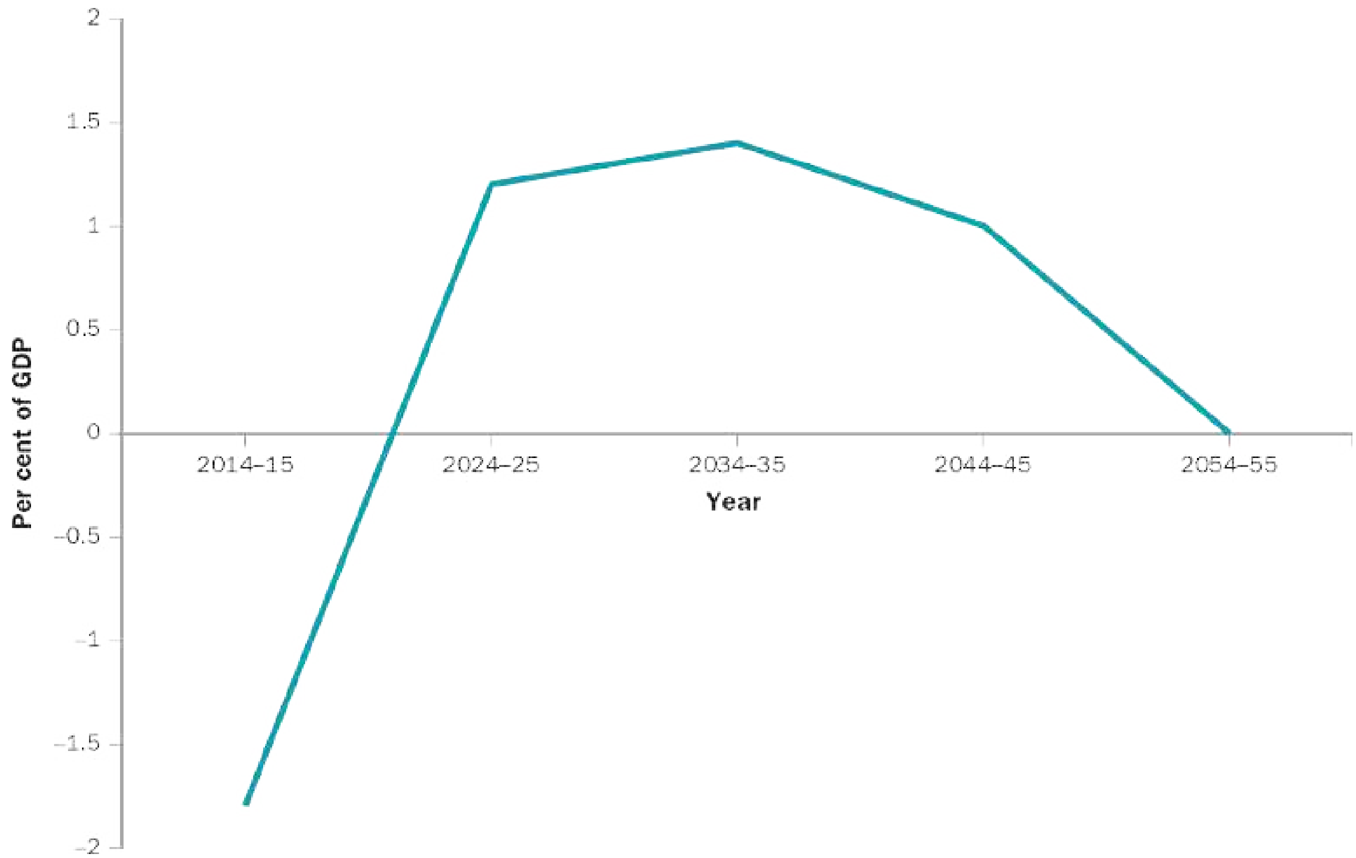


Figure 8.11 **Projected primary budget balances**

Note: The ageing population is likely to lead to a reduced budget surplus from 2035 onwards.

Source: Based on Commonwealth of Australia data. Australian Government 2015, *Intergenerational Report*, available at https://treasury.gov.au/publication/2015-intergenerational-report/.

8.4.3 FISCAL POLICY AND THE

PUBLIC DEBT

LO 8.6

FIND ONLINE

In Chapter 4 we looked at how the government's budget balance affects national savings. There we saw that budget surpluses add to national savings while budget deficits subtract from national savings. In Background briefing 4.2 we detailed how past fiscal policy in Australia has been directed at achieving budget surpluses with the aim of boosting national saving, noting the move into budget deficits associated with the government's response to the Global Financial Crisis.

One consequence of this policy has been some significant changes in the amount of debt owed by the government. Figure 8.12 shows the net debt accumulated by the Australian Government together with its budget balances. Figure 8.12 suggests a link between fiscal policy and government debt. Look carefully at the figure—you can see that when the budget is in surplus, the stock of Australian Government net debt falls, while deficits are associated with increases in the stock of government debt.

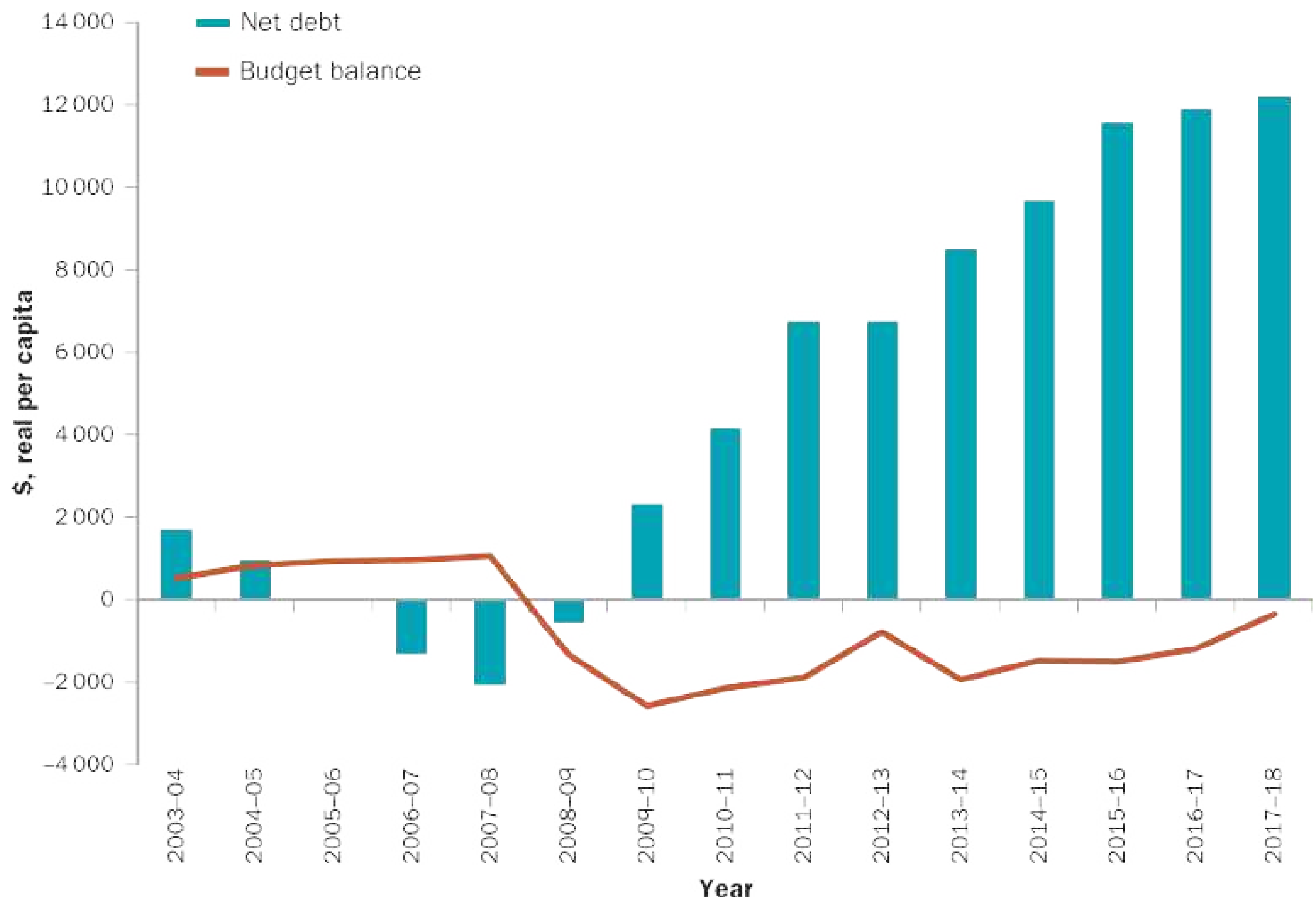


Figure 8.12 **The net debt accumulated by the Australian Government together with its budget balances**

Note: The Australian Government's budget deficit and net debt are related. When the budget is in surplus, the stock of government debt falls. A budget deficit is associated with an increase in the stock of debt.

Source: Based on Commonwealth of Australia data. Australian Government 2018, 'Final budget outcome 2017-18', https://www.budget.gov.au/2017-18/content/fbo/html/.

For what reason might such a link exist? Think about the spending activities of the government. These comprise government expenditure and transfer payments. We will denote government expenditure undertaken by the government in period t by G_t, and transfer payments by Q_t. Hence, in any period, the total spending activities of the government can be given by the sum $G_t + Q_t$ (note that in this analysis we measure everything in real terms).

The government has three means at its disposal to finance this expenditure. First, it can raise taxes. We will denote the taxes available to be spent by the government in period t by T_t (note that because we have explicitly separated out transfers in this analysis, what we are referring to here are *gross* taxes). Second, it can borrow money. When the government borrows money, it issues a security. This is a financial asset that obliges the government to repay the loan, and pay interest, over some designated time period. We will let B_{t-1} be the stock of securities that the government still has owing at the end of the last period. Any new borrowing that the government undertakes in period t will mean that $B_t - B_{t-1}$ will be a positive number. In other words, if the government continues to borrow money, it will accumulate a growing stockpile of debt (this is usually called the *public debt*). Note that this implies that there will be a third expenditure item for the government, the interest it needs to pay on its stock of debt. We will assume that in any period, t, the government pays interest of rB_{t-1}, where r is the real rate of interest. For example, if the government has a stock of public debt equal to $100 million, and the real interest rate is 5 per cent, it will have to finance interest payments of $5 million. Third, the government can simply print money to finance its expenditure. Printing money is a practice that is not often used by governments to finance their expenditure since this usually leads to very high rates of inflation (we will explore this more in Chapter 9). Therefore, we will assume that this means of financing expenditure is not actively pursued.

In symbols, the arguments in the previous paragraph can be summarised as:

$$G_t + Q_t + rB_{t-1} = T_t + (B_t - B_{t-1})$$ **Equation 8.3**

The left-hand side of Equation 8.3 represents all the spending that has to be undertaken by the government in period t; this comprises government expenditure, G_t, transfer payments, Q_t, and interest payments, rB_{t-1}. The right-hand side of Equation 8.3 details all of the sources of funding available to the government to finance this expenditure, taxes, T_t, and borrowing, $(B_t - B_{t-1})$. Equation 8.3 is called the **government budget constraint**.

If we rearrange Equation 8.3 so that gross taxes are on the left-hand side, the link between fiscal policy and the stock of public debt becomes readily apparent:

$$G_t + Q_t - T_t + rB_{t-1} = (B_t - B_{t-1})$$ **Equation 8.4**

When the government runs a budget deficit, $G_t + Q_t - T_t$ will be a positive number. From Equation 8.4, you can see that this must mean that B_t will be greater than B_{t-1}. In other words, budget deficits lead to an increase in the stock of public debt over time.

On the other hand, if the government runs a budget surplus, $G_t + Q_t - T_t$ will be a negative number. As long as the surplus can cover interest payments on any accumulated debt (so that $G_t + Q_t - T_t + rB_{t-1} < 0$), then the surplus will mean that the stock of debt will fall over time; in other words, B_t will be less than B_{t-1}.

Given sufficient time, and a succession of budget surpluses, the government's debt can be fully paid off. And this explains what we see in Figure 8.12; the Australian Government's budget surpluses in the years before the Global Financial Crisis caused the government to no longer be a net debtor (the government has also used the proceeds from one-off sales of public assets such as Telstra to speed this process along).

Why might the elimination of public debt be desirable? Recall from Chapter 4 the discussion of *crowding out*. This referred to the tendency of government borrowing to push up the real rate of interest, thereby discouraging investment expenditure by the private sector. However, crowding out disappears if the government does not have to borrow funds to finance its spending. So one argument why the government might adopt a fiscal policy that implies a reduction in the stock of debt is to encourage investment expenditure by the private sector.

Another argument relates to what is sometimes known as **intergenerational equity**. Consider Equation 8.4. Unless the government is going to borrow money forever, in which case the stock of public debt will become very large indeed, Equation 8.4 implies that at some point the government is going to have to run budget surpluses. This means that government expenditure will have to fall, or transfer payments be reduced, or taxes be increased, or, most likely, some combination of all three. If this happens in the future, then the current generation can enjoy the benefits of budget deficits while passing on the costs of those deficits to future generations.

Crowding out and intergenerational equity provide powerful arguments for why governments might wish to avoid policies that accumulate a large public debt. However, there is another argument that needs to be taken into consideration in any cost–benefit analysis of policies designed to reduce the public debt. This is the potential loss of benefits conferred on the economy by government spending. One example of this is the provision of public infrastructure. There are a variety of investment projects, such as transport networks and electricity generation, that are simply too expensive or too unprofitable for private companies to fund. Yet, the economy may benefit from these projects. Two economists, Glenn Otto and Graham Voss, calculated that for Australia a 1 per cent increase in government spending on infrastructure raises the productivity of the private sector by around 0.4 per cent (Otto & Voss 1994). In such a case, borrowing by the government may provide a *net* benefit to the economy, even after allowing for issues such as crowding out and intergenerational equity. As in all areas of public policy, the extent to which reduction in the public debt is a desirable policy can only be answered after an application of the cost–benefit principle.

THINKING AS AN ECONOMIST 8.4

Why did eurozone countries implement 'austerity' measures in 2010–12?

The eurozone, a subset of the broader European Union, refers to the 17 European countries that share the euro as their common currency. In the wake of the Global Financial Crisis, the eurozone became the focus of a great deal of attention by economic commentators and policymakers. Relatively poor economic outcomes and unusually high peacetime budget deficits and associated large stocks of government debt led some to wonder about the long-term viability of the eurozone (e.g. see Wolf 2012).

Why are large budget deficits and associated stock of public debt viewed with such concern?

The main question to be answered is the sustainability of the public debt. This refers to the ability of a nation to earn sufficient income going forward for its public debt to be repaid.

Recall the government budget constraint, Equation 8.4, reproduced below.

$$G_t + Q_t - T_t + rB_{t-1} = (B_t - B_{t-1})$$

Equation 8.4

The government budget constraint shows that without growth in taxation, T_t, increased spending by the government either through its own expenditure, G_t, or through net transfer payments, Q_t, will increase the stock of public debt, B_t and imply higher interest payments, rB_t, in the future. A sustainable level of public debt is one that can be repaid in a timely fashion through growth in taxation revenue. This can be achieved through economic growth, that is, through the collection of higher tax revenues made possible by an increase in gross domestic product through time. In contrast, an unsustainable public debt is where the likelihood of repayment of the debt is low. The main reason is that the prospects for collecting the required tax revenue are themselves low as the economy is not growing at a fast enough rate. In such a situation, lenders may be less inclined to continue to provide funds unless they are compensated for the risk of possible default by very high rates of interest. This, of itself, is problematic, as high interest rates discourage planned investment and consumption, thus further dampening the prospects for growth. An economy with an unsustainable public debt may therefore find itself trapped in a vicious cycle in which low economic growth, combined with high government spending, raises the spectre of the inability to repay the debt and where this possibility further depresses the prospects for growth.

The scenario described in the previous paragraph means that nations with an unsustainable public debt—and for many commentators this described the economies of Greece, Portugal and Ireland and perhaps others in the eurozone—needed to take steps to bring their debt under control. Equation 8.4 shows that the options are limited: raise taxes and/or lower government spending.

It is exactly these policies, known as *austerity measures*, which were introduced throughout the eurozone beginning around 2010. While helping to bring budget deficits under some control, and leading to a decline in the ratio of public debt to GDP, the short-term macroeconomic effects of austerity were controversial. For example, Nobel Laureate Paul Krugman (2012) argued there exists a negative relationship between austerity measures and slow growth in GDP—a finding consistent with the basic Keynesian model.

▹▹ RECAP

Fiscal policy is not often used as a stabilisation tool. However, fiscal policy does have important roles in the economy. Three of these roles are:

1. to influence the distribution of disposable income across households
2. the management of the likely pressures on government expenditure implied by the ageing of the population
3. the management of the government's public debt.

SUMMARY

- Government spending represents one of the two main components of fiscal policy, the other component being decisions about taxes and transfer payments.
- Government spending is a component of the economy's overall planned aggregate spending. This means that the government can have a direct impact on planned aggregate expenditure in the economy by varying its own level of expenditure. Should the economy have a contractionary output gap, the government could eliminate that gap by increasing its expenditure. The value of the economy's multiplier will determine by how much the government needs to increase its expenditure to remove a given contractionary output gap.
- Changes in taxes and transfer payments also affect planned aggregate expenditure but do so indirectly by changing the amount of disposable income in the economy. From the consumption function, this would then affect planned consumption spending. Note that changes in the tax rate will affect the slope of the economy's planned aggregate expenditure schedule and will therefore change the economy's equilibrium level of GDP.

- The way in which changes in taxation are financed can be important for understanding the effects of government policy. For example, a tax cut that is matched by a decline in government expenditure will lead to a fall in the equilibrium level of GDP. This is because a proportion of the tax cut is not spent but is instead saved.

- There are three qualifications that need to be made in relation to the ability of fiscal policy to act as a tool of macroeconomic stabilisation. First, fiscal policy changes can affect the supply side of the economy and can therefore affect the economy's potential output. Second, prolonged periods of government budget deficits reduce national savings and this can have long-run implications for the economy's ability to invest in new capital goods. Third, it is difficult to change fiscal policy quickly, which makes it slow to adjust to sudden changes in the macroeconomic environment.
- Fiscal policy can affect the distribution of income in the economy. This is because the taxes and transfers shift income between different groups in society.
- Fiscal policy faces a challenge over the next 50 years to respond to the ageing of the Australian population. An older population requires more public spending, particularly on health-related services. An ageing population is therefore likely to lead to an increase in government expenditure and budget deficits in the future. The theory of tax smoothing suggests that an optimal response to this is to increase the budget surplus now in anticipation of the higher spending needs in the future.
- Budget surpluses and the proceeds from sales of public assets such as Telstra allowed the government to pay off debt accumulated as a result of past budget deficits. The fiscal policy response to the Global Financial Crisis has seen the return of budget deficits and a positive stock of public debt.

KEY TERMS

automatic stabilisers 201

balanced budget multiplier 197

demographic change 205

Gini coefficient 203

government budget constraint 208

intergenerational equity 209

Lorenz curve 203

progressive income taxes 202

supply-siders 198

REVIEW QUESTIONS

1. The government is considering two alternative policies, one involving increased government purchases of 50 units, the other involving an exogenous tax cut of 50 units. Which policy will stimulate planned aggregate expenditure by more? Why? LO 8.2 **MEDIUM**
2. Explain the effect of an increase in the tax rate on the economy's planned aggregate expenditure line. Is this any different from the effect on planned aggregate expenditure of an increase in the exogenous component of taxation? Explain. LO 8.2 **EASY**
3. Discuss three reasons why the use of fiscal policy to stabilise the economy is more complicated than suggested by the basic Keynesian model. LO 8.3 **EASY**
4. Explain how the tax transfer system affects the distribution of income across households. Suggest two policies that might achieve greater equity in the distribution of income. What broader effects might these policies have on the economy? LO 8.4 **EASY**
5. Explain the possible implications of the ageing of the population for fiscal policy. In light of these implications, how should fiscal policy respond? LO 8.5 **MEDIUM**
6. What are the benefits and costs associated with a cut in the level of the government's public debt? LO 8.6 **MEDIUM**

PROBLEMS

1. An economy is initially at full employment, but a decrease in planned investment spending (a component of exogenous expenditure) pushes the economy into recession. Assume that the marginal propensity to consume (MPC) of this economy is 0.75 and that the multiplier is 4. LO 8.1 **MEDIUM**

a) How large is the contractionary gap after the fall in planned investment?

b) By how much would the government have to change its purchases to restore the economy to full employment?

c) Referring to your answer for part (b), would an equivalent change in taxes produce the same result? Explain.

d) Suppose that the government's budget is initially in balance, with government spending equal to taxes collected. A balanced-budget law forbids the government from running a deficit. Is there anything that fiscal policymakers could do to restore full employment in this economy, assuming they do not want to violate the balanced-budget law?

2. An economy is described by the following equations: LO 8.2 **MEDIUM**

$C = 40 + 0.75\,(Y - T)$

$I^P = 100$

$G = 150$

$X = 30$

$M = 0$

$\overline{T} = 180$

$t = 0$

$Y^* = 7000$

The multiplier in this economy is 4.

a) Find a numerical equation relating planned aggregate expenditure to output.

b) Construct a table to find the value of short-run equilibrium output. (*Hint*: The economy is fairly close to full employment.)

c) By how much would government purchases have to change in order to eliminate any output gap? By how much would taxes have to change? Show the effects of these fiscal policy changes in a Keynesian cross diagram.

d) Repeat part (c) assuming that $Y^* = 800$.

3. For the following economy, find exogenous expenditure, the multiplier, short-run equilibrium output and the output gap. By how much would exogenous expenditure have to change to eliminate the output gap? LO 8.1 **MEDIUM**

$C = 2500 + 0.75\,(Y - T)$

$I^P = 2000$

$G = 3000$

$X = 100$

$M = 0$

$\overline{T} = 2500$

$t =$

$Y^{*} = 22\,500$

4. An economy is described by the following equations: LO 8.1
MEDIUM

$C = 40 + 0.9\,(Y - T)$

$I^{P} = 80$

$G = 140$

$M = 0$

$X = 0$

$T = 170$

$t = 0$

The multiplier in this economy is 10.

a) Find short-run equilibrium output.

b) Economic recovery abroad increases the demand for the country's exports; as a result, X rises to 40. What happens to short-run equilibrium output?

c) Repeat part (b), but this time assume that foreign economies are slowing, reducing the demand for the country's exports, while the domestic demand for imports increases so that $NX = -40$.

d) How do your results help to explain the tendency of recessions and expansions to spread across countries?

5. This problem illustrates the workings of automatic stabilisers. Suppose that the components of planned spending in an economy are $\overline{C} = \overline{C} + c(Y - T)$, $I^P = I$, $G = \overline{G}$, $X = \overline{X}$ and $T = tY$ where t is the fraction of income paid in taxes (the tax rate). As we will see in this problem, a tax system of this sort serves as an automatic stabiliser, because taxes collected automatically fall when incomes fall.
LO 8.2 **HARD**

a) Find an algebraic expression for short-run equilibrium output in this economy.

b) Find an algebraic expression for the multiplier, that is, the amount that output changes when exogenous expenditure changes by one unit. Compare the expression you found to the formula for the multiplier when taxes have only an exogenous component. Show that making taxes proportional to income reduces the multiplier.

c) Explain how reducing the size of the multiplier helps to stabilise the economy, holding constant the typical size of fluctuations in the components of exogenous expenditure.

d) Suppose $\overline{C} = 500$, $\overline{I} = 1500$, $\overline{G} = 2000$, $X = 0$, $c = 0.8$ and $t =$

0.25. Calculate numerical values for short-run equilibrium output and the multiplier.

REFERENCES

Athanasopoulos G and Vahid F 2003, 'Statistical inference and changes in income inequality in Australia', *The Economic Record*, vol. 79, no. 247, December, pp. 412–24.

Australian Bureau of Statistics 2009, 'International trade in goods and services, Australia', Cat. no. 5368.0.

Australian Bureau of Statistics (ABS) 2013, 'Household income and income distribution, Australia, 2011–12', Fact sheet 5, Cat. no. 6523.0, http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/6523.0Main+Features62011-12?OpenDocument#factsheet5.

Australian Bureau of Statistics 2018, 'Residential property price indexes: Eight capital cities', Cat. no. 6416.0.

Australian Government 2015, *Intergenerational Report*, available at https://treasury.gov.au/publication/2015-intergenerational-report/.

Australian Government 2018, 'Final budget outcome 2017–18', https://www.budget.gov.au/2017-18/content/fbo/html/.

Australian Taxation Office for the Commonwealth of Australia 2018, 'Resident tax rates 2018–19', https://www.ato.gov.au/Rates/In dividual-income-tax-rates/, accessed October 2018.

Dickens C 1850, *David Copperfield*.

Economic Report of the President, 2018, ‘Table B-18, Federal receipts, outlays, surplus or deficit, and debt, as percent of gross domestic product, fiscal years 1945–2017’, https://www.gpo.gov/fdsys/granule/ERP-2017/ERP-2017-table18, accessed November 2018.

Federal Reserve Bank of St Louis (FRED) 2018, Federal Reserve economic data, https://fred.stlouisfed.org.

Gini C 1912, ‘*Variabilitá e mutabilita*’, reprinted in Pizetti E and Salvemini T (eds) 1955, *Memorie di Metodologica Statistica*, Libreria Eredi Virgilio Veschi, Rome.

Gottschalk P and Smeeding T 1997, ‘Cross-national comparisons of earnings and income inequality’, *Journal of Economic Literature*, vol. 35, June, pp. 633–87.

International Monetary Fund (IMF) 2018, ‘Fiscal monitor, April 2018’, available at https://www.imf.org/en/Publications/FM/Issues/2018/04/06/fiscal-monitor-april-2018.

International Monetary Fund 2018, ‘Fiscal monitor, October 2018’, https://www.imf.org/en/Publications/FM/Issues/2018/10/04/fiscal-monitor-october-2018.

Krugman P 2008, ‘What to do’, *The New York Review of Books*, 18 December, https://www.nybooks.com/articles/2008/12/18/what-to-do/, accessed October 2018.

Krugman P 2012, ‘Austerity and growth, again (wonkish)’, *The New York Times*, 24 April, https://krugman.blogs.nytimes.com/2012/04/24/austerity-and-growth-again-wonkish/?_r=0, accessed October 2018.

LIS Cross-National Data Center in Luxembourg n.d., ‘Inequality and poverty’, www.lisdatacenter.org/data-access/key-figures/download-key-figures.

Lorenz MO 1905, ‘Methods for measuring the concentration of wealth’, *Journal of the American Statistical Association*, vol. 9, pp. 209–19.

Murphy KM and Welch F 2001, ‘Industrial change and the demand for skill’, in *The Causes and Consequences of Increasing Inequality*, University of Chicago Press.

OECD 1996, *Ageing in OECD Countries: A Critical Policy Challenge*, OECD, Paris.

Otto G and Voss G 1994, ‘Public capital and private sector productivity’, *The Economic Record*, vol. 70, no. 209, June, pp. 121–32.

Wilkins R 2013, ‘Evaluating the evidence on income inequality in

Australia in the 2000s', Melbourne Institute of Applied Economic and Social Research Working Paper No. 26/13, www.melbourneinstitute.com/downloads/working_paper_series/wp2013n26.pdf.

Wolf M 2012, 'Much too much ado about Greece', *Financial Times*, 14 February, www.ft.com/intl/cms/s/0/3d4c2598-5701-11e1-be5e-00144feabdc0.html#axzz2pYGAeykp.

CHAPTER 9

Money, prices and the Reserve Bank

After reading this chapter, you should be able to answer the following questions.

9.1 How does the financial system allocate saving to productive uses?

9.2 What are the three principal uses of money?

9.3 How does the government measure Australia's money supply?

9.4 In what sense do commercial banks create money?

9.5 What is the relation between the money supply and the general level of prices?

9.6 What roles does the Reserve Bank play in the economy?

9.7 How can the Reserve Bank affect the level of interest rates in the economy?

SETTING THE SCENE

Few institutions in a modern economy have their decision-making scrutinised as much as the central bank. This is hardly surprising, given the range of activities for which the central bank is responsible. These range from supervision of the banking sector, the issuance of the currency (notes and coins), operating the payments system (which allows banks to transfer funds to each other) and monetary policy, and the setting of interest rates.

Until 1959, the Commonwealth Bank undertook the functions of a central bank in Australia. As a result of the *Reserve Bank Act 1959* (Cwlth), central bank duties were given over to the newly formed Reserve Bank of Australia in 1959, leaving the Commonwealth Bank to maintain its commercial and savings bank activities.

The Act establishing the Reserve Bank was quite specific in its statement about the role of the newly formed central bank. This was to conduct its operations to ensure the:

1. stability of the currency of Australia
2. maintenance of full employment in Australia
3. economic prosperity and welfare of the people of Australia.

The first of these roles is usually interpreted to mean the maintenance of a low rate of inflation, preserving, in other words, the real purchasing power of the currency. The second and third roles are self-evident.

Decision-making at the Reserve Bank is carried out by its board. The board consists of nine members, including the Governor and the Deputy Governor of the Reserve Bank and the Secretary of the Department of Treasury. The remaining members are appointed by the Australian Treasurer. The board meets 11 times a year, usually at the Reserve Bank's head office in Sydney. The main purpose of these meetings is to set the course of monetary policy, based on a detailed review of the current state and future prospects of the economy. These meetings are highly anticipated events, with frequent speculation in advance in the financial media about what the board might or might not do to interest rates.

The Reserve Bank is free to set monetary policy independently from direct political interference from the government. It is, in theory, possible for the government of the day to overturn a decision made by the Reserve Bank, but this would require a full and complete explanation to be given to parliament with the Reserve Bank's reasons for disagreeing with the government also presented to parliament (see 'Statement on monetary policy' at www.rba.gov.au/publications/smp/index.html for more details about the relationship between the government and the Reserve Bank.)

9.1 THE FINANCIAL SYSTEM AND THE ALLOCATION OF SAVING TO PRODUCTIVE USES

LO 9.1

In Chapter 4, we discussed the way in which adjustments to the real interest rate coordinate decisions made regarding aggregate saving and investment in the economy. This is important: a successful economy not only saves but also uses its saving wisely by applying these limited funds to the investment projects that seem likely to be the most productive.

A well-functioning financial system improves the allocation of saving in two distinct ways. First, the financial system provides information to savers about which of the many possible uses of their funds are likely to prove most productive and hence pay the highest return. By evaluating the potential productivity of alternative capital investments, the financial system helps to direct saving to its best uses. Second, financial markets help savers to share the risks of individual investment projects. Sharing of risks protects individual savers from bearing excessive risk, while at the same time making it possible to direct saving to projects, such as the development of new technologies, which are risky but potentially very productive.

In this section, we discuss three key components of the financial system: the banking system, and the bond market and stock market. In doing so, we elaborate on the role of the financial system in providing information about investment projects and in helping savers to share the risks of lending.

9.1.1 THE BANKING SYSTEM

The banking system consists of commercial banks that accept deposits from individuals and businesses and use those deposits to make loans. Banks are the most important example of a class of institutions called *financial intermediaries*, firms that extend credit to borrowers using funds raised from savers.

Why are financial intermediaries such as banks, which stand between savers and investors, necessary? The main reason is that, through specialisation, banks and other intermediaries develop a comparative advantage in evaluating the quality of borrowers—the information-gathering function that we referred to a moment ago. Most savers, particularly small savers, do not have the time or the knowledge to determine for themselves which borrowers are likely to use the funds they receive most productively. In contrast, banks and other intermediaries have gained expertise in performing the information-gathering activities necessary for profitable lending, including checking out the borrower's background, determining whether the borrower's business plans make sense, and monitoring the borrower's activities during the life of the loan. Because banks specialise in evaluating potential borrowers, they can perform this function at a much lower cost, and with better results, than individual savers could on their own.

Banks also reduce the costs of gathering information about potential borrowers by pooling the saving of many individuals to make large loans. Each large loan needs to be evaluated only once, by the bank, rather than separately by each of the hundreds of individuals whose saving may be pooled to make the loan.

Banks help savers by eliminating their need to gather information about potential borrowers and by directing their saving towards higher return, more-productive investments. Banks help borrowers as well by providing access to credit that might otherwise not be available. Unlike a large corporation, which typically has many ways to raise funds, a small business that wants to buy a copier or remodel its offices will have few options other than going to a bank. Because the bank's lending officer has developed expertise in evaluating small business loans, and may even have an ongoing business relationship with the small business owner, the bank will be able to gather the information it needs to make the loan at a reasonable cost. Likewise, consumers who want to borrow to finish a basement or add a room to a house will find few good alternatives to a bank.

In sum, banks' expertise at gathering information about alternative lending opportunities allows them to bring together small savers looking for good uses for their funds, and small borrowers with worthwhile investment projects.

A second reason that people hold bank deposits is to make it easier to make payments. Most bank deposits allow the holder to use a debit card or ATM card. For many transactions, paying by debit card is more convenient than using cash—for example, you have a record of the transaction.

EXAMPLE 9.1 – THE JAPANESE BANKING CRISIS

How did the banking crisis of the 1990s in Japan affect the Japanese economy?

During the 1980s, real estate and stock prices soared in Japan. Japanese banks made many loans to real estate developers, and the banks themselves acquired stock in corporations. However, in the early 1990s, land prices plummeted in Japan, leading many bank borrowers to default on their loans. Stock prices also came down sharply, reducing the value of banks' shareholdings. The net result was that most Japanese banks fell into severe financial trouble, with many large banks near bankruptcy. What was the effect of this crisis, which lasted more than a decade, on the Japanese economy?

Japan has traditionally relied very heavily on banks to allocate its saving. Thus, when the severe financial problems of the banks prevented them from operating normally, many borrowers found it unusually difficult to obtain credit—a situation known as a 'credit crunch'. Smaller borrowers such as small- and medium-sized businesses had been particularly dependent on banks for credit and thus suffered disproportionately.

The Japanese economy, after many years of robust growth, suffered a severe recession throughout the 1990s. Many factors contributed to this sharp slowdown. However, the virtual breakdown of the banking system certainly did not help the situation, as credit shortages interfered with smaller firms' ability to make capital investments and, in some cases, to purchase raw materials and pay workers.

The Japanese Government recognised these problems but responded very slowly, in large part out of reluctance to bear the high costs of returning the banks to a healthy financial condition. In recent years, the health of the Japanese banking system appears to have improved significantly, notwithstanding the Global Financial Crisis, although problems remain and the Japanese economy has not returned to its earlier high rate of growth.

The commercial banking system plays a central role in determining the quantity of money in the economy. We will return to this point shortly, but first we need to look at bonds and stocks, and the markets in which they are traded.

9.1.2 BONDS AND STOCKS

Large and well-established corporations that wish to obtain funds for investment will sometimes go to banks. Unlike the typical small borrower, a larger firm usually has alternative ways of raising funds, notably through the corporate bond market and the stock market. We first discuss some of the mechanics of bonds and stocks, then return to the role of bond and stock markets in allocating saving.

Bonds

A **bond** is a legal promise to repay a debt. These repayments typically consist of two parts. First, the principal amount, which is the amount originally lent, is paid at some specific date in the future, called the **maturation date**. Second, the owner of the bond, called the bondholder, receives regular interest, or **coupon payments**, until the bond's maturation date. For example, a bond may have a principal amount of $1000 payable on 1 January 2030 and annual coupon payments of $50. These coupon payments are also equal to the principal amount times the **coupon rate**, where the coupon rate is the interest rate promised when the bond is issued. (The coupon rate therefore is also equal to the annual coupon payment divided by the principal.) In the example above, the principal is $1000 and the coupon rate is 5 per cent, resulting in annual coupon payments of .05 × $1000, or $50.

Corporations and governments frequently raise funds by issuing bonds and selling them to savers. The coupon rate that a newly issued bond must promise in order to be attractive to savers depends on a number of factors, including the bond's term, its credit risk and its tax treatment. The term of a bond is the length of time until the bond's maturation date, which can range from 30 days to 30 years or more. The annual coupon rates on long-term (30-year) bonds generally exceed those on short-term (1-year) bonds because lenders require higher coupon rates (and, hence, higher annual coupon payments) to lend for a long term.

Credit risk is the risk that the borrower will go bankrupt and thus not repay the loan. A borrower that is viewed as risky will have to pay a higher coupon rate to compensate lenders for taking the chance of losing all or part of their financial investment. For example, so-called high-yield bonds, less formally known as 'junk bonds', are bonds issued by firms judged to be risky by credit-rating agencies; these bonds pay higher coupon rates than bonds issued by companies thought to be less risky.

Bond owners are not required to hold their bonds until their maturation dates. They are always free to sell their bonds in the bond market, an organised market run by professional bond traders. The market value of a particular bond at any given point in time is called the 'price' of the bond. The price of a bond can be greater than, less than, or equal to the principal amount of the bond, depending on how the current or prevailing interest rate in financial markets compares with the interest rate at the time the bond was issued. The close relationship between the price of a bond and the current interest rate is illustrated by Example 9.2.

EXAMPLE 9.2 – BOND PRICES AND INTEREST RATES

What is the relationship between bond prices and interest rates?

On 1 January 2012 Tanya purchases a newly issued, two-year government bond with a principal amount of $1000 for a price of $1000. The coupon rate on the bond is 5 per cent, paid annually, reflecting the prevailing interest rates on 1 January 2012. Hence, Tanya, or whoever owns the bond at the time, will receive a coupon payment of $50 (5% of $1000) on 1 January 2013. The owner of the bond will receive another coupon payment of $50 on 1 January 2014, at which time she also will receive repayment of the principal amount of $1000.

On 1 January 2013, after receiving her first year's coupon payment, Tanya decides to sell her bond to raise the funds to take a vacation. She offers her bond for sale in the bond market. The buyer of the bond will receive $1050 on 1 January 2014, representing the second coupon payment of $50, plus repayment of the $1000 principal. How much can Tanya expect to get for her 'used' bond? The answer depends on the prevailing interest rate in the bond market when she sells her bond on 1 January 2013.

Suppose first that, on 1 January 2013 when Tanya takes her bond to the bond market, the prevailing interest rate on newly issued one-year bonds has risen to 6 per cent. Thus, someone who buys a new one-year bond on 1 January 2013 with a 6 per cent coupon rate for $1000 will receive $1060 on 1 January 2014 ($1000 principal repayment plus a $60 coupon payment). Would that person also be willing to pay Tanya the $1000 Tanya paid for her bond? No. Note that the coupon payment on Tanya’s ‘used’ bond does not rise when interest rates rise but remains equal to $50. Consequently, the purchaser of Tanya’s ‘used’ bond will receive only $1050 on 1 January 2014 when the bond matures. In order to sell her ‘used’ bond, Tanya will have to reduce the price below $1000.

This example illustrates the fact that bond prices and interest rates are inversely related. When the interest rate being paid on newly issued bonds rises, the price financial investors are willing to pay for existing bonds falls.

How much would the price for Tanya’s ‘used’ bond have to fall? Recall that the person who buys the newly issued one-year bond on 1 January 2013 for $1000 will receive $1060 on 1 January 2014. This $60 gain represents a 6 per cent return on the price they paid. That person will buy Tanya’s ‘used’ bond only if Tanya’s bond also will give them a 6 per cent return. The price for Tanya's bond that allows the purchaser to earn a 6 per cent return must satisfy the equation

$$\text{Bond price} \times 1.06 = \$1050$$

Solving the equation for the bond price, we find that Tanya's bond will sell for $1050/1.06, or just under $991. To check this result, note that on 1 January 2014 the purchaser of the bond will receive $1050, or $59 more than they paid on 1 January 2013. Their rate of return is $59/$991, or 6 per cent, as expected.

What if the prevailing interest rate had instead fallen to 4 per cent? When prevailing interest rates fall, bond prices rise. The price of Tanya's 'used' bond would rise until it, too, gave a return of 4 per cent. At that point, the price of Tanya's bond would satisfy the relationship

$$\text{Bond price} \times 1.04 = \$1050$$

implying that the price of her bond would rise to $1050/1.04, or almost $1010.

Finally, what happens if the interest rate when Tanya wants to sell is 5 per cent, the same as it was when she originally bought the bond? You should show that in this case the bond would sell at its original price of $1000.

Issuing bonds is one means by which a corporation or a government can obtain funds from savers. Another important way of raising funds, but one restricted to corporations, is by issuing stock to the public.

Stocks

A share of **stock (or equity)** is a claim to partial ownership of a firm. For example, if a corporation has one million shares of stock outstanding, ownership of one share is equivalent to ownership of one-millionth of the company. Stockholders receive returns on their financial investment in two forms.

First, shareholders receive a regular payment called a **dividend** for each share of stock they own. Dividends are determined by the firm's management and usually depend on the firm's recent profits. Second, shareholders receive returns in the form of capital gains when the price of their stock increases.

Prices of stocks are determined through trading on a stock exchange. A stock's price rises and falls as the demand for the stock changes. Demand for stocks in turn depends on factors such as news about the prospects of the company. For example, the stock price of a pharmaceutical company that announces the discovery of an important new drug is likely to rise on the announcement, even if actual production and marketing of the drug are some time away, because financial investors expect the company to become more profitable in the future. Example 9.3 illustrates numerically some key factors that affect stock prices.

EXAMPLE 9.3 – BUYING SHARES IN A NEW COMPANY

How much should you pay for a share of FortuneCookie.com?

You have the opportunity to buy shares in a new company called FortuneCookie.com, which plans to sell gourmet fortune cookies online. Your stockbroker estimates that the company will pay $1.00 per share in dividends a year from now, and that in a year the market price of the company will be $80.00 per share. Assuming that you accept your broker's estimates as accurate, what is the most that you should be willing to pay today per share of FortuneCookie.com? How does your answer change if you expect a $5.00 dividend? Or if you expect a $1.00 dividend but an $84.00 stock price in one year?

Based on your broker's estimates, you conclude that in one year each share of FortuneCookie.com you own will be worth $81.00 in your pocket—the $1.00 dividend plus the $80.00 you could get by reselling the stock. Finding the maximum price you would pay for the stock today, therefore, boils down to asking how much you would invest today to have $81.00 a year from today. Answering this question in turn requires one more piece of information, which is the expected rate of return that you require in order to be willing to buy stock in this company.

How would you determine your required rate of return to hold stock in FortuneCookie.com? For the moment, let’s imagine that you are not too worried about the potential riskiness of the stock, either because you think that it is a ‘sure thing’ or because you are a devil-may-care type who is not bothered by risk. In that case, you can apply the cost–benefit principle. Your required rate of return to hold FortuneCookie.com should be about the same as you can get on other financial investments such as government bonds. The available return on other financial investments gives the opportunity cost of your funds.

For example, if the interest rate currently being offered by government bonds is 6 per cent, you should be willing to accept a 6 per cent return to hold FortuneCookie.com as well. In that case, the maximum price you would pay today for a share of FortuneCookie.com satisfies the equation

$$\text{Stock price} \times 1.06 = \$81.00$$

This equation defines the stock price you should be willing to pay if you are willing to accept a 6 per cent return over the next year. Solving this equation yields stock price = \$81.00/1.06 = \$76.42. If you buy FortuneCookie.com for $76.42, then your return over the year will be ($81.00 − $76.42)/$76.42 = $4.58/$76.42 = 6%, which is the rate of return you required to buy the stock.

If, instead, the dividend is expected to be $5.00, then the total benefit of holding the stock in one year, equal to the expected dividend plus the expected price, is $5.00 + $80.00, or $85.00. Assuming again that you are willing to accept a 6 per cent return to hold FortuneCookie.com, the price you are willing to pay for the stock today satisfies the relationship stock price × 1.06 = $85.00. Solving this equation for the stock price yields stock price = $85.00/1.06 = $80.19.

Comparing this price with that in the previous case, we see that a higher expected dividend in the future increases the value of the stock today. That's why good news about the future prospects of a company—such as the announcement by a pharmaceutical company that it has discovered a useful new drug—affects its stock price immediately.

If the expected future price of the stock is $84.00, with the dividend at $1.00, then the value of holding the stock in one year is once again $85.00, and the calculation is the same as the previous one. Again, the price you should be willing to pay for the stock is $80.19.

These examples show that an increase in the future dividend or in the future expected stock price raises the stock price today, whereas an increase in the return a saver requires to hold the stock lowers today's stock price. Since we expect required returns in the stock market to be closely tied to market interest rates, this last result implies that increases in interest rates tend to depress stock prices as well as bond prices.

Our examples also took the future stock price as given. But what determines the future stock price? Just as today's stock price depends on the dividend shareholders expect to receive this year and the stock price a year from now, the stock price a year from now depends on the dividend expected for next year and the stock price two years from now, and so on.

Ultimately, then, today's stock price is affected not only by the dividend expected this year but future dividends as well. A company's ability to pay dividends depends on its earnings. If a company's earnings are expected to increase rapidly in the future, its future dividends will probably grow too. Thus, as we noted in the example of the pharmaceutical company that announces the discovery of a new drug, news about future earnings—even earnings quite far in the future—is likely to affect a company's stock price immediately.

In the examples we have studied, we assumed that you were willing to accept a return of 6 per cent to hold FortuneCookie.com, the same return that you could get on a government bond. However, financial investments in the stock market are quite risky in that returns to holding stocks can be highly variable and unpredictable. For example, although you expect a share of FortuneCookie.com to be worth $80.00 in one year, you also realise that there is a chance it might sell as low as $50.00 or as high as $110.00 per share. Most financial investors dislike risk and unpredictability and thus have a higher required rate of return for holding risky assets like stocks than for holding relatively safe assets like government bonds. The difference between the required rate of return to hold risky assets and the rate of return on safe assets, like government bonds, is called the **risk premium**.

EXAMPLE 9.4 – RISKINESS AND STOCK PRICES

What is the relationship between stock prices and risk?

Let's build on our previous examples by introducing risk. Suppose that FortuneCookie.com is expected to pay a $1.00 dividend and have a market price of $80.00 per share in one year. The interest rate on government bonds is 6 per cent per year. However, to be willing to hold a risky asset like a share of FortuneCookie.com, you require an expected return four percentage points higher than the rate paid by safe assets like government bonds (a risk premium of 4%). Hence, you require a 10 per cent expected return to hold FortuneCookie.com. What is the most you would be willing to pay for the stock now? What do you conclude about the relationship between perceived riskiness and stock prices?

As a share of FortuneCookie.com is expected to pay $81.00 in one year and the required return is 10 per cent, we have stock price × 1.10 = $81.00. Solving for the stock price, we find the price to be $81.00/1.10 = $73.64, less than the price of $76.42 we found when there was no risk premium and the required rate of return was 6 per cent. We conclude that financial investors' dislike of risk, and the resulting risk premium, lowers the prices of risky assets like stocks.

9.2 BOND MARKETS, STOCK MARKETS AND THE ALLOCATION OF SAVINGS

LO 9.1

Like banks, bond markets and stock markets provide a means of channelling funds from savers to borrowers with productive investment opportunities. For example, a corporation that is planning a capital investment but does not want to borrow from a bank has two other options: it can issue new bonds, to be sold to savers in the bond market, or it can issue new shares in itself, which are then sold in the stock market. The proceeds from the sales of new bonds or stocks are then available to the firm to finance its capital investment.

How do stock and bond markets help to ensure that available saving is devoted to the most productive uses? As we mentioned at the beginning of this section, two important functions served by these markets are gathering information about prospective borrowers and helping savers to share the risks of lending. Now that you know the basics of how bonds and stocks are priced, we can look at the role of bond and stock markets.

9.2.1 THE INFORMATIONAL ROLE OF BOND AND STOCK MARKETS

Savers and their financial advisers know that to get the highest possible returns on their financial investments they must find the potential borrowers with the most profitable opportunities. This knowledge provides a powerful incentive to scrutinise potential borrowers carefully.

For example, companies considering a new issue of stocks or bonds know that their recent performance and plans for the future will be carefully studied by professional analysts and other financial investors. If the analysts and other potential purchasers have doubts about the future profitability of the firm, they will offer a relatively low price for the newly issued shares or they will demand a high interest rate on newly issued bonds. Knowing this, a company will be reluctant to go to the bond or stock market for financing unless its management is confident that it can convince financial investors that the firm's planned use of the funds will be profitable. Thus, the ongoing search by savers and their financial advisers for high returns leads the bond and stock markets to direct funds to the uses that appear most likely to be productive.

Risk sharing and diversification

Many highly promising investment projects are also quite risky. The successful development of a new drug to lower cholesterol could create billions of dollars in profits for a drug company, for example; but if the drug turns out to be less effective than some others on the market, none of the development costs will be recouped. An individual who lent their life savings to help finance the development of the anti-cholesterol drug might enjoy a handsome return but also takes the chance of losing everything. Savers are generally reluctant to take large risks, so without some means of reducing the risk faced by each saver, it might be very hard for the company to find the funds to develop the new drug.

Bond and stock markets help reduce risk by giving savers a means to diversify their financial investments. **Diversification** is the practice of spreading one's wealth over a variety of different financial investments to reduce overall risk. The idea of diversification follows from the adage that 'you shouldn't put all your eggs in one basket'. Rather than putting all of their savings in one very risky project, a financial investor will find it much safer to allocate a small amount of saving to each of a large number of stocks and bonds. That way, if some financial assets fall in value, there is a good chance that others will rise in value, with gains offsetting losses. The following example illustrates the benefits of diversification.

EXAMPLE 9.5 – THE BENEFITS OF DIVERSIFICATION

What are the benefits of diversification?

Vikram has $200 to invest and is considering two stocks, Smith Umbrella Co and Jones Suntan Lotion Co. Suppose the price of one share of each stock is $100. The umbrella company will turn out to be the better investment if the weather is rainy, but the suntan lotion company will be the better investment if the weather is sunny. In Table 9.1, we illustrate the amounts by which the price of one share of each stock will change and how this depends on the weather.

TABLE 9.1 Changes in the stock price of two companies

INCREASE IN STOCK PRICE PER SHARE		
ACTUAL WEATHER	**SMITH UMBRELLA CO**	**JONES SUNTAN LOTION CO**
Rainy	+$10	Unchanged
Sunny	Unchanged	+$10

According to Table 9.1, the price of one share of Smith Umbrella Co stock will rise by $10 (from $100 to $110) if it rains but will remain unchanged if the weather is sunny. The price of one share of Jones Suntan Lotion Co stock, on the other hand, is expected to rise by $10 (from $100 to $110) if it is sunny but will remain unchanged if there is rain.

Suppose the chance of rain is 50 per cent and the chance of sunshine is 50 per cent. How should Vikram invest his $200? If Vikram were to invest all his $200 in Smith Umbrella, he could buy two shares. Half of the time it will rain and each share will rise by $10, for a total gain of $20. Half of the time, however, it will be sunny, in which case the stock price will remain unchanged. Thus, his average gain will be 50 per cent (or one-half) times $20 plus 50 per cent times $0, which is equal to $10.

If, however, Vikram invested all of his $200 in Jones Suntan Lotion Co, he could again buy two shares for $100 each. Each share would rise by $10 if the weather is sunny (for a total gain of $20) and remain unchanged if the weather is rainy. Since it will be sunny half the time, the average gain will be 50 per cent times $20 plus 50 per cent times $0, or $10.

Although Vikram can earn an average gain of $10 if he puts all of his money into either stock, investing in only one stock is quite risky, since his actual gain varies widely depending on whether there is rain or shine. Can Vikram guarantee himself a gain of $10, avoiding the uncertainty and risk? Yes, all he has to do is buy one share of each of the two stocks. If it rains, he will earn $10 on his Smith Umbrella stock and nothing on his Jones Suntan stock. If it's sunny, he will earn nothing on Smith Umbrella but $10 on Jones Suntan. Rain or shine, he is guaranteed to earn $10 —without risk.

The existence of bond markets and stock markets makes it easy for savers to diversify by putting a small amount of their saving into each of a wide variety of different financial assets, each of which represents a share of a particular company or investment project. From society's point of view, diversification makes it possible for risky but worthwhile projects to obtain funding, without individual savers having to bear too much risk.

THINKING AS AN ECONOMIST 9.1

Why did the US stock market rise sharply in the 1990s, then fall in the new millennium?

Stock prices soared during the 1990s in the United States. The Standard & Poor's 500 index, which summarises the stock price performance of 500 major companies, rose 60 per cent between 1990 and 1995, then more than doubled between 1995 and 2000. However, in the first two years of the new millennium, this index lost nearly half its value. Why did the US stock market boom in the 1990s and bust in the 2000s?

The prices of stocks depend on their purchasers' expectations about future dividends and stock prices and on the rate of return required by potential stockholders. The required rate of return in turn equals the interest rate on safe assets plus the risk premium. In principle, a rise in stock prices could be the result of increased optimism about future dividends, a fall in the required return, or some combination.

Probably both factors contributed to the boom in stock prices in the 1990s. Dividends grew rapidly in the 1990s, reflecting the strong overall performance of the US economy. Encouraged by the promise of new technologies, many financial investors expected future dividends to be even higher.

There is also evidence that the risk premium that people required to hold stocks fell during the 1990s, thereby lowering the total required return and raising stock prices. One possible explanation for a decline in the risk premium in the 1990s is increased diversification. During that decade, the number and variety of mutual funds available increased markedly. Millions of Americans invested in these funds, including many who had never owned stock before or had owned stock in only a few companies. This increase in diversification for the typical stock market investor may have lowered the perceived risk of holding stocks (because they could now own stocks by buying mutual funds), which in turn reduced the risk premium and raised stock prices. An alternative explanation is that investors simply underestimated the riskiness inherent in the economy and, consequently, in the stock market. To the extent that investors underestimated the riskiness of stocks, the risk premium may have fallen to an unrealistically low level.

After 2000, both of these favourable factors reversed. The growth in dividends was disappointing to stockholders, in large part because many high-tech firms did not prove as profitable as had been hoped. An additional blow was a series of corporate accounting scandals in 2002, in which it became known that some large firms had taken illegal or unethical actions to make their profits seem larger than in fact they were. A number of factors, including a recession, a major terrorist attack and the accounting scandals, also increased stockholders' concerns about the riskiness of stocks, so that the risk premium they required to hold stocks rose from its 1990s lows. The combination of lower expected dividends and a higher premium for risk sent stock prices sharply downward. Only in 2003, when the economy began to grow more rapidly, did stock prices begin to recover.

9.3 MONEY AND ITS USES

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Bonds and stocks are particular types of financial assets. Where does money fit into this scheme? And what exactly is money?

Historically, a wide variety of objects have been used as **money**, including gold and silver coins, shells, beads, feathers and, on the islands of Yap in Micronesia, large, immovable boulders. Prior to the use of metallic coins, by far the most common form of money was the cowrie, a type of shell found in the South Pacific. Cowries were used as money in some parts of Africa until relatively recently, being officially accepted for payment of taxes in Uganda until the beginning of the twentieth century. Today, money can be virtually intangible, for example, you can now easily access your funds held in a deposit account, which exists only in the form of an entry in your bank's computer, via a debit card.

Why do people use money? Money has three principal uses: as a *medium of exchange*, as a *unit of account* and as a *store of value*.

Money serves as a **medium of exchange** when it is used to purchase goods and services, as when you pay cash for a newspaper or make a direct deposit to cover your electricity bill. This is perhaps money's most crucial function. Without money, all economic transactions would have to be in the form of **barter**, which is the direct trade of goods or services for other goods or services.

Barter is highly inefficient because it requires that each party to a trade has something that the other party wants, a so-called *double coincidence of wants*. For example, under a barter system a musician could get their dinner only by finding someone willing to trade food for a musical performance. Finding such a match of needs, where each party happens to want exactly what the other person has to offer, would be difficult to do on a regular basis. In a world with money, the musician's problem is considerably simpler. First, they must find someone who is willing to pay money for their musical performance. Then, with the money received, they can purchase the food and other goods and services that they need. In a society that uses money, it is not necessary that the person who wants to hear music and the person willing to provide food to the musician be one and the same. In other words, there need not be a double coincidence of wants for trades of goods and services to take place.

By eliminating the problem of having to find a double coincidence of wants in order to trade, the use of money in a society permits individuals to specialise in producing particular goods or services, as opposed to having every family or village produce most of what it needs. Specialisation greatly increases economic efficiency and material standards of living. This usefulness of money in making transactions explains why savers hold some money, even though money generally pays a low rate of return. Cash, for example, pays no interest at all, and the balances in many deposit accounts usually pay a lower rate of interest than could be obtained in alternative financial investments.

Money's second function is as a *unit of account*. As a **unit of account** , money is the basic yardstick for measuring economic value. In most countries, virtually all prices—including the price of labour (wages) and the prices of financial assets, such as shares of BHP—are expressed in dollars. Expressing economic values in a common unit of account allows for easy comparisons. For example, grain can be measured in bushels and coal in tonnes, but to judge whether 20 bushels of grain is economically more or less valuable than a tonne of coal we express both values in dollar terms. The use of money as a unit of account is closely related to its use as a medium of exchange; because money is used to buy and sell things, it makes sense to express prices of all kinds in money terms.

As a **store of value** , money is a way of holding wealth. For example, the miser who stuffs cash in their mattress or buries gold coins under the old gum tree at midnight is holding wealth in money form. Likewise, if you regularly keep a balance in your deposit account, you are holding part of your wealth in the form of money. Although money is usually the primary medium of exchange or unit of account in an economy, it is not the only store of value. There are numerous other ways of holding wealth, such as owning shares, bonds or real estate.

For most people, money is not a particularly good way to hold wealth, apart from its usefulness as a medium of exchange. Unlike government bonds and other types of financial assets, most forms of money pay no interest, and there is always the risk of cash being lost or stolen. However, cash has the advantage of being anonymous and difficult to trace, making it an attractive store of value for smugglers, drug dealers and others who want their assets to stay out of the view of the tax office.

THINKING AS AN ECONOMIST 9.2

From Ithaca Hours to bitcoin: What is private money, communally created money and open-source money?

Since money is such a useful tool, why is money usually issued only by governments? Are there examples of privately issued, or communally created, money?

Money is usually issued by the government, not private individuals, but in part, this reflects legal restrictions on private money issuance. Where the law allows, private moneys do sometimes emerge. For example, privately issued currencies circulate in more than 30 US communities. In Ithaca, New York, a private currency known as 'Ithaca Hours' has circulated since 1991. Instituted by town resident Paul Glover, each Ithaca Hour is equivalent to $10, the average hourly wage of workers in the county. The bills, printed with specially developed inks to prevent counterfeiting, honour local people and the environment. An estimated 1600 individuals and businesses have earned and spent Hours. Founder Paul Glover argues that the use of Hours, which can't be spent elsewhere, induces people to do more of their shopping in the local economy.

A more recent development in private money was the emergence of the virtual currency known as 'bitcoin' in 2009. This is a peer-to-peer, open-source online payment system without a central administrator, where payments are recorded in a public ledger using bitcoin as the unit of account. New bitcoins are created as a reward for payment-processing work, known as mining, in which users offer their computing power to verify and record payments into the public ledger. Already-circulating bitcoins can be obtained in exchange for other currencies, products and services. Users can send and receive bitcoins electronically using special wallet software on a personal computer, mobile device or web application. As of mid-September 2017, the value of one bitcoin was around US$3500, with more than 16.5 million bitcoins in circulation.

Despite its promise as a decentralised digital currency, bitcoin has not been very successful as money so far, and it is not widely accepted for most transactions. The relatively small commercial use of bitcoin compared to its use by speculators has contributed to significant price volatility. In a famous episode, in November 2013 one bitcoin traded for more than $1100—more than 10 times its price in dollars a few months earlier—before sharply declining and trading for less than $300 during much of 2015. In late 2015, the digital currency started climbing in value again, reaching an all-time high of more than $5000 per one bitcoin on 1 September 2017—before falling to around $4500 the next day and to around $3500 later that month. This volatility limits bitcoin's ability to act as a stable store of value and as a reliable unit of account in which prices could be quoted—two of the three principal uses of money described earlier in this chapter.

What do Ithaca Hours and bitcoin have in common? By functioning as a medium of exchange, each facilitates trade within a community.

9.3.1 MEASURING MONEY

How much money, defined as financial assets usable for making purchases, is there in the economy at any given time? This question is not simple to answer because in practice it is not easy to draw a clear distinction between those assets that should be counted as money and those that should not. Dollar coins are certainly a form of money, and a Fred Williams painting certainly is not. However, brokerage firms now offer accounts that allow their owners to combine financial investments in shares and bonds with credit card privileges. Should the balances in these accounts, or some part of them, be counted as money? It is difficult to tell.

Economists skirt the problem of deciding what is and is not money by using several alternative definitions of money, which vary in how broadly the concept of money is defined:

- *Currency* is notes and coins on issue less holdings of notes and coins by all banks and the Reserve Bank.
- *M1* is currency plus current deposits with banks. (Current deposits are money held in cheque and savings accounts.)
- *M3* is M1 plus all deposits of the private non-bank sector.
- *Broad money* is M3 plus borrowings from the private sector by non-bank depository corporations, less holdings of currency and deposits of non-bank depository corporations.

Table 9.2 details the amount of money in circulation in Australia as at August 2018.

TABLE 9.2 Currency, M1, M3 and broad money in Australia, August 2018 ($ billion)

Currency	74.3
M1	353.9
M3	2098.0
Broad money	2108.3

Source: Reserve Bank of Australia 2018, ‘Financial aggregates, August’, https://www.rba.gov.au/statistics/frequency/fin-agg/2018/.

▹▹ RECAP

Money has value to society because it performs three socially useful functions: as a medium of exchange, a store of value and a unit of account.

In practice there are many basic measures of money. M1, a relatively narrow measure, is made up primarily of currency and balances held in accounts that can be accessed by debit cards. The broadest measure, broad money, includes all the assets in M1 plus some additional assets that can be used to make payments.

9.4 COMMERCIAL BANKS AND THE CREATION OF MONEY

LO 9.4

What determines the amount of money in the economy? If the economy's supply of money consisted entirely of currency, the answer would be simple: the supply of money would just be equal to the value of the currency created and circulated by the government. However, as we have seen, in modern economies the money supply consists not only of currency but also of deposit balances held by the public in commercial, that is, private, banks. The determination of the money supply in a modern economy thus depends in part on the behaviour of commercial banks and their depositors.

To see how the existence of commercial banks affects the money supply, we will use the example of a fictional country, the Republic of Gorgonzola. Initially, we assume, Gorgonzola has no commercial banking system. To make trading easier and eliminate the need for barter, the government directs the central bank of Gorgonzola to put into circulation a million identical paper notes, called guilders. The central bank prints the guilders and distributes them to the populace. At this point the Gorgonzolan money supply is a million guilders.

However, the citizens of Gorgonzola are unhappy with a money supply made up entirely of paper guilders, since the notes may be lost or stolen. In response to the demand for safekeeping of money, some Gorgonzolan entrepreneurs set up a system of commercial banks. At first these banks are only storage vaults where people can deposit their guilders. When people need to make a payment they can either physically withdraw their guilders or, more conveniently, write a cheque on their account. Cheques give the banks permission to transfer guilders from the account of the person paying by cheque to the account of the person to whom the cheque is made out. With a system of payments based on cheques, the paper guilders need never leave the banking system, although they flow from one bank to another as a depositor of one bank makes a payment to a depositor in another bank. Deposits do not pay interest in this economy; indeed, the banks can make a profit only by charging depositors fees in exchange for safeguarding their cash.

Let us suppose for now that people prefer bank deposits to cash and so deposit all of their guilders with the commercial banks. With all guilders in the vaults of banks, the balance sheet of all of Gorgonzola's commercial banks taken together is as shown in Table 9.3.

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TABLE 9.3 Consolidated balance sheet of Gorgonzolan comr banks (initial)

ASSETS		LIABILITIES	
Currency = reserves	1 000 000 guilders	Deposits	1 000 00

The *assets* of the commercial banking system in Gorgonzola are the paper guilders sitting in the vaults of all the individual banks. The banking system's *liabilities* are the deposits of the banks' customers, since cheque account balances represent money owed by the banks to the depositors.

Cash or similar assets held by banks are called **bank reserves** . In this example, bank reserves, for all the banks taken together, equal 1 000 000 guilders—the currency listed on the asset side of the consolidated balance sheet. Banks hold reserves to meet depositors' demands for cash withdrawals or to pay cheques drawn on their depositors' accounts. In this example, the bank reserves of 1 000 000 guilders equal 100 per cent of banks' deposits, which are also 1 000 000 guilders. A situation in which bank reserves equal 100 per cent of bank deposits is called **100 per cent reserve banking** .

Bank reserves are held by banks in their vaults rather than circulated among the public, and thus are *not* counted as part of the money supply. However, bank deposit balances, which can be used in making transactions, *are* counted as money. So, after the introduction of 'safe keeper' banks in Gorgonzola, the money supply, equal to the value of bank deposits, is 1 000 000 guilders, which is the same as it was prior to the introduction of banks.

After a while—to continue the story—the commercial bankers of Gorgonzola begin to realise that keeping 100 per cent reserves against deposits is not necessary. True, a few guilders flow in and out of the typical bank as depositors receive payments or write cheques but, for the most part, the stacks of paper guilders just sit there in the vaults, untouched and unused. It occurs to the bankers that they can meet the random inflow and outflow of guilders to their banks with reserves that are less than 100 per cent of their deposits. After some observation, the bankers conclude that keeping reserves equal to only 10 per cent of deposits is enough to meet the random ebb and flow of withdrawals and payments from their individual banks. The remaining 90 per cent of deposits, the bankers realise, can be lent out to borrowers to earn interest.

So the bankers decide to keep reserves equal to 100 000 guilders, or 10 per cent of their deposits. The other 900 000 guilders they lend out at interest to Gorgonzolan cheese producers, who want to use the money to make improvements to their farms. After the loans are made, the balance sheet of all of Gorgonzola's commercial banks taken together has changed, as shown in Table 9.4.

TABLE 9.4 Consolidated balance sheet of Gorgonzolan commercial banks after one round of loans

ASSETS		LIABILITIES	
Currency (= reserves)	100 000 guilders	Deposits	1 000 000 guilders
Loans to cheese producers	900 000 guilders		

After the loans are made, the banks' reserves of 100 000 guilders no longer equal 100 per cent of the banks' deposits of 1 000 000 guilders. Instead, the **reserve–deposit ratio**, which is bank reserves divided by deposits, is now equal to 100 000/1 000 000, or 10 per cent. A banking system in which banks hold fewer reserves than deposits, so that the reserve–deposit ratio is less than 100 per cent, is called a **fractional-reserve banking system**.

Notice that 900 000 guilders have flowed out of the banking system (as loans to cheese producers) and are now in the hands of the public. But we have assumed that private citizens prefer bank deposits to cash for making transactions. So, ultimately people will redeposit the 900 000 guilders in the banking system. After these deposits are made, the consolidated balance sheet of the commercial banks is as in Table 9.5.

TABLE 9.5 Consolidated balance sheet of Gorgonzolan commercial banks after guilders are redeposited

ASSETS		LIABILITIES	
Currency (= reserves)	1 000 000 guilders	Deposits	1 900 000 guilde
Loans to cheese producers	900 000 guilders		

Notice that bank deposits, and hence the economy's money supply, now equal 1 900 000 guilders. In effect, the existence of the commercial banking system has permitted the creation of new money. These deposits, which are liabilities of the banks, are balanced by assets of 1 000 000 guilders in reserves and 900 000 guilders in loans owed to the banks.

The story does not end here. On examining their balance sheets the bankers are surprised to see that they once again have 'too many' reserves. With deposits of 1 900 000 guilders and a 10 per cent reserve–deposit ratio, they need only 190 000 guilders in reserves. But they have 1 000 000 guilders in reserves—810 000 too many. Since lending out their excess guilders is always more profitable than leaving them in the vault, the bankers proceed to make another 810 000 guilders in loans. Eventually these loaned-out guilders are redeposited in the banking system, after which the consolidated balance sheet of the banks is as shown in Table 9.6 .

TABLE 9.6 Consolidated balance sheet of Gorgonzolan commercial banks after guilders are redeposited

ASSETS		LIABILITIES	
Currency (= reserves)	1 000 000 guilders	Deposits	2 710 000 guilder
Loans to cheese producers	1 710 000 guilders		

Now the money supply has increased to 2 710 000 guilders, equal to the value of bank deposits. Despite the expansion of loans and deposits, the bankers find that their reserves of 1 000 000 guilders still exceed the desired level of 10 per cent of deposits, which are 2 710 000 guilders. And so, yet another round of lending will take place.

CONCEPT CHECK 9.1

Determine what the balance sheet of the banking system of Gorgonzola will look like after a third round of lending to cheese producers and redeposits of guilders into the commercial banking system. What is the money supply at that point?

The process of expansion of loans and deposits will only end when reserves equal 10 per cent of bank deposits, because as long as reserves exceed 10 per cent of deposits, the banks will find it profitable to lend out the extra reserves. Since reserves at the end of every round equal 1 000 000 guilders, for the reserve–deposit ratio to equal 10 per cent, total deposits must equal 10 000 000 guilders. Further, since the balance sheet must balance, with assets equal to liabilities, we know that at the end of the process, loans to cheese producers must equal 9 000 000 guilders. If loans equal 9 000 000 guilders, then bank assets, the sum of loans and reserves (1 000 000 guilders), will equal 10 000 000 guilders, which is the same as bank liabilities (bank deposits). The final consolidated balance sheet is as shown in Table 9.7.

TABLE 9.7 Final consolidated balance sheet of Gorgonzolan commercial banks

ASSETS		LIABILITIES	
Currency (= reserves)	1 000 000 guilders	Deposits	10 000 000 guild
Loans to cheese producers	9 000 000 guilders		

The money supply, which is equal to total deposits, is 10 000 000 guilders at the end of the process. We see that the existence of a fractional-reserve banking system has multiplied the money supply by a factor of 10, relative to the economy with no banks or the economy with 100 per cent reserve banking. Put another way, with a 10 per cent reserve–deposit ratio, each guilder deposited in the banking system can 'support' 10 guilders worth of deposits.

To find the money supply in this example more directly, we observe that deposits will expand through additional rounds of lending as long as the ratio of bank reserves to bank deposits exceeds the reserve–deposit ratio desired by banks. When the actual ratio of bank reserves to deposits equals the desired reserve–deposit ratio, the expansion stops. So, ultimately, deposits in the banking system satisfy the following relationship:

$$\frac{\text{Bank reserves}}{\text{Bank deposits}} = \text{desired reserve} - \text{deposit ratio}$$

This equation can be rewritten to solve for bank deposits:

$$\text{Bank deposits} = \frac{\text{bank reserves}}{\text{desired reserve–deposit ratio}}$$

Equation 9.1

In Gorgonzola, since all the currency in the economy flows into the banking system, bank reserves equal 1 000 000 guilders. The reserve–deposit ratio desired by banks is 0.10. Therefore, using Equation 9.1, we find that bank deposits equal (1 000 000 guilders)/0.10, or 10 million guilders, the same answer we found in the consolidated balance sheet of the banks in

Table 9.7.

CONCEPT CHECK 9.2

Find deposits and the money supply in Gorgonzola if the banks' desired reserve–deposit ratio is 5 per cent rather than 10 per cent. What if the total amount of currency circulated by the central bank is 2 000 000 guilders and the desired reserve–deposit ratio remains at 10 per cent?

9.4.1 THE MONEY SUPPLY WITH BOTH CURRENCY AND DEPOSITS

In the example of Gorgonzola we assumed that all money is held in the form of deposits in banks. In reality, of course, people keep only part of their money holdings in the form of bank accounts and hold the rest in the form of currency. Fortunately, allowing for the fact that people hold both currency and bank deposits does not greatly complicate the determination of the money supply, as Example 9.6 shows.

EXAMPLE 9.6 – THE MONEY SUPPLY WITH BOTH CURRENCY AND DEPOSITS

Suppose that the citizens of Gorgonzola choose to hold a total of 500 000 guilders in the form of currency and to deposit the rest of their money in banks. Banks keep reserves equal to 10 per cent of deposits. What is the money supply in Gorgonzola?

The money supply is the sum of currency in the hands of the public and bank deposits. Currency in the hands of the public is given as 500 000 guilders. What is the quantity of bank deposits? Since 500 000 of the 1 000 000 guilders issued by the central bank are being used by the public in the form of currency, only the remaining 500 000 guilders is available to serve as bank reserves. We know that deposits equals bank reserves divided by the reserve–deposit ratio, so deposits are 500 000 guilders/0.10 = 5 000 000 guilders. The total money supply is the sum of currency in the hands of the public (500 000 guilders) and bank deposits (5 000 000 guilders), or 5 500 000 guilders.

We can write a general relationship that captures the reasoning of Example 9.6. First, let us write out the fact that the money supply equals currency plus bank deposits:

$$\text{Money supply} = \text{currency held by the public} + \text{bank deposits}$$

We also know that bank deposits equal bank reserves divided by the reserve–deposit ratio that is desired by commercial banks (Equation 9.1). Using that relationship to substitute for bank deposits in the expression for the money supply, we get:

$$\text{Money supply} = \text{currency held by the public} + \frac{\text{bank reserves}}{\text{desired reserve} - \text{deposit ratio}}$$

Equation 9.2

We can use Equation 9.2 to confirm our answer to Example 9.6. In that example, currency held by the public is 500 000 guilders, bank reserves are 500 000 guilders and the desired reserve–deposit ratio is 0.10. Plugging these values into Equation 9.2, we get that the money supply equals 500 000 + 500 000/0.10 = 5 500 000, the same answer we found before.

EXAMPLE 9.7 – THE MONEY SUPPLY AT CHRISTMAS

During the Christmas season, people choose to hold unusually large amounts of currency for shopping. With no action by the central bank, how would this change in currency holding affect the national money supply?

To illustrate with a numerical example, suppose that initially bank reserves are 500, the amount of currency held by the public is 500 and the desired reserve–deposit ratio in the banking system is 0.2. Inserting these values into Equation 9.2, we find that the money supply equals 500 + 500/0.2 = 3000.

Now suppose that because of Christmas shopping needs, the public increases its currency holdings to 600 by withdrawing 100 from commercial banks. These withdrawals reduce bank reserves to 400. Using Equation 9.2, we find now that the money supply is 600 + 400/0.2 = 2600. So the public's increased holdings of currency have caused the money supply to drop, from 3000 to 2600. The reason for the drop is that with a reserve–deposit ratio of 20 per cent, every dollar in the vaults of banks can 'support' $5 of deposits and hence $5 of money supply. However, the same dollar in the hands of the public becomes $1 of currency, contributing only $1 to the total money supply. So, when the public withdraws cash from the banks, the overall money supply declines.

▹▹ RECAP

Part of the money supply consists of deposits in private commercial banks. Hence the behaviour of commercial banks and their depositors helps to determine the money supply.

Cash or similar assets held by banks are called bank reserves. In modern economies, banks' reserves are less than their deposits, a situation called fractional-reserve banking. The ratio of bank reserves to deposits is called the reserve–deposit ratio; in a fractional-reserve banking system this ratio is less than 1.

The portion of deposits not held as reserves can be lent out by the banks to earn interest. Banks will continue to make loans and accept deposits as long as the reserve–deposit ratio exceeds its desired level. This process stops only when the actual and desired reserve–deposit ratios are equal. At that point total bank deposits equal bank reserves divided by the desired reserve–deposit ratio, and the money supply equals the currency held by the public plus bank deposits (see Equation 9.2).

9.5 MONEY AND PRICES

LO 9.5

From a macroeconomic perspective, a major reason that the supply of money is important is that, *in the long run, the amount of money circulating in an economy and the general level of prices are closely linked*. Indeed, it is virtually unheard of for a country to experience high, sustained inflation without a comparably rapid growth in the amount of money held by its citizens. Later in the book you will learn that, over short periods, inflation can arise from sources other than an increase in the supply of money. Over a longer period, and particularly for more severe inflations, the rate of inflation and the rate of growth of the money supply are closely related.

The existence of a close link between the money supply and prices should make intuitive sense. Imagine a situation in which the available supply of goods and services is approximately fixed. Then the more cash that people hold, the more they will be able to bid up the prices of the fixed supply of goods and services. Thus, a large money supply relative to the supply of goods and services (too much money chasing too few goods) tends to result in high prices. Likewise, a rapidly *growing* supply of money will lead to quickly *rising* prices—that is, inflation.

9.5.1 VELOCITY

To explore the relationship of money growth and inflation in a bit more detail, it is useful to introduce the concept of *velocity*. In economics, velocity is a measure of the speed at which money circulates. For example, a given dollar coin might pass from your hand to the shopkeeper's when you buy a litre of milk. The same dollar may then pass from the shopkeeper to the supplier, from the supplier to the dairy farmer who produced the milk, from the farmer to the feed supply store owner and so on. The more quickly money circulates from one person to the next, the higher its velocity. More formally, **velocity** is defined as the value of transactions completed in a period of time divided by the stock of money required to make those transactions. The higher this ratio, the faster the 'typical' dollar is circulating.

As a practical matter, we usually do not have precise measures of the total value of transactions taking place in an economy; so, as an approximation, economists often measure the total value of transactions in a given period by nominal GDP for that period. A numerical value of velocity can then be obtained from the following formula:

$$\begin{aligned}\text{Velocity} &= \frac{\text{value of transactions}}{\text{money stock}}\\ &= \frac{\text{nominal GDP}}{\text{money stock}}\end{aligned}$$

Let *V* stand for velocity and let *M* stand for the particular money stock being considered (e.g. M1 or broad money). Nominal GDP (a measure of the total value of transactions) equals the price level, *P*, times *real* GDP, *Y*. Using this notation, we can write the definition of velocity as:

$$V = \frac{P \times Y}{M}$$

Equation 9.3

EXAMPLE 9.8 – THE VELOCITY OF MONEY IN THE AUSTRALIAN ECONOMY

In Australia, in the three months of the December quarter 2009, currency was $46.2 billion, M1 was $251.3 billion and nominal GDP was $320.5 billion. Find the velocity of currency and of M1 for that quarter.

Using Equation 9.3, velocity for currency is given by:

$$V = \frac{\$320.5 \text{ billion}}{\$46.2 \text{ billion}} = 6.94$$

Similarly, velocity for M1 was:

$$V = \frac{\$320.5 \text{ billion}}{\$251.3 \text{ billion}} = 1.28$$

You can see that the velocity of currency is higher than that of M1. This makes sense: because cash is used more frequently for small, frequent transactions than the current deposit accounts that are in M1, each dollar of currency ‘turns over’ more often than the average dollar of M1.

A variety of factors determine velocity. A leading example is advances in payment technologies, such as contactless 'tap and go'. These new technologies have allowed people to carry out their daily business while holding less cash, and thus have tended to increase velocity over time.

9.5.2 MONEY AND INFLATION IN THE LONG RUN

We can use the definition of velocity to see how money and prices are related in the long run. First, rewrite the definition of velocity, Equation 9.3, by multiplying both sides of the equation by the money stock, *M*. This yields:

$$MV = PY \qquad \text{Equation 9.4}$$

Equation 9.4, a famous relationship in economics, is called for historical reasons the **quantity equation**. The quantity equation states that money multiplied by velocity equals nominal GDP. Because the quantity equation is simply a rewriting of the definition of velocity, Equation 9.3, it always holds exactly.

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The quantity equation is important in macroeconomics because it can be used to theorise about the relationship between money and prices. To keep things simple, imagine that velocity, *V*, is determined by current payments technologies and thus is approximately constant over the period we are considering. Likewise, suppose that real output, *Y*, is approximately constant. If we use a bar over a variable to indicate that the variable is constant, we can rewrite the quantity equation as:

$$M\overline{V} = P\overline{Y}$$

Equation 9.5

where we are treating $\overline{V}$ and $\overline{Y}$ as fixed numbers.

Now look at Equation 9.5 and imagine that for some reason the money supply, *M*, increases by 10 per cent. Because $\overline{V}$ and $\overline{Y}$ are assumed to be fixed, Equation 9.5 can continue to hold only if the price level, *P*, also rises by 10 per cent. That is, according to the quantity equation, a 10 per cent increase in the money supply, *M*, should cause a 10 per cent increase in the price level, *P*, that is, an inflation of 10 per cent.

The intuition behind this conclusion is the one we mentioned at the beginning of this section. If the quantity of goods and services, *Y*, is approximately constant (and assuming also that velocity, *V*, is also constant), an increase in the supply of money will lead people to bid up the prices of the available goods and services. Thus, high rates of money growth will tend to be associated with high rates of inflation and with no associated change in real output. Figure 9.1 shows these relationships for 110 countries during the period 1960–90. Each data point in the first figure represents the average rate of growth in the money supply and the average inflation rate for a country. In the second figure the data points correspond to combinations of money supply growth and real output growth in each country. The amazing thing to note about the data displayed in Figure 9.1 is how closely they accord with Equation 9.5 . To a very significant degree, inflation rates correspond to the rates of growth of the respective money supplies. Moreover, countries with the highest average rates of money supply growth are also the countries with the highest rates of inflation. Finally, growth in the money supply leaves real output growth unaffected.

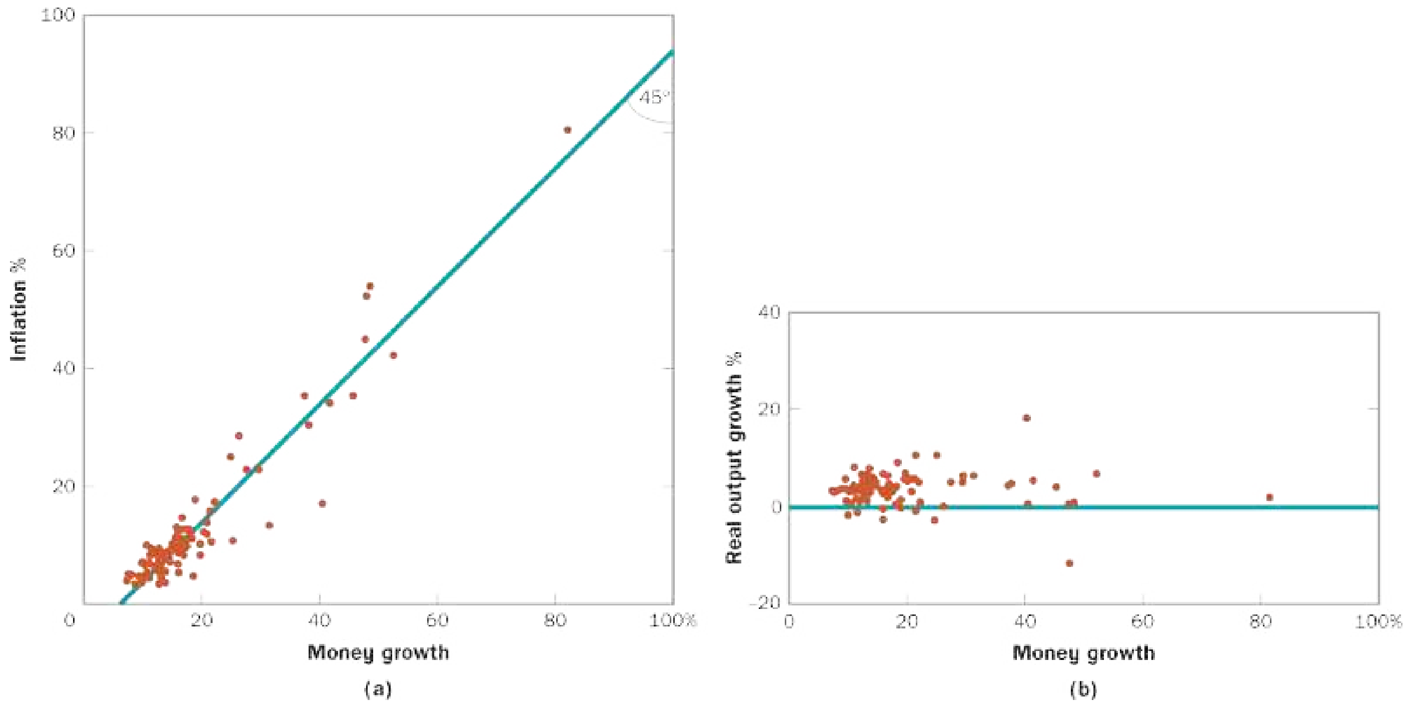

Figure 9.1 **The association between money growth and real output growth, 1960–90**

Note: (a) Countries with higher rates of growth in their money supplies also tended to have higher rates of inflation between 1960 and 1990. (b) However, there would appear to be no systematic relation between money growth and real output.
Source: Adapted from McCandless GT and Weber WE 1995, 'Some monetary facts', *Federal Reserve Bank of Minneapolis Quarterly Review*, vol. 19, no. 3, pp. 2–11.

If high rates of money growth lead to inflation, why do countries allow their money supplies to rise quickly? Usually, rapid rates of money growth are the result of large government budget deficits. Particularly in developing countries or countries suffering from war or political instability, governments sometimes find that they cannot raise sufficient taxes or borrow enough from the public to cover their expenditures. In this situation the government's only recourse may be to print new money and use this money to pay its bills. If the resulting increase in the amount of money in circulation is large enough the result will be inflation.

▹▹ RECAP

A high rate of money growth generally leads to inflation. The larger the amount of money in circulation, the higher the public will bid up the prices of available goods and services.

Velocity measures the speed at which money circulates; equivalently, it is the value of transactions completed in a period of time divided by the stock of money required to make those transactions. A numerical value for velocity can be obtained from the equation $V = (PY)/M$, where V is velocity, PY is nominal GDP (a measure of the total value of transactions) and M is the money supply.

The *quantity equation* states that money times velocity equals nominal GDP, or, in symbols, $M \times V = P \times Y$. The quantity equation is a restatement of the definition of velocity and thus always holds. If velocity and output are approximately constant, the quantity equation implies that a given percentage increase in the money supply leads to the same percentage increase in the price level. In other words, the rate of growth of the money supply equals the rate of inflation.

9.6 THE RESERVE BANK OF AUSTRALIA

LO 9.6, 9.7

For participants in financial markets and for other people as well, one of the most important branches of the government is the **Reserve Bank of Australia**, often called the Reserve Bank. The Reserve Bank is Australia's *central bank*. Like central banks in other countries, the Reserve Bank has two main responsibilities. First, it is responsible for monetary policy, which these days means that the Reserve Bank influences the level of interest rates in the economy. Second, the Reserve Bank bears important responsibility for the oversight and regulation of financial markets. The Reserve Bank also plays a major role during periods of crisis in financial markets.

9.6.1 INFLUENCING INTEREST RATES: OPEN-MARKET OPERATIONS

The way monetary policy is conducted has changed at various points in Australia's history. The emphasis now is on Reserve Bank interventions in the financial market, designed to affect the general level of interest rates in the economy. Prior to this, for example throughout the 1970s and early 1980s, the focus was on targeting the amount of money in circulation in the economy. However, the advent of **financial deregulation** in the early 1980s meant that a much wider range of financial assets became available to the public, many of which were effectively close substitutes for the set of financial assets comprising the official definitions of the money supply. As a result, the list of assets that constituted money became blurred. In the face of this uncertainty the Reserve Bank moved to a system of directly targeting interest rates.

Understanding the process by which the Reserve Bank affects the level of interest rates in the economy is challenging as it involves several stages. Here we give a brief description of the process. A more detailed description can be found in Otto (2007). To begin, the Reserve Bank affects the supply of reserves that Australia's commercial banks hold in special accounts, known as **exchange settlement accounts**, with the Reserve Bank. The Reserve Bank achieves this through its *open-market operations*. Suppose that the Reserve Bank wants to raise the level of bank reserves—we will see how this affects the interest rate shortly. To accomplish this, the Reserve Bank buys financial assets, usually from the private banks. To simplify the actual procedure for the moment, think of the Reserve Bank as paying for the financial assets it acquires with newly printed money. As a result, the reserves of the commercial banking system will increase by an amount equal to the value of the assets purchased by the Reserve Bank. The Reserve Bank's purchase of government bonds, leading to an increase in bank reserves, is called an **open-market purchase**.

To reduce bank reserves, the Reserve Bank reverses the procedure. It sells some of the financial assets that it holds (acquired in previous open-market purchases), usually to the banks. This leads to a transfer of reserves from the commercial banks to the Reserve Bank. The Reserve Bank retires these reserves from circulation. The sale of financial assets by the Reserve Bank for the purpose of reducing bank reserves is called an **open-market sale**. Open-market purchases and sales together are called **open-market operations**. Open-market operations are the most convenient and flexible tool that the Reserve Bank has for affecting the level of bank reserves and are employed on a regular basis.

From the material in Section 9.4, and from Equation 9.2, we know that changes in bank reserves have implications for the economy's money supply. The following example traces through a hypothetical open-market operation showing how this affects bank reserves and therefore the money supply.

EXAMPLE 9.9 – INCREASING THE MONEY SUPPLY BY OPEN-MARKET OPERATIONS

In a particular economy, currency held by the public is 1000 shekels, bank reserves are 200 shekels and the desired reserve–deposit ratio is 0.2. What is the money supply? How is the money supply affected if the central bank prints 100 shekels and uses this new currency to buy government bonds from the banks?

As bank reserves are 200 shekels and the reserve–deposit ratio is 0.2, bank deposits must equal 200 shekels/0.2, or 1000 shekels. The money supply, equal to the sum of currency held by the public and bank deposits, is therefore 2000 shekels, a result you can confirm using Equation 9.2.

The open-market purchase puts 100 more shekels into the banks' reserves, raising bank reserves from 200 to 300 shekels. As the desired reserve–deposit ratio is 0.2, multiple rounds of lending and redeposit will eventually raise the level of bank deposits to 300 shekels/0.2, or 1500 shekels. The money supply, equal to 1000 shekels held by the public plus bank deposits of 1500 shekels, equals 2500 shekels. So the open-market purchase of 100 shekels, by raising bank reserves by 100 shekels, has increased the money supply by 500 shekels. Again, you can confirm this result using Equation 9.2.

CONCEPT CHECK 9.3

Continuing Example 9.9, suppose that instead of an open-market purchase of 100 shekels, the central bank conducts an open-market sale of 50 shekels' worth of government bonds. What happens to bank reserves, bank deposits and the money supply?

How do these open-market operations affect interest rates? To answer this question we have to look in more detail at the exchange settlement accounts. These are accounts kept by the commercial banks with the Reserve Bank that are used by the banks to settle their obligations with each other. Some proportion of banks' cash reserves are deposited with the Reserve Bank in these exchange settlement accounts. Example 9.10 illustrates how these accounts operate.

EXAMPLE 9.10 – EXCHANGE SETTLEMENT ACCOUNTS

Suppose Andrew pays for an overseas holiday by authorising a bank transfer for $3000 to Velta, the owner of a travel agency. Andrew banks with the Common Bank while Velta uses the Nation Bank for her business transactions. A means is required of transferring funds between the two banks. In practice this is achieved by debiting the Common Bank's exchange settlement account at the Reserve Bank and crediting the Nation Bank's exchange settlement account. The Common Bank now has $3000 fewer reserves on hand, while the Nation Bank has $3000 more reserves.

Exchange settlement accounts pay a relatively low rate of interest.

This means that commercial banks have an incentive not to keep more reserves in their exchange settlement accounts than are needed to fulfil their obligations to other banks. However, the banks must also be careful not to have too little an amount in their exchange settlement accounts or they will be unable to conduct transactions with other banks. The problem for the banks is that their need for exchange settlement reserves fluctuates daily, according to the amount of business their customers are transacting on any given trading day. On a day where, for example, the Common Bank's customers authorise a lot of transfers, the Common Bank will require a high balance in its exchange settlement account. When few transfers are authorised by Common Bank customers, a smaller exchange settlement balance is appropriate.

Commercial banks use a very specialised segment of the financial system to help them manage their exchange settlement accounts. This is called the overnight cash market. Its function is to facilitate borrowing and lending for periods of 24 hours or less. A commercial bank, for example, fearing that its exchange settlement balances may be running low, can go to the overnight cash market and borrow funds to tide it over for that day. The interest rate on that loan is called the **overnight cash rate** . Banks who have excess exchange settlement balances can lend that money on the **overnight cash market** .

What has any of this to do with the Reserve Bank's monetary policy? The important role of the overnight cash market in the banking system means that the cash rate of interest is susceptible to the actions of the Reserve Bank.

By carefully monitoring conditions in the cash market the Reserve Bank can tailor its purchases and sales of financial assets so as to achieve a particular *target* for the cash rate. Suppose, for example, that the cash rate looks like it will be above the Reserve Bank's target rate. The Reserve Bank would respond by increasing its purchases of financial assets from the banks. These purchases are paid for by the Reserve Bank crediting the exchange settlement accounts of the selling banks. As discussed above, commercial banks have an incentive to lend out any surplus funds in their exchange settlement accounts, and this is done through the overnight cash market. The increase in funds in the overnight cash market makes it easier for borrowers in that market to negotiate a lower cash rate than was previously the case. The end result is a lower overnight cash interest rate.

Should the cash rate look like it will be below the Reserve Bank's target rate, the Reserve Bank will sell financial assets to the banks. This results in commercial banks' exchange settlement accounts being debited. To prevent the exchange settlement balances from becoming too low, the commercial banks borrow funds in the overnight cash market. This increase in demand for borrowed funds pushes up the overnight cash rate.

In practice, although open-market operations are needed to maintain a stated target for the cash rate, *changing* the cash rate simply requires an announcement to be made by the Reserve Bank. This is because the Reserve Bank is prepared to lend to the commercial banks to top up their exchange settlement accounts at a rate that is a small fixed margin relative to the target cash rate. The Reserve Bank will also pay an interest rate on funds deposited in exchange settlement accounts that is a small fixed margin below the target cash rate. Since the understanding is that the Reserve Bank will always provide exchange settlement funds to the banks at a rate based on the target cash rate and will always pay a rate on funds deposited in exchange settlement accounts based on the target rate, the market-determined interest rate in the overnight cash market would move in line with the new target. (See Reserve Bank of Australia, *Statistical Bulletin*, June 2003, for more detail.) We will return to this in Chapter 10.

The monthly meetings of the Reserve Bank Board decide what the target cash rate will be for the coming month. Changes to the target often indicate a change in the stance of monetary policy. For example, a decision by the board to increase the cash rate target is usually a signal that the board believes that higher interest rates are justified than was previously the case. In Chapter 10 we will look more closely at the reasons why the Reserve Bank might feel that such a move is necessary.

Monetary policy seeks to affect all interest rates in the economy, not just the overnight cash rate. For open-market operations to have the desired economy-wide effect on interest rates, there must be some link between the cash rate and other rates of interest. Without such a link, monetary policy could not affect the level of planned aggregate expenditure in the economy since firms and consumers looking to borrow money to finance their expenditure are unlikely to borrow funds in the overnight cash market. It is these expenditure plans that the Reserve Bank is seeking to influence through its monetary policy.

Fortunately, as Figure 9.2 shows, longer-term interest rates track the overnight cash rate very closely (the figure shows the target cash rate and three selected rates of interest; a similar close relationship exists between the target cash rate and other key interest rates). This is not too surprising. If the overnight rate, for example, was much lower than other interest rates, borrowers might well be attracted to loans in the overnight cash market, despite their short-term nature. This would decrease the demand for longer maturity loans, tending to push down their rates of interest. Likewise, should the overnight cash rate be much higher than other interest rates, the demand for longer-term maturity loans would increase, bidding up their rates of interest.

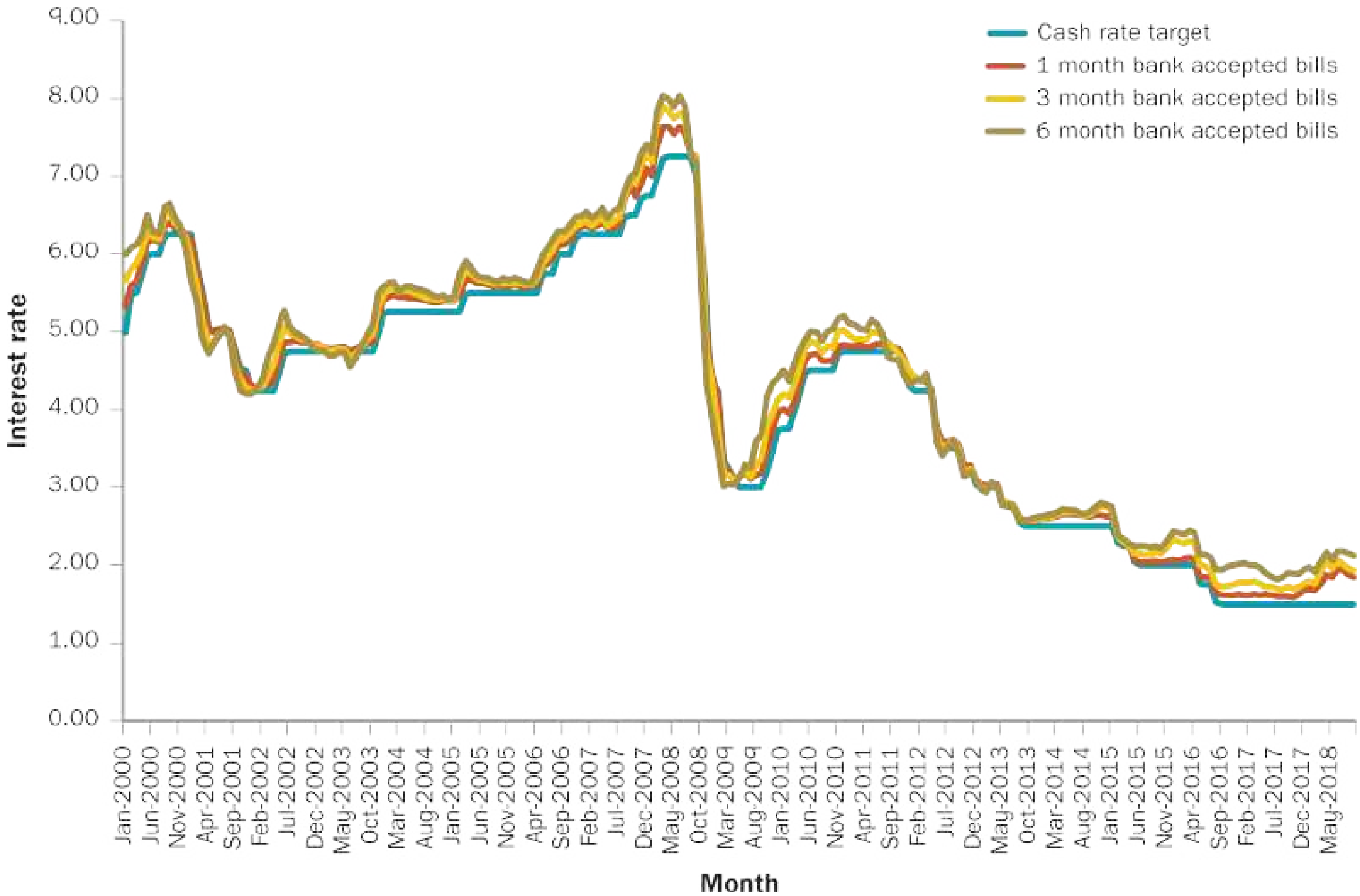

Figure 9.2 **Interest rates**

Note: There is a close connection between the overnight cash rate and other key interest rates in the economy.
Source: Based on data from various issues of Reserve Bank of Australia n.d., 'Statistics', https://www.rba.gov.au/statistics/.

The relationship that exists between these interest rates, and the fact that the Reserve Bank can target the overnight cash rate through the effect of open-market operations on banks' exchange settlement accounts, means that in changing the cash rate, the Reserve Bank is also able to affect other rates of interest as well. It is through this mechanism that the Reserve Bank is able to influence the level of planned aggregate spending in the economy. We will discuss this in more detail in Chapter 10.

You may be wondering how this analysis relates to the argument we discussed in Chapter 4, where we showed how the interest rate in the economy was determined by saving and investment decisions. In that model, the role of the Reserve Bank in influencing the interest rate seems absent. However, it turns out that the operation of monetary policy and the argument about the determination of interest rates presented in Chapter 4 are not inconsistent. One way of thinking about this is to note that in conducting its open-market operations, the Reserve Bank affects the reserves that banks have on hand that can then be lent. Take the example of a fall in the rate of interest. According to the model illustrated in Figure 4.13, a fall in the interest rate could be achieved by moving the supply of funds schedule to the right. This is exactly what an open-market purchase of bonds by the Reserve Bank does. It increases banks' supply of liquidity and leads to increased bank lending. On the other hand, an increase in the interest rate can be achieved by shifting the supply of funds schedule in Figure 4.13 to the left. An open-market sale of bonds by the Reserve Bank will bring this about.

▹▹ RECAP

Through its open-market operations and by lending to the banks, the Reserve Bank is able to affect the level of commercial banks' reserves and the balances that the commercial banks hold in exchange settlement accounts with the Reserve Bank. The banks have incentives to have neither too little nor too much in their exchange settlement accounts—they use the overnight cash market to engage in short-term borrowing and lending in order to manage their exchange settlement account balances. This enables the Reserve Bank to target the overnight cash interest rate, since their open-market operations result in exchange settlement accounts being either debited (if bonds are sold to the public) or credited (if bonds are purchased from the public). By adjusting its open-market operations appropriately, the Reserve Bank can ensure that the level of the overnight cash rate is at the target. As other interest rates in the economy follow the overnight cash rate very closely, the Reserve Bank is able to influence the overall level of interest rates in the economy.

SUMMARY

- *Money* is any asset that can be used in making purchases, such as currency and current deposit account balances. Money has three main functions. It is a *medium of exchange*, which means that it can be used in transactions. It is a *unit of account*, in that economic values are typically measured in units of money (e.g. dollars). And it is a *store of value*, a means by which people can hold wealth. In practice, it is difficult to measure the money supply since many assets have some money-like features. A relatively narrow measure of money is M1, which includes currency and current deposit accounts. A broader measure of money, M3, includes all the assets in M1 plus additional assets that are somewhat less convenient to use in transactions than those included in M1.
- Because bank deposits are part of the money supply, the behaviour of commercial banks and of bank depositors affects the amount of money in the economy. A key factor is the *reserve–deposit ratio* chosen by banks. *Bank reserves* are cash or similar assets held by commercial banks for the purpose of meeting depositor withdrawals and payments. The reserve–deposit ratio is bank reserves divided by deposits in banks. A banking system in which all deposits are held as reserves practises *100 per cent reserve banking*. Modern banking systems have reserve–deposit ratios of less than 100 per cent and are called *fractional-reserve banking systems*.

- Commercial banks create money through multiple rounds of lending and accepting deposits. This process of lending and increasing deposits comes to an end when banks' reserve–deposit ratios equal their desired levels. At that point, bank deposits equal bank reserves divided by the desired reserve–deposit ratio. The money supply equals currency held by the public, plus deposits in the banking system.
- Australia's central bank is called the Reserve Bank of Australia, or the Reserve Bank for short. The Reserve Bank's two main responsibilities are making monetary policy, which means determining rates of interest in the economy, and overseeing and regulating financial markets, especially banks.
- The Reserve Bank can affect the money supply indirectly through its control of the supply of bank reserves. The Reserve Bank can change bank reserves through *open-market operations*, in which the Reserve Bank buys or sells government securities in exchange for currency held by banks or the public.
- In the long run, the rate of growth of the money supply and the rate of inflation are closely linked, because a larger amount of money in circulation allows people to bid up the prices of existing goods and services. *Velocity* measures the speed at which money circulates; equivalently, it is the value of transactions completed in a period of time, divided by the stock of money required to make those transactions. Velocity is defined by the equation $V = (P \times Y)/M$, where V is velocity, $P \times Y$ is nominal GDP (a measure of the total value of transactions) and M is the money supply. The definition of

velocity can be rewritten as the *quantity equation*, $M \times V = P \times Y$. The quantity equation shows that, if velocity and output are constant, a given percentage increase in the money supply will lead to the same percentage increase in the price level.

- Monetary policy is conducted through the use of open-market operations to secure a target level for the overnight cash interest rate. As other interest rates in the economy closely follow the overnight cash rate, this gives the Reserve Bank the ability to influence all of the interest rates in the economy.

KEY TERMS

100 per cent reserve banking 227

bank reserves 227

barter 224

bond 218

coupon payments 218

coupon rate 218

diversification 222

dividend 219

exchange settlement accounts 233

financial deregulation 233

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overnight cash market 235

overnight cash rate 235

quantity equation 231

Reserve Bank of Australia 233

reserve–deposit ratio 227

risk premium 221

stock (or equity) 219

REVIEW QUESTIONS

1. What is *money?* Why do people hold money even though it pays a lower return than other financial assets? LO 9.1 **EASY**
2. Suppose that the public switches from doing most of its shopping with currency to using bank transfers instead. If the Reserve Bank takes no action, what will happen to the national money supply? Explain. LO 9.2 **MEDIUM**
3. The Reserve Bank wants to reduce Australia's money supply. Describe the action it might take, and explain how this action would accomplish the Reserve Bank's objective. LO 9.5 **MEDIUM**
4. Define *velocity*. How has the introduction of payment technologies such as ATM machines affected velocity? Explain. LO 9.4 **EASY**
5. Use the quantity equation to explain why money growth and inflation tend to be closely linked. LO 9.4 **EASY**

PROBLEMS

1. During World War II an Allied soldier named Robert Radford spent several years in a large German prisoner-of-war camp. At times more than 50 000 prisoners were held in the camp, with some freedom to move about within the compound. Radford later wrote an account of his experiences. He described how an economy developed in the camp, in which prisoners traded food, clothing and other items. Services, such as barbering, were also exchanged. Lacking paper money, the prisoners began to use cigarettes (provided monthly by the Red Cross) as money. Prices were quoted, and payments made, using cigarettes. LO 9.1 **MEDIUM**

   a) In Radford's POW camp, how did cigarettes fulfil the three functions of money?

   b) Why do you think the prisoners used cigarettes as money, as opposed to other items of value such as squares of chocolate or pairs of boots?

   c) Do you think a non-smoking prisoner would have been willing to accept cigarettes in exchange for a good or service in Radford's camp? Why or why not?

2. Obtain recent data on M1, M3 and their components. (For an online source go to www.rba.gov.au.) By what percentage have the two monetary aggregates grown over the past year? Which components of the two aggregates have grown the most quickly? LO 9.2 **EASY**

3. Redo the example of Gorgonzola in the text (see Tables 9.3 to 9.7), assuming that: LO 9.3 **MEDIUM**

   a) initially the Gorgonzolan central bank puts 2 000 000 guilders into circulation

   b) commercial banks desire to hold reserves of 20 per cent of deposits.

   As in the text, assume that the public holds no currency. Show the consolidated balance sheets of Gorgonzolan commercial banks after the initial deposits (compare with Table 9.3), one round of loans (compare with Table 9.4), the first redeposit of guilders (compare with Table 9.5) and two rounds of loans and redeposits (Table 9.6). What are the final values of bank reserves, loans, deposits and the money supply?

4. a) A country's bank reserves are \$150, the public holds \$200 in currency and the desired reserve–deposit ratio is 0.25. Find its deposits and the money supply.

   b) A country's money supply is \$700 and currency held by the public equals bank reserves. The desired reserve–deposit ratio is 0.25. Find currency held by the public and bank reserves.

   c) A country's money supply is \$1250, of which \$250 is currency held by the public. Bank reserves are \$110. Find the desired reserve–deposit ratio. LO 9.4 **EASY**

5. When a central bank increases bank reserves by \$1, the money supply rises by more than \$1. The amount of extra money created when the central bank increases bank reserves by \$1 is called the

money multiplier. LO 9.5 **HARD**

a) Explain why the money multiplier is generally greater than 1. In what special case would it equal 1?

b) The initial money supply is $1000, of which $500 is currency held by the public. The desired reserve–deposit ratio is 0.2. Find the increase in money supply associated with increases in bank reserves of $20. What is the money multiplier in this economy?

c) Find a general rule for calculating the money multiplier.

d) Suppose the Reserve Bank wanted to reduce the money multiplier, perhaps because it believes that change would give it more precise control over the money supply. What action could the Reserve Bank take to achieve its goal?

6. Real GDP is $15 trillion, nominal GDP is $24 trillion, M1 is $5.5 trillion and M3 is $8.5 trillion. LO 9.4 **EASY**

a) Find velocity for M1 and for M3.

b) Show that the quantity equation holds for both M1 and M3.

7. You are given the following data for 2012 and 2013: LO 9.4 **MEDIUM**

	2012	2013
Money supply	1000	1100
Velocity	8.0	8.0
Real GDP	12 000	12 000

a) Find the price level for 2012 and 2013. What is the rate of inflation between the two years?

b) What is the rate of inflation between 2012 and 2013?

c) What is the rate of inflation between 2012 and 2013 if the money supply in 2013 is 1100 and output in 2013 is 12 600?

REFERENCES

McCandless GT and Weber WE 1995, ‘Some monetary facts’, *Federal Reserve Bank of Minneapolis Quarterly Review*, vol. 19, no. 3, pp. 2–11.

Otto G 2007, ‘Central bank operating procedures: How the RBA achieves its target for the cash rate’, *Australian Economic Review*, vol. 40, no. 2, June, pp. 216–24.

Reserve Bank of Australia n.d., ‘Statistics’, https://www.rba.gov.au/statistics/.

Reserve Bank of Australia 2018, ‘Financial aggregates, August’, https://www.rba.gov.au/statistics/frequency/fin-agg/2018/.

CHAPTER 10

The Reserve Bank and the economy

After reading this chapter, you should be able to answer the following questions.

10.1 How does the Reserve Bank target the overnight cash interest rate?

10.2 What are the effects of the Reserve Bank changing the target for the overnight cash interest rate?

10.3 How does a change in the target rate for the overnight cash interest rate affect base money?

10.4 Under what circumstances can the Reserve Bank affect the real interest rate?

10.5 How does the Reserve Bank's monetary policy affect the equilibrium level of GDP in the short run?

10.6 What is meant by a monetary policy reaction function?

SETTING THE SCENE

At the height of the Great Depression, as economists and policymakers all over the world were searching for something (perhaps anything) that would kickstart their economies, a famous interchange took place in the United States between the Chairman of the Federal Reserve,

Marriner Eccles, and members of a Congressional hearing considering the Banking Act of 1935. This was an important piece of legislation aiming to restructure the Federal Reserve, establishing the Federal Open Market Committee that would oversee monetary policy decisions. It is the structure that still operates monetary policy in the United States.

Members of Congress were very interested in the thoughts of Governor Eccles regarding the role of monetary policy in fighting the Depression. They may not have been reassured.

Mr. BROWN. I think it would be interesting to Members of Congress, and particularly to this committee, to know what your policy would be under present conditions. I assume it is the same policy we have at the present time.

Governor ECCLES. I cannot speak for the Federal Reserve Board as to what the policy of the Board would be if this legislation is enacted. That would naturally be a matter that the Board would have to determine.

Mr. BROWN. Do you not think it is fair for us to ask what you would do if given this power under present conditions! It seems to me that we ought to know, that Congress ought to know your *attitude as chairman of the Board.*

Governor ECCLES. I can speak only for myself with reference to the matter. I cannot speak for other members of the Board, who would be just as independent in exercising their judgment as I would try to be.

Mr. BROWN. When I say "your" I am referring directly to you.

Governor ECCLES. Yes; I understand. Under present circumstances there is very little, if anything, that can be done.

Mr. GOLDSBOROUGH. You mean you cannot push a string.

Governor ECCLES. That is a good way to put it, one cannot push a string. We are in the depths of a depression and, as I have said several times before this committee, beyond creating an easy money situation through reduction of discount rates and through the creation of excess reserves, there is very little, if anything that the reserve organization can do toward bringing about recovery. I believe that in a condition of great business activity that is developing to a point of credit inflation monetary action can very effectively curb undue expansion.

Mr. BROWN. That is a case of pulling the string.

The *pushing on a string* metaphor has become famous for describing what is an oftentimes keenly debated point about monetary policy: to what extent can a central bank influence economic outcomes? Pushing on a string refers to doubts about whether a central bank can improve economic conditions during a contraction, doubts that appeared to have been held by Governor Eccles. Pulling on a string, however, implies greater confidence in monetary policy's ability to rein in an expansion.

During the Global Financial Crisis, the question of whether the aggressive cuts to interest rates pursued by central banks, including Australia's own Reserve Bank, would be ineffective in boosting planned aggregate expenditure (trying to *push on a string*) was front and centre in policymakers' minds as they struggled to contain the fallout from the bursting of the housing price bubble in the United States. It was for this reason that monetary policy was not relied on solely as a response to the crisis. As we've seen, aggressive fiscal policies were also introduced to boost planned aggregate expenditure.

The difficulties inherent in 'pushing on a string' remind us that the best setting for the instruments of macroeconomic policy is not always as straightforward as might first appear from the models we examine in this text. This is a theme we return to at the end of this chapter when we examine the question of whether monetary policy is an art or a science.

10.1 THE RESERVE BANK, INTEREST RATES AND MONETARY POLICY

LO 10.1, 10.2

In Chapter 9 we described how the Reserve Bank targets the interest rate in the overnight cash market in order to conduct monetary policy. In Section 9.6.1 we described briefly how changes in the cash rate can be expected to impact on other interest rates in the economy, specifically, longer-term rates of interest that would influence planned aggregate spending.

We can now show this process more formally, using an example. Suppose we consider the market for a particular type of bond, 90-day commercial bills. This is a bond supplied by firms seeking funds for three months. As with all markets, we are interested in supply and demand decisions, in this instance the supply and demand of 90-day bills. When the *price of these bills is high*, which we now know from Chapter 9 corresponds to a low interest rate, firms are likely to issue an *increased quantity* of bills, since the cost of *borrowing* when the interest rate is low is also relatively low. (When we say ‘an increased quantity of bonds’, be aware that what we actually mean is that firms would like to borrow more money than was previously the case.) We therefore expect to see a positively sloped supply of 90-day bills schedule. The demand curve for 90-day bills summarises the decisions made by those willing to *lend* money for 90 days. When the price of 90-day bills is high, and hence the rate of interest is low, fewer funds will be lent (fewer 90-day bills will be purchased) than when the price is low and the interest rate is high. The demand curve, therefore, has a negative slope.

Figure 10.1 shows the market for 90-day bills. Suppose that these bills are currently priced at P_0, a level below the equilibrium price, P_e. Given the inverse relation between the price of a bond and its interest rate, we can equivalently describe what is happening here as a situation in which the interest rate on 90-day bills is in *excess* of its equilibrium. Figure 10.1 shows that at the price P_0 there is an excess demand in the bill market—the amount that people wish to lend to firms on these terms exceeds the amount that firms wish to borrow. As a result, the price at which these bills are traded will be bid upwards (corresponding to a fall in the interest rate) until the equilibrium price and quantity, P_e and Q_e, are reached.

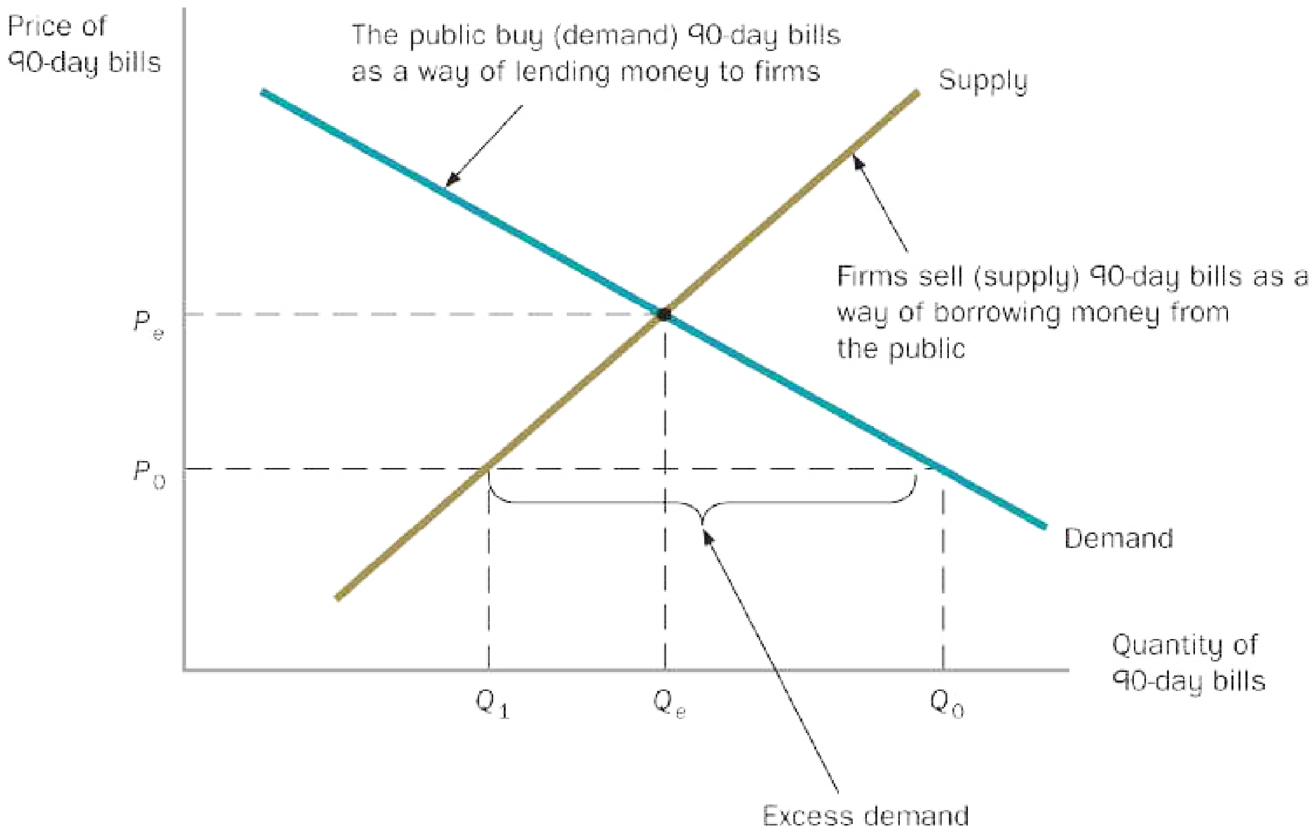

Figure 10.1 **The market for 90-day bills**

Note: The supply curve for bills shows how firms' willingness to borrow funds (for 90 days) from the public changes as the price of 90-day bills changes. When the price is high (and the interest rate is low), borrowing is relatively inexpensive for firms and hence the amount of borrowing (or the supply of bills) will increase. The demand curve for bills shows how the public's willingness to lend to firms for 90 days changes as the price of 90-day bills changes. When the price is low (and the interest rate is high), lending is relatively attractive for the public and hence the amount of lending (or the demand for bills) will increase. Should the price of 90-day bills be below the equilibrium price, there will be an excess demand for these bills.

BACKGROUND BRIEFING 10.1

Statement by the Governor, Mr Glenn Stevens

> ‘At its meeting today, the Board decided to lower the cash rate by 25 basis points to 2.5 per cent, effective 7 August 2013’ (Stevens 2013).

Eleven times a year, the Reserve Bank board meets to consider the setting of monetary policy. The board receives a detailed briefing on the current and future state of the economy, which is prepared by economists employed by the Reserve Bank. Based on this information, the board decides whether to target a new overnight cash rate or to leave interest rates as they are.

What factors determine the board’s decision? Until comparatively recently, the Reserve Bank board did not publish the minutes of its meetings, so we never really knew all of the factors that went into the making of monetary policy in Australia. However, in recent years the flow of information from the Reserve Bank has improved significantly. The above quote, for example, comes from a Reserve Bank media release. These are issued monthly and can be found on the Reserve Bank’s website. The purpose of these releases is to inform the public of the broad thinking behind current monetary policy. The release from which the above quote is taken, issued on 6 August 2013, documents a range of reasons that led the board to decrease the target cash rate.

These included relatively weak global economic growth and a slowing in the pace of domestic economic activity. Detailed minutes summarising the reasons behind specific monetary policy decisions are now also released, usually two weeks after the relevant meeting of the board. Economists pore over these minutes seeking to find insight into the factors that influence the board's thinking. You can find these minutes on the Reserve Bank's website at www.rba.gov.au/monetary-policy/rba-board-minutes.

Reference

Stevens G 2013, 'Statement by Glenn Stevens, Governor: Monetary policy decision', Media release, www.rba.gov.au/media-releases/2013/mr-13-15.html.

We can now see the implications of the Reserve Bank targeting the cash rate for the bill market. Suppose that the Reserve Bank takes steps to increase the overnight cash interest rate (see Chapter 9, Section 9.6.1). Further, suppose that prior to the Reserve Bank's move, the 90-day bill market is in equilibrium. This is shown by point *A* in Figure 10.2.

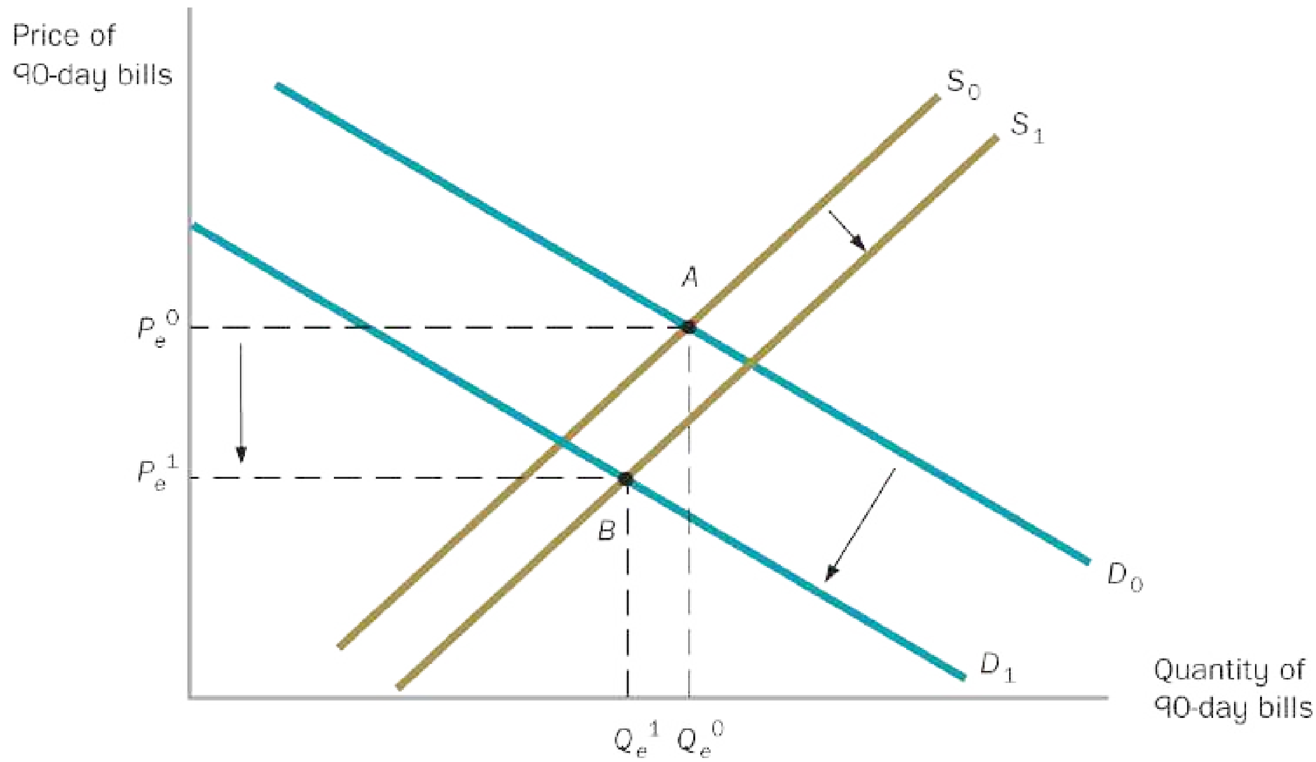

Figure 10.2 **The effect of an increase in the cash rate on the 90-day bill market**

Note: An increase in the cash rate causes the price of 90-day bills to fall and, consequently, the interest rate on 90-day bills to increase.

An increase in the overnight cash rate will affect both the demand and supply of 90-day bills. The higher interest rate in the overnight cash market will cause some firms, who previously dealt in that market to borrow short-term funds, to revise their financing plans and move to longer-maturity loans such as the 90-day bill market. Consequently, the supply of 90-day bills will shift to the right, as shown in Figure 10.2. Some lenders, on the other hand, will leave the 90-day bill market to seek the higher returns available in the overnight cash market. This will cause the demand for 90-day bills to shift to the left, as shown in Figure 10.2. The end result is an equilibrium at point

B where the price of 90-day bills is now lower, P_e^1, and hence where the interest rate on 90-day bills is now higher.

The Reserve Bank's move to increase the cash rate has spilled over and caused the 90-day bill rate also to increase, even though the 90-day bill rate is not directly targeted by the Reserve Bank. These spillover effects will continue in other markets. For example, once the 90-day bill rate increases, we would expect that the 180-day bill rate would follow suit and so on until all interest rates in the economy have increased in line with the increase in the cash rate.

▹▹ RECAP

The Reserve Bank sets a target for the overnight cash interest rate. The Reserve Bank's aim is to affect the entire range of interest rates in the economy since it wishes to affect the level of planned *aggregate* spending. Very little borrowing to finance expenditure occurs in the overnight cash market. The Reserve Bank can achieve its goal of affecting all interest rates since changes to the overnight cash interest rate have implications for the demand and supply of all financial assets. These changes mean that interest rates everywhere in the economy eventually change to match any changes to the overnight cash rate.

BACKGROUND BRIEFING 10.2

Alternative monetary policy arrangements—The case of Singapore

The Reserve Bank of Australia is one of several central banks around the world that target a short-term interest rate. However, not all central banks operate in this way.

A good example of an alternative way of operating monetary policy is the approach taken by the Monetary Authority of Singapore (MAS). Instead of targeting an interest rate, the MAS targets Singapore's exchange rate (see www.mas.gov.sg/Monetary-Policy-and-Economics/Monetary-Policy.aspx). For an economy as open as Singapore's, the exchange rate can have as big an impact on the components of planned expenditure as does the interest rate elsewhere. For example, a weak currency would make Singapore's exports relatively less expensive while, at the same time, imports into Singapore would be costlier. The result would be an increase in net exports which, all else being equal, would have an expansionary effect on the economy.

Singapore targets its exchange rate against a basket of currencies belonging to its main trading partners. On a day-to-day basis, the MAS intervenes in foreign exchange markets to keep Singapore’s exchange rate within undisclosed upper and lower exchange rate bands. If the exchange rate appears to be too weak relative to the target band, the MAS buys domestic currency, thus driving up its price (the exchange rate). The opposite occurs if the exchange rate is perceived as being too strong. In this case the MAS sells Singapore currency in order to drive its price down. These interventions in currency markets allow the MAS to control closely the final value of the exchange rate. We will look more closely at how a central bank can manage the exchange rate in Chapter 17.

One consequence of this policy is that the MAS is unable to exert an independent influence on interest rates in Singapore. Central banks that target the exchange rate must ensure that the interest rate does not move out of line with the interest rate in other countries. The MAS might not, for example, be able to increase its interest rate unless the United States did likewise. The reason is that the relatively high interest rate in Singapore, assuming that US rates have remained the same, would lead financial investors to invest their funds in Singaporean financial assets to obtain the relatively higher rate of return on offer. To do this, financial investors would need Singapore currency, driving up its demand and hence its price, making maintenance of the exchange rate target impossible. Likewise, if the United States were to lower its interest rate, Singapore would have to do the same, otherwise exactly the same scenario would play out—relatively high interest rates in Singapore would drive up the value of the Singapore dollar. Similar considerations apply should Singapore wish to lower its interest rate or if it failed to match an interest increase elsewhere. Now, the demand for Singapore's currency would be relatively low as financial investors would seek higher returns elsewhere. This would reduce demand for the Singapore dollar and lead to a weakening of the currency. Targeting the exchange rate, in other words, is not just an alternative to targeting the interest rate, it actually precludes targeting the interest rate.

10.1.1 THE IMPLICATIONS OF A CHANGE IN MONETARY POLICY FOR THE MONEY SUPPLY

LO 10.3, 10.4

As is now clear, the Reserve Bank conducts its monetary policy by targeting an interest rate—by setting a target **overnight cash interest rate** and then allowing other interest rates to adjust. In this section we look at what this implies for the money supply. We pose the following question: does a change in monetary policy require there to be a change in the money supply? The answer, perhaps surprisingly, is no.

A change in monetary policy can be achieved by the Reserve Bank through an announcement of a new target cash rate. This is because the Reserve Bank will always: (1) pay an interest rate on funds deposited by banks in their exchange settlement accounts that is a fixed margin below the target cash rate; and (2) offer to lend exchange settlement funds to the banks at a rate that is a fixed margin above the target cash rate. In practice, deposits in exchange settlement accounts earn a rate that is 25 basis points below the target and loans of exchange settlement funds by the Reserve Bank are made at a rate that is 25 basis points above the target. For example, a target cash rate of 5 per cent implies funds deposited in exchange settlement accounts earn a 4.75 per cent interest rate and the Reserve Bank will lend additional funds at an interest rate of 5.25 per cent.

To see how an announcement of a new target cash rate is all that is needed to move the actual cash rate, first let us define a concept known as **base money**. This is equal to the amount of currency in circulation plus the deposits that banks have with the Reserve Bank in exchange settlement accounts. Prior to the introduction of interest rate targeting by the Reserve Bank, monetary policy changes were brought about through open market sales and purchases of financial assets to affect the quantity of base money in circulation (and, as explained in Chapter 9, this still happens on a daily basis to ensure that the overnight cash interest rate stays at its target). However, changes in base money are no longer needed to implement a *change* in monetary policy, that is, to bring about a change in the overnight cash rate to reach a new target.

To see this, let us suppose that the Reserve Bank announces an increase in the target cash rate from 5 per cent to 5.5 per cent. This corresponds to an announcement that the rate paid by the Reserve Bank on funds deposited in exchange settlement accounts will increase from 4.75 per cent to 5.25 per cent. In response, banks will wish to hold more funds in their exchange settlement accounts (assuming, of course, all other factors relevant to this decision are unchanged). This implies an increase in the demand for base money (remember, base money includes exchange settlement deposits). The banks attempt to increase their exchange settlement deposits by offering fewer loans in the overnight cash market. As a consequence, the amount of funds available in the overnight cash market declines. Borrowers in the overnight cash market respond to this withdrawal of funds by increasing the cash interest rate they are willing to pay to secure loans. Figures 10.3 and 10.4 show how this process works in practice.

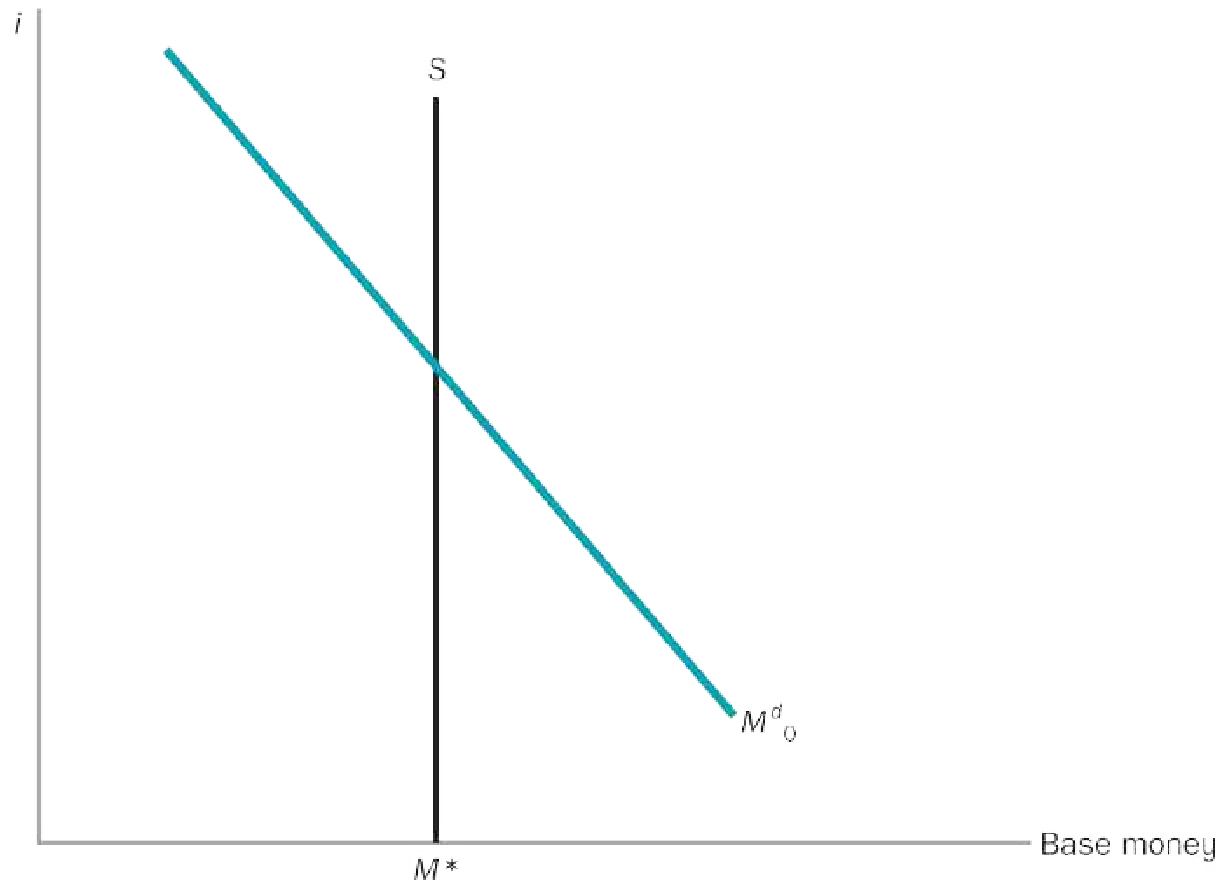

Figure 10.3 **The demand and supply of base money**

Note: The demand for base money is inversely related to the cash interest rate. The supply of base money is controllable by the Reserve Bank and is therefore perfectly inelastic with respect to the cash rate.

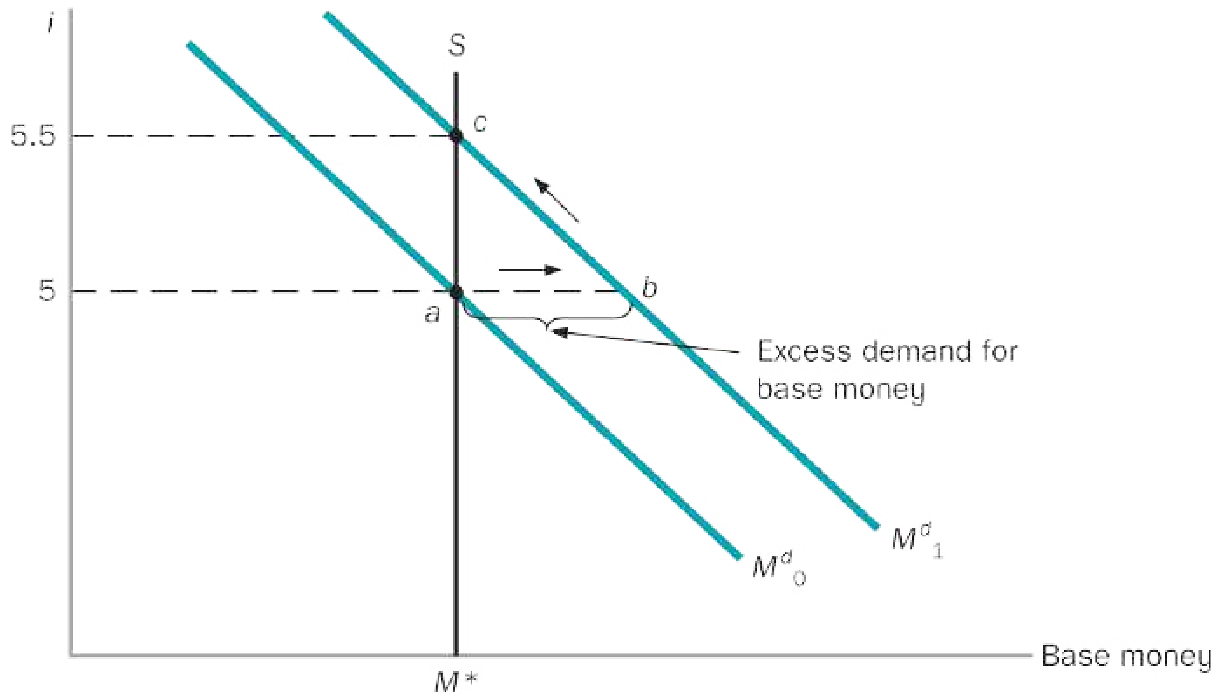

Figure 10.4 **A change in the target cash interest rate**

Note: A Reserve Bank announcement of a change in the target rate for the overnight cash interest rate will change the demand for base money since the interest paid on exchange settlement accounts is tied to the target rate. As the supply of base money is not altered by a change in the target rate, the actual cash rate moves in the same direction as the target rate.

In Figure 10.3 the stock of base money in circulation in the economy is measured on the horizontal axis. The interest rate in the overnight cash market is shown on the vertical axis.

The demand for base money has a negative slope. To see why, think of how banks would respond to a relatively high cash rate. It is most likely that banks will be more inclined to lend money in the overnight cash market than leave those funds as deposits in their exchange settlement accounts. Hence, a high cash rate is associated with a low demand for base money. However, a low cash rate makes banks less inclined to lend money on the overnight cash market. Banks would prefer to keep those funds in their exchange settlement accounts; therefore, the demand for base money is high.

The supply of base money is drawn as a vertical line. This is because the Reserve Bank has ultimate control over the quantity of base money in circulation. Clearly, the Reserve Bank controls how many notes and coins are in circulation. Through its open-market operations and its willingness to lend exchange settlements funds to the banks, the Reserve Bank can always affect the amount of funds in exchange settlement accounts. Since both the amount of notes and coins in circulation and the Reserve Bank's open-market operations and preparedness to lend need not respond to the cash interest rate in any systematic fashion (remember, the cash interest rate relates to a specific form of borrowing and lending that occurs among banks themselves), the supply of base money can be drawn as perfectly inelastic with respect to the cash rate.

In Figure 10.4 we show what happens when the Reserve Bank announces a higher target cash interest rate, in this case up from 5 per cent to 5.5 per cent. The effect will be to shift the demand for base money to the right. This is because the announcement of the higher target cash rate signals that the Reserve Bank will now pay a higher interest rate on exchange settlement balances (up from 4.75% to 5.25%). This is shown in Figure 10.4 as a shift in the demand curve from $M^d{}_0$ to $M^d{}_1$, reflecting banks' wish to transfer funds into their exchange settlement accounts.

In the short run, the effect is to create excess demand for exchange settlement funds; until the cash rate has had a chance to adjust the relevant point on the new demand curve is point *b*. If the Reserve Bank wished to keep the cash rate unchanged, it would use its open-market operations or lending facility to shift the supply curve to the right so that banks have available the extra exchange settlement funds demanded. However, this is not the situation we are dealing with here. In this case, the Reserve Bank wishes to see a higher cash rate. Therefore, it will not take steps to change base money. Instead it will allow market forces in the overnight cash market to push the cash interest rate upwards. As this occurs, the incentives banks have to withdraw funds from the cash market in favour of their exchange settlement accounts diminishes, the demand for exchange settlement funds fall and there is a movement along the new demand curve, $M^d{}_1$, from point *b* to point *c*. In this way the new target cash rate is established in the overnight cash market; this has been achieved without a change in base money. For more details see Otto (2007) and Coombes and Reimers (2009).

10.2 CAN THE RESERVE BANK CONTROL REAL INTEREST RATES?

LO 10.5

Through its targeting of the overnight cash interest rate, the Reserve Bank can control *nominal* interest rates in the economy. But many important economic decisions, such as the decisions to save and invest, depend on real interest rates. To affect those decisions the Reserve Bank must exert some control over *real* interest rates.

Most economists believe that the Reserve Bank can control real interest rates, at least for some period. To see why, recall the definition of the real interest rate (for simplicity, we will speak as if there is only one interest rate in the economy—as we know, there are hundreds if not thousands of interest rates, but as they generally move together, it does little harm to act as if there is only a single rate of interest):

$$r = i - \pi$$

The real interest rate, r, equals the nominal interest rate, i, minus the rate of inflation, π. As we have seen, the Reserve Bank can control the nominal interest rate quite precisely through its targeting of the overnight cash rate. Furthermore, inflation appears to change relatively slowly in response to changes in policy or economic conditions, for reasons we will discuss in the next chapter. Because inflation tends to adjust slowly, actions by the Reserve Bank to change the nominal interest rate generally lead the real interest rate to change by about the same amount, at least in the short run. In the long run, the real interest rate will be determined by the balance between saving and investment, as outlined in Chapter 4. In this longer time frame, the inflation rate and other economic variables would have adjusted so that the balance between saving and investment will determine the real interest rate. An additional complication concerns global financial markets; for many countries the ability to influence interest rates is limited by the existence of interest rates in other countries that could be accessed by domestic borrowers and lenders. We will discuss this in much more detail in Chapter 18.

In discussing the Reserve Bank's control over interest rates we should also return to a point mentioned above: in reality, not just one but many thousands of interest rates are seen in the economy. Because interest rates tend to move together (allowing us to speak of *the* interest rate), an action by the Reserve Bank to change the overnight cash interest rate generally causes other interest rates to change in the same direction. However, the tendency of other interest rates (such as the long-term government bond rate or the rate on bonds issued by corporations) to move in the same direction as the cash rate is only a tendency, not an exact relationship. In practice, then, the Reserve Bank's control of other interest rates may be somewhat less precise than its control of the cash rate—a fact that complicates the Reserve Bank's policymaking.

▹▹ RECAP

The Reserve Bank controls the nominal interest rate through its targeting of the overnight cash interest rate. Because inflation is slow to adjust, in the short run the Reserve Bank can control the real interest rate (equal to the nominal interest rate minus the inflation rate), as well as the nominal interest rate. In the long run, however, the real interest rate is determined by the balance of saving and investment.

10.3 THE EFFECTS OF THE RESERVE BANK'S ACTIONS ON THE ECONOMY

Now that we have seen how the Reserve Bank can influence interest rates (both nominal and real), we can consider how monetary policy can be used to help eliminate output gaps and stabilise the economy. The basic idea is relatively straightforward. The level of real interest rates prevailing in the economy affects planned aggregate expenditure. Specifically, a lower real interest rate encourages higher planned spending by households and firms, while a higher real interest rate reduces spending. By adjusting the real interest rate the Reserve Bank can move planned spending in the desired direction. Under the assumption of the basic Keynesian model, namely, that firms produce just enough goods and services to meet the demand for their output, the Reserve Bank's stabilisation of planned spending leads to stabilisation of aggregate output and employment as well. In this section we will first explain how planned aggregate expenditure is related to the real interest rate. Then we will show how the Reserve Bank can use changes in the real interest rate to fight a recession or inflation.

10.3.1 PLANNED AGGREGATE EXPENDITURE AND THE REAL INTEREST RATE

In Chapter 7 we saw how planned spending is affected by changes in output Y. Changes in output affect the private sector's disposable income

($Y - T$), which in turn influences consumption spending—a relationship captured by the consumption function.

A second variable that has potentially important effects on aggregate expenditure is the real interest rate, r. The real interest rate influences the behaviour of both households and firms.

For households, the effect of a higher real interest rate is to increase the reward for saving, which leads households to save more. (Because a higher real interest rate also reduces the amount households must put aside to reach a given savings target, the net effect of a higher real interest rate on saving is theoretically ambiguous. However, empirical evidence suggests that higher real interest rates have a modest positive effect on saving.) At a given level of income, households can save more only if they consume less. Thus, saying that a higher real interest rate *increases* saving is the same as saying that a higher real interest rate *reduces* consumption spending at each level of income. In terms of the analysis we used in Chapter 7, an increase in the real interest rate will lower exogenous consumption, shifting the consumption function downwards. The idea that higher real interest rates reduce household spending makes intuitive sense. Think, for example, about people's willingness to buy consumer durables, such as cars or furniture. Purchases of consumer durables, which are part of consumption spending, are often financed by borrowing from a bank or credit union. When the real interest rate rises, the monthly finance charges associated with the purchase of a car or a piano are higher, and people become less willing or able to make the purchase. Thus, a higher real interest rate reduces people's willingness to spend on consumer goods, holding constant disposable income and other factors that affect consumption.

Besides reducing consumption spending, a higher real interest rate also discourages firms from making capital investments (in the 45-degree diagram, this would show up as a downward shift of the planned investment schedule). As in the case of a consumer thinking of buying a car or a piano, when a rise in the real interest rate increases financing costs, firms may reconsider their plans to invest. For example, upgrading a computer system may be profitable for a manufacturing firm when the cost of the system can be financed by borrowing at a real interest rate of 3 per cent. However, if the real interest rate rises to 6 per cent, doubling the cost of funds to the firm, the same upgrade may not be profitable and the firm may choose not to invest. We should also remember that residential investment—the building of houses and apartment buildings—is also part of investment spending. Higher interest rates, in the form of higher mortgage rates, certainly discourage this kind of investment spending as well.

The conclusion is that, at any given level of output, *both consumption spending and planned investment spending decline when the real interest rate increases*. Conversely, a fall in the real interest rate tends to stimulate consumption and investment spending by reducing financing costs. Example 10.1 is a numerical illustration of how planned aggregate expenditure can be related to the real interest rate and output.

EXAMPLE 10.1 – PLANNED AGGREGATE

EXPENDITURE AND THE REAL INTEREST RATE

In a certain economy, the components of planned spending are given as:

$$\begin{aligned} C &= 640 + 0.8\,(Y - T) - 400r \\ I^p &= 250 - 600r \\ G &= 300 \\ X &= 20 \\ M &= 0 \\ T &= \overline{T} = 250 \end{aligned}$$

Find the relationship of planned aggregate expenditure to the real interest rate, *r*, and output, *Y*, in this economy. Find exogenous expenditure and induced expenditure.

In this example the real interest rate, *r*, can affect both consumption of goods and services and planned investment. For example, the final term in the equation describing consumption, −400*r*, implies that a 1 per cent (0.01) increase in the real interest rate, from 4 per cent to 5 per cent, reduces consumption spending by 400(0.01) = 4 units. Similarly, the final term in the equation for planned investment tells us that in this example, a 1 per cent increase in the real interest rate lowers planned investment by 600(0.01) = 6 units. Thus, the overall effect of a 1 per cent increase in the real interest rate is to lower planned aggregate expenditure by 10 units, the sum of the effects on consumption and investment. Disposable income ($Y - T$) is assumed to affect consumption spending through a marginal propensity to consume of 0.8 (see the first equation) and government purchases, G, exports, X, and taxes, T, are assumed to be exogenous (for simplicity, we assume there is no induced component to taxation, nor imports).

To find a numerical equation that describes the relationship of planned aggregate expenditure (PAE) to output we begin with the general definition of planned aggregate expenditure:

$$PAE = C + I^P + G + NX$$

Substituting for the four components of expenditure, using the equations describing each type of spending above, we get:

$$PAE = [640 + 0.8(Y - 250) - 400r] + [250 - 600r] + 300 + 20$$

The first term in brackets on the right-hand side of this equation is the expression for consumption, using the fact that taxes T = 250; the second bracketed term is planned investment; and the last two terms correspond to the exogenously given numerical values of government purchases and exports. If we simplify this equation and group together the terms that do not depend on output, *Y*, and the terms that do depend on output, we get:

$$PAE = [(640 - 0.8 \times 250 - 400r) + (250 - 600r) + 300 + 20] + 0.8Y$$

or, simplifying further:

$$PAE = [1010 - 1000r] + 0.8Y$$

Equation 10.1

In Equation 10.1, the term in brackets is *exogenous expenditure*, the portion of planned aggregate expenditure that does not depend on output. *Notice that in this example exogenous expenditure depends on the real interest rate*, *r*. Induced expenditure, the portion of planned aggregate expenditure that does depend on output, equals 0.8*Y* in this example.

EXAMPLE 10.2 – THE REAL INTEREST RATE AND SHORT-RUN EQUILIBRIUM OUTPUT

In the economy described in Example 10.1 the real interest rate, *r*, is set by the Reserve Bank to equal 0.05

(5%). Find the short-run equilibrium output.

We found in Example 10.1 that, in this economy, planned aggregate expenditure is given by Equation 10.1. We are given that the Reserve Bank sets the real interest rate at 5 per cent. Setting r = 0.05 in Equation 10.1 gives:

$$PAE = \left[1010 - 1000 \times \left(0.05\right)\right] + 0.8Y$$

Simplifying, we get:

$$PAE = 960 + 0.8Y$$

So, when the real interest rate is 5 per cent exogenous expenditure is 960 and induced expenditure is 0.8Y.

Short-run equilibrium output is the level of output that equals planned aggregate spending. To find short-run equilibrium output use the equilibrium condition that $PAE = Y$ (see Equation 7.6). Therefore, in this example, we have:

$$Y = 960 + 0.8Y$$

in equilibrium.

Subtracting 0.8Y from both sides implies that:

$$0.2Y = 960$$

and hence that equilibrium Y = 960/0.2 = 4800.

Short-run equilibrium output can also be found graphically, using the Keynesian cross diagram (45-degree diagram,) from Chapter 7.

CONCEPT CHECK 10.1

Draw a Keynesian cross diagram to illustrate the equilibrium in Example 10.2.

CONCEPT CHECK 10.2

For the economy described in Example 10.2, suppose the Reserve Bank sets the real interest rate at 3 per cent rather than at 5 per cent. Find short-run equilibrium output using the algebraic method shown in Example 10.2. Illustrate on a 45-degree diagram the adjustments that take place in the economy as it moves from an equilibrium with a real interest rate of 5 per cent to an equilibrium with a real interest rate of 3 per cent.

BACKGROUND BRIEFING 10.3

The zero lower bound and the need for ‘unconventional’ monetary policy

Until December 2008, the US central bank, the Federal Reserve, conducted monetary policy through open-market operations aimed at increasing and decreasing short-term interest rates in line with the Federal Reserve’s target rate. Other interest rates in the economy, which are typically higher than the federal funds rate due to a combination of higher risk and longer maturity, were expected to move up and down more or less together with the federal funds rate. But in December 2008 the Federal Reserve reduced its target for the federal funds rate to the range 0 to 1/4 per cent, effectively hitting what is called the zero lower bound—a level, close to zero, below which the Federal Reserve cannot further reduce short-term interest rates. Attempting to stimulate the economy by reducing the federal funds rate further was no longer a viable option, because interest rates cannot in general be much below zero (a negative nominal interest rate would mean that lending institutions pay borrowing institutions to hold their money—something lending institutions would not normally do).

The federal funds rate remained effectively zero in the years following December 2008. But other interest rates in the economy remained significantly above zero during that period. For example, the nominal interest rate on 10-year debt issued by the US Government was in the range 1.5 to 4 per cent between 2009 and 2015. After December 2008, the Federal Reserve could no longer effectively reduce the different interest rates in the economy that were still above zero by reducing the federal funds rate (which was already at its zero lower bound) and ‘pulling’ other rates down with it. To keep stimulating the economy by making money cheaper, the Federal Reserve had to turn to less conventional methods: targeting such higher interest rates more directly. We now discuss some of the methods used by the Federal Reserve.

Quantitative easing

You are already familiar with one way for making money more cheaply available: open market operations. Following the Global Financial Crisis, the Federal Reserve engaged in a specific type of such operations, referred to as large-scale asset purchase programs These programs, aimed to help in bringing down longer-term interest rates once the federal funds rate was already at (or close to) its zero lower bound, are examples of what is known as **quantitative easing**. Quantitative easing (QE) refers to a central bank buying specified amounts of financial assets from commercial banks and other private financial institutions, thereby lowering the yield or return of those assets while increasing the money supply. Quantitative easing basically includes the same steps as regular open-market purchases, but is distinguished from these regular purchases in the type and term of the financial assets purchased as well as in the overall goal of the policy. While conventional expansionary policy usually involves the purchase of short-term government bonds in order to keep interest rates at a specified target value, quantitative easing is used by central banks to stimulate the economy by purchasing assets of longer maturity, thereby lowering longer-term interest rates.

Since the peak of the Global Financial Crisis in 2008, the Federal Reserve has expanded its balance sheet dramatically, adding trillions of dollars' worth of longer-term treasury notes, commercial debt and mortgage-backed securities through several rounds of quantitative easing. By including commercial and private debt in these purchases, it has also been suggested that the Federal Reserve is providing credit easing by removing specific gridlocks that have been identified in certain credit markets.

In short, by purchasing longer-term assets (including bonds and other debt), the Federal Reserve increased the amount of bank reserves while exerting downward pressure on longer-term interest rates (recall that bond prices and interest rates are inversely related). And by purchasing specific types of assets—such as debt related to mortgages—the Federal Reserve could help decrease interest rates in specific markets such as mortgage and housing markets that were hit particularly hard during the Global Financial Crisis.

Forward guidance

Quantitative easing helps to lower long-term interest rates in the economy through open-market purchases. Another means for lowering long-term rates is known as **forward guidance**, information that a central bank provides to the financial markets regarding its expected future monetary policy path. The idea behind it is simple: by guiding markets regarding the central bank’s future intentions, the central bank can influence long-term interest rates because these rates are affected by what market participants believe the central bank will do in the future. To illustrate this, imagine that financial markets believe that short-term interest rates, currently at around zero, will remain close to zero for several more years. Then the market price of a three-year bond, for example, will be such that the implied interest rate (or yield, or return) on the bond is close to zero. But if financial markets believed that short-term interest rates, while currently at zero, were about to increase dramatically in the next few months and stay elevated for several years, then a three-year bond’s current price would reflect these beliefs, and hence the implied interest rate on the bond would be much higher.

Interest on reserves and monetary policy normalisation

We have seen that starting in 2008 and continuing in the following years, the Federal Reserve took unprecedented steps to support the economy and help it recover from a historically deep global recession. The close-to-zero federal funds rate, the several rounds of quantitative easing (or large-scale asset purchases) and the resulting massive amounts of excess reserves, and other policies such as forward guidance were an unusual combination, designed for unusual times. It was always expected, by both the Federal Reserve and the public, that at some future date monetary policy would ‘normalise’: the federal fund’s rate would rise, the Federal Reserve’s balance sheet and banks’ excess reserves would shrink, and real-world money markets would again resemble more closely the traditional basic money-market model with its simplifying assumptions.

What would monetary policy normalisation look like? In theory, in order to tighten monetary policy, the Federal Reserve could start by reversing its quantitative easing efforts using, again, open-market operations. Specifically, the Federal Reserve could start selling the assets it purchased as part of its quantitative easing programs (or it could even just stop reinvesting in new assets as the assets it purchased matured or prepaid). The payment the Federal Reserve would receive against these assets would drain reserves from the banking system, the price of these assets would fall and interest rates on these assets would rise again. Once enough excess reserves had been thus drained from the system, the federal funds rate—the overnight price of reserves—would start rising again.

However, when the Federal Reserve concluded, in late 2015, that the time to start tightening monetary policy had come, it did not first let long-term interest rates rise by reversing its past quantitative easing purchases. Instead, in the first phase of tightening, the Federal Reserve returned to using its long-time tool: raising the federal funds rate (you can see this in Figure 14.5). Starting to tighten monetary policy by increasing the Federal Reserve's target for the federal funds rate, rather than by increasing longer-term interest rates, has several advantages. One advantage is that the Federal Reserve is familiar with the federal funds rate as a monetary policy tool; it has experience controlling this rate and moving it as needed—at times rather rapidly. Another advantage is that market participants, such as households and investors, are also familiar with the federal funds rate as a monetary tool. For example, households and investors are used to the Federal Reserve focusing on its target for the federal funds rate when communicating with the public.

To raise the federal funds rate without first engaging in a large-scale asset sale, the Federal Reserve's main channel has been to increase the interest rate it pays banks on the reserves they hold with the Federal Reserve. These include banks' required reserves (reserves held with the Federal Reserve in order to meet the required reserve–deposit ratios) and banks' excess reserves (similar to exchange settlement balances in the Australian context). The Federal Reserve paid an interest rate of 1/4 per cent on required and excess reserve balances between 2008 and 2015. Since the Federal Reserve started raising this interest rate in December 2015, the federal funds rate has been rising with it, because banks have little incentive to lend their excess reserves to other banks at rates below the rate they get on these reserves from the Fed.

10.3.2 THE RESERVE BANK FIGHTS A RECESSION

We have seen that the Reserve Bank can control the real interest rate in the short run, and that the real interest rate in turn affects planned spending and short-run equilibrium output. Putting these two results together, we can see how Reserve Bank actions may help to stabilise the economy.

Suppose the economy faces a recessionary gap—a situation in which real output is below potential output and planned spending is 'too low'. To fight a recessionary gap, the Reserve Bank should reduce the real interest rate, stimulating consumption and investment spending. According to the theory we have developed, this increase in planned spending will cause output to rise, restoring the economy to full employment. Example 10.3 illustrates this point by extending Example 10.2.

EXAMPLE 10.3 – THE RESERVE BANK FIGHTS A

RECESSION

For the economy described in Example 10.2, suppose potential output, *Y, equals 5000. As before, the Reserve Bank has set the real interest rate equal to 5 per cent. At that real interest rate, what is the output gap? What should the Reserve Bank do to eliminate the output gap and restore full employment? Assume that the multiplier in this economy is 5.**

In Example 10.2 we showed that with the real interest rate at 5 per cent, short-run equilibrium output for this economy is 4800. Potential output is 5000, so the output gap, $100 \times \left(\frac{Y - Y*}{Y*}\right)$, equals −4 per cent (which corresponds to 200 units). Because actual output is below potential, this economy faces a contractionary or recessionary gap.

To fight the recession the Reserve Bank should lower the real interest rate, raising aggregate expenditure until output reaches 5000, the potential level. That is, the Reserve Bank's objective is to increase output by 200. Because the multiplier equals 5, to increase output by 200, the Reserve Bank must increase exogenous expenditure by 200/5 = 40 units. By how much should the Reserve Bank reduce the real interest rate to increase exogenous expenditure by 40 units? Exogenous expenditure in this economy is [1010 − 1000*r*], as you can see from Equation 10.1, so that each percentage point reduction in r increases exogenous expenditure by $1000 \times (0.01) = 10$ units. To increase exogenous expenditure by 40, the Reserve Bank should lower the real interest rate by four percentage points, from 5 per cent to 1 per cent.

In summary, to eliminate the recessionary gap of 200, the Reserve Bank should lower the real interest rate from 5 per cent to 1 per cent. Notice that the Reserve Bank's decrease in the real interest rate increases short-run equilibrium output, as economic logic suggests.

The Reserve Bank's recession-fighting policy is shown graphically in Figure 10.5. The reduction in the real interest rate raises planned spending at each level of output, shifting the expenditure line upwards. When the real interest rate equals 1 per cent, the expenditure line intersects the 45-degree line at $Y = 5000$, so that output and potential output are equal. A reduction in interest rates by the Reserve Bank, made with the intention of reducing a recessionary gap in this way, is an example of an *expansionary* monetary policy—or, less formally, a *monetary easing*.

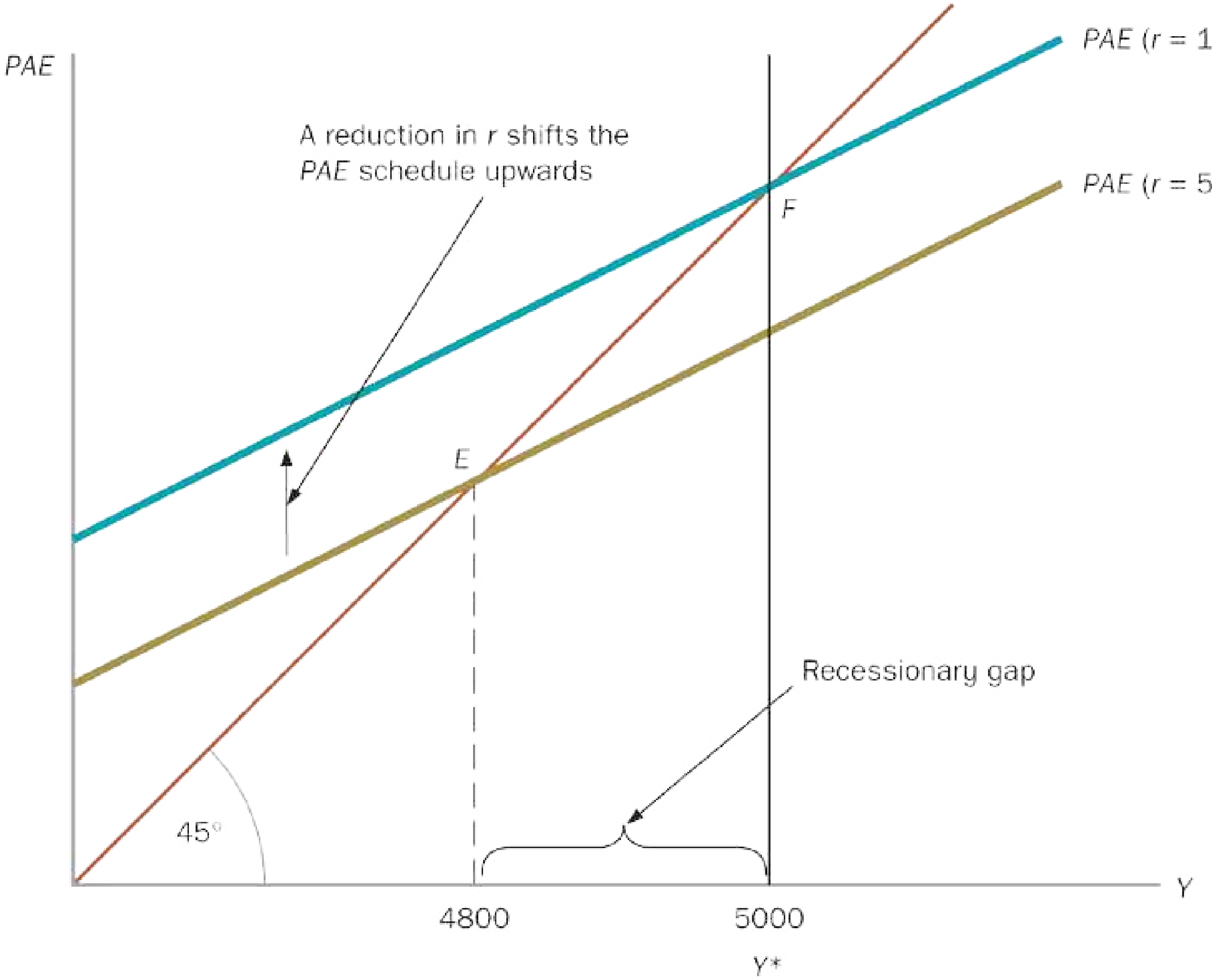

Figure 10.5 **The Reserve Bank fights a recession**

Note: When the real interest rate is 5 per cent, the expenditure line intersects the 45-degree line at point *E*. At that point output is 4800, below the economy's potential output of 5000 (a recessionary gap of 200). If the Reserve Bank reduces the real interest rate to 1 per cent, stimulating consumption and investment spending, the expenditure line will shift upwards. At the new point of intersection, *F*, output will equal potential output at 5000.

CONCEPT CHECK 10.3

Continuing Example 10.3, suppose that potential output is 4850 rather than 5000. By how much should the Reserve Bank cut the real interest rate to restore full employment? You may take as given that the multiplier is 5.

▹▹ RECAP

Should the economy experience a contractionary gap, the Reserve Bank can target a lower overnight cash interest rate, to lower all interest rates, in the expectation that this will increase planned aggregate expenditure and return the economy to equilibrium at its potential level of output.

10.3.3 THE RESERVE BANK FIGHTS INFLATION

LO 10.6

FIND ONLINE

To this point we have focused on the problem of stabilising output, without considering inflation. In the next chapter we will see how ongoing inflation can be incorporated into our analysis. For now, we will simply note that one important cause of inflation is an expansionary output gap—a situation in which planned spending, and hence actual output, exceeds potential output. When an expansionary gap exists, firms find that the demand for their output exceeds their normal rate of production. Although firms may be content to meet this excess demand at previously determined prices for some time, if the high demand persists they will ultimately raise their prices, spurring inflation.

Because an expansionary gap tends to lead to inflation, the Reserve Bank moves to eliminate expansionary gaps as well as recessionary gaps. The procedure for getting rid of an expansionary gap—a situation in which output is 'too high' relative to potential output—is the reverse of that for fighting a recessionary gap, a situation in which output is 'too low'. As we have seen, the cure for a recessionary gap is to reduce the real interest rate, an action that stimulates planned spending and increases output. The cure for an expansionary gap is to *raise* the real interest rate, which reduces consumption and planned investment by raising the cost of borrowing. The resulting fall in planned spending leads in turn to a decline in output and to a reduction in inflationary pressures.

EXAMPLE 10.4 – THE RESERVE BANK FIGHTS INFLATION

For the economy studied in Examples 10.2 and 10.3, assume that potential output is 4600 rather than 5000. At the initial real interest rate of 5 per cent, short-run equilibrium output is 4800, so this economy has an expansionary gap of 4.3 per cent, or 200 units. How should the Reserve Bank change the real interest rate to eliminate this gap?

In Example 10.3 we were told that the multiplier in this economy is 5. Hence to reduce total output by 200 the Reserve Bank needs to reduce exogenous expenditure by 200/5 = 40 units. From Equation 10.1 we know that exogenous expenditure in this economy is [1010 − 1000*r*], so that each percentage point (0.01) increase in the real interest rate lowers exogenous expenditure by 10 units (1000 × 0.01). We conclude that to eliminate the inflationary gap the Reserve Bank should raise the real interest rate by four percentage points (0.04), from 5 per cent to 9 per cent. The higher real interest rate will reduce planned aggregate expenditure and output to the level of potential output, 4600, eliminating inflationary pressures.

The effects of the Reserve Bank’s inflation-fighting policy are shown in Figure 10.6. With the real interest rate at 5 per cent, the expenditure line intersects the 45-degree line at point E in the figure, where output equals 4800. To reduce planned spending and output, the Reserve Bank raises the real interest rate to 9 per cent. The higher real interest rate slows consumption and investment spending, moving the expenditure line downwards. At the new equilibrium point, G, actual output equals potential output at 4600. The Reserve Bank's raising of the real interest rate—a contractionary policy action—has thus eliminated the expansionary output gap and with it the threat of inflation.

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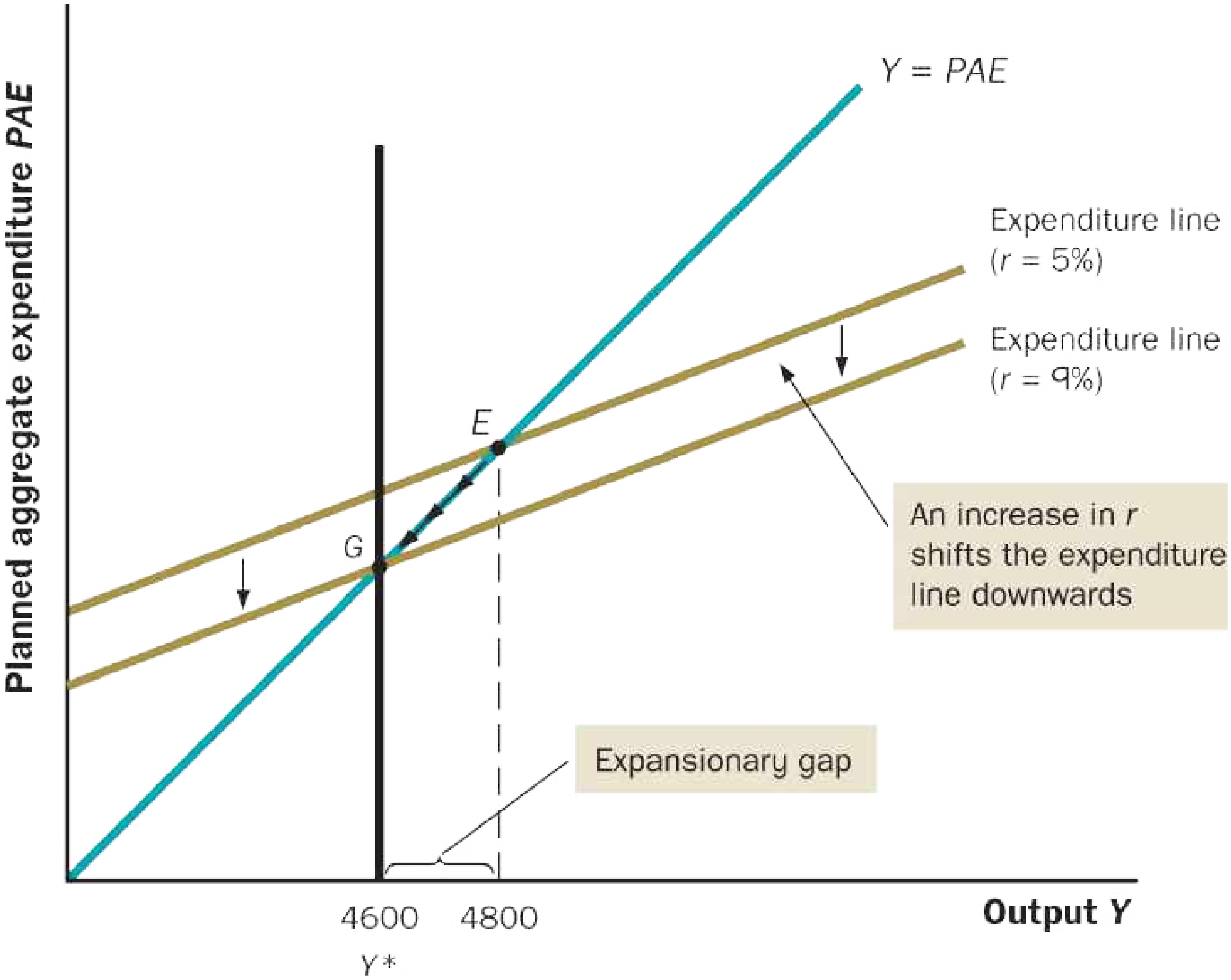

Figure 10.6 **The Reserve Bank fights inflation**

Note: When the real interest rate is 5 per cent, the expenditure line intersects the 45-degree line at point *E*, where short-run equilibrium output equals 4800. If potential output is 4600, an expansionary output gap of 200 units exists. If the Reserve Bank raises the real interest rate to 9 per cent, reducing planned aggregate expenditure, the expenditure line shifts downwards. At the new intersection point, *G*, actual output equals potential output at 4600, and the expansionary gap is eliminated.

THINKING AS AN ECONOMIST 10.1

Why did the Reserve Bank target six falls in the overnight cash rate between September 2008 and April 2009?

The Reserve Bank's target for the overnight cash interest rate fell sharply between September 2008 and April 2009 (see Figure 10.7). In August 2008 the Reserve Bank's target for the overnight cash rate was 7.25 per cent; by April 2009 the target rate had fallen to 3 per cent. Why did the Reserve Bank cut the cash rate so much in this period?

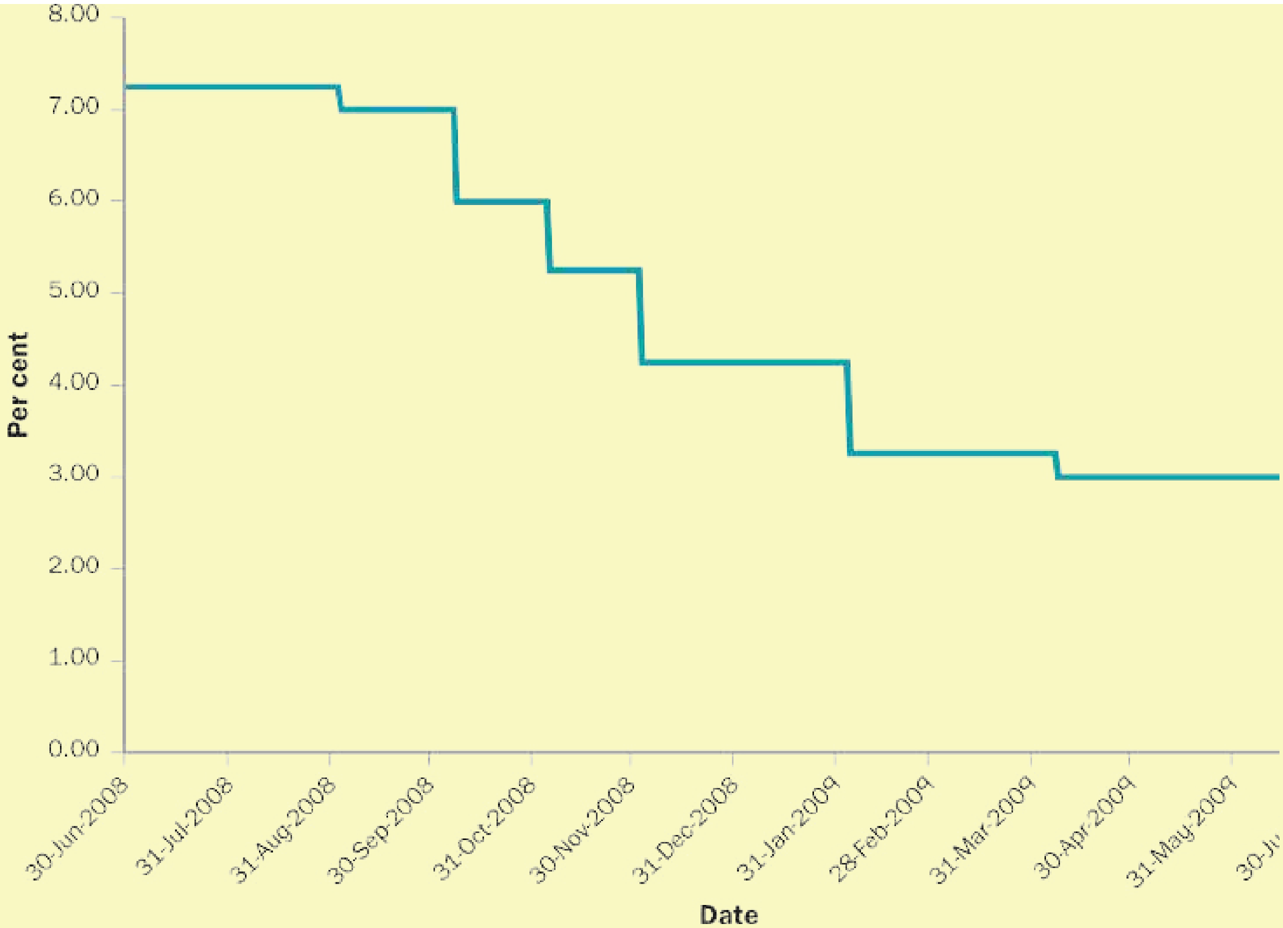

Figure 10.7 **The Reserve Bank's target overnight cash interest rate**

Note: The Reserve Bank's target for the overnight cash interest rate fell from 7.25 per cent in September 2008 to 3 per cent in April 2009 in response to the Global Financial Crisis.

Source: Based on data from Reserve Bank of Australia (RBA) n.d., 'Interest rates', www.rba.gov.au/statistics/tables/index.html#interest_rates.

The answer lies in the fears the Reserve Bank had about the potential risks to the domestic economy in the wake of the unfolding Global Financial Crisis. In Thinking as an Economi st 8.2 (Chapter 8), we described the main features of the Global Financial Crisis and how an aggressive fiscal policy response was introduced to support planned aggregate expenditure. In Examples 10.2 and 10.3 we showed how in theory monetary policy could also be used to respond to a situation of too low a level of planned aggregate expenditure. The significant falls in the target cash interest rate over 2008–09 were an example where this theory was put into practice. To quote from the minutes of the Reserve Bank board meeting on 7 October 2008 (the meeting at which the decision was made to cut the target cash rate by a full percentage point):

> The key factors for members' consideration were the Page 257 sharply worsening conditions in international financial markets during September and the consequential deterioration in the global economic outlook. Prices in global asset markets had fallen sharply and growth in credit in the major economies had slowed to unusually low rates. These developments meant that households and businesses in many countries would have difficulty accessing funding and that global economic activity, which had already slowed significantly, would probably slow further. Members noted that forecasts of growth in GDP in both developed and developing economies were, therefore, in the process of being revised down, particularly for 2009. Members also

noted that Australian financial markets were being affected to a lesser extent than in many other countries, given the relative strength of the domestic banking system. Nonetheless, the deterioration in the outlook for global economic activity posed downside risks to the domestic economy (RBA 2008).

Other central banks acted even more aggressively. The Federal Reserve in the United States, for example, cut its target interest rate, the federal funds rate, from 5.25 per cent in August 2007 to zero in December 2008.

These consistent cuts made it cheaper for both businesses and households to borrow funds to make purchases; the expectation was that this would encourage the private sector to borrow to fund increased planned expenditure. The results of these actions are shown in Figure 10.8 by the upward shift in the planned expenditure line and the movement of the economy from point *E* towards point *F*.

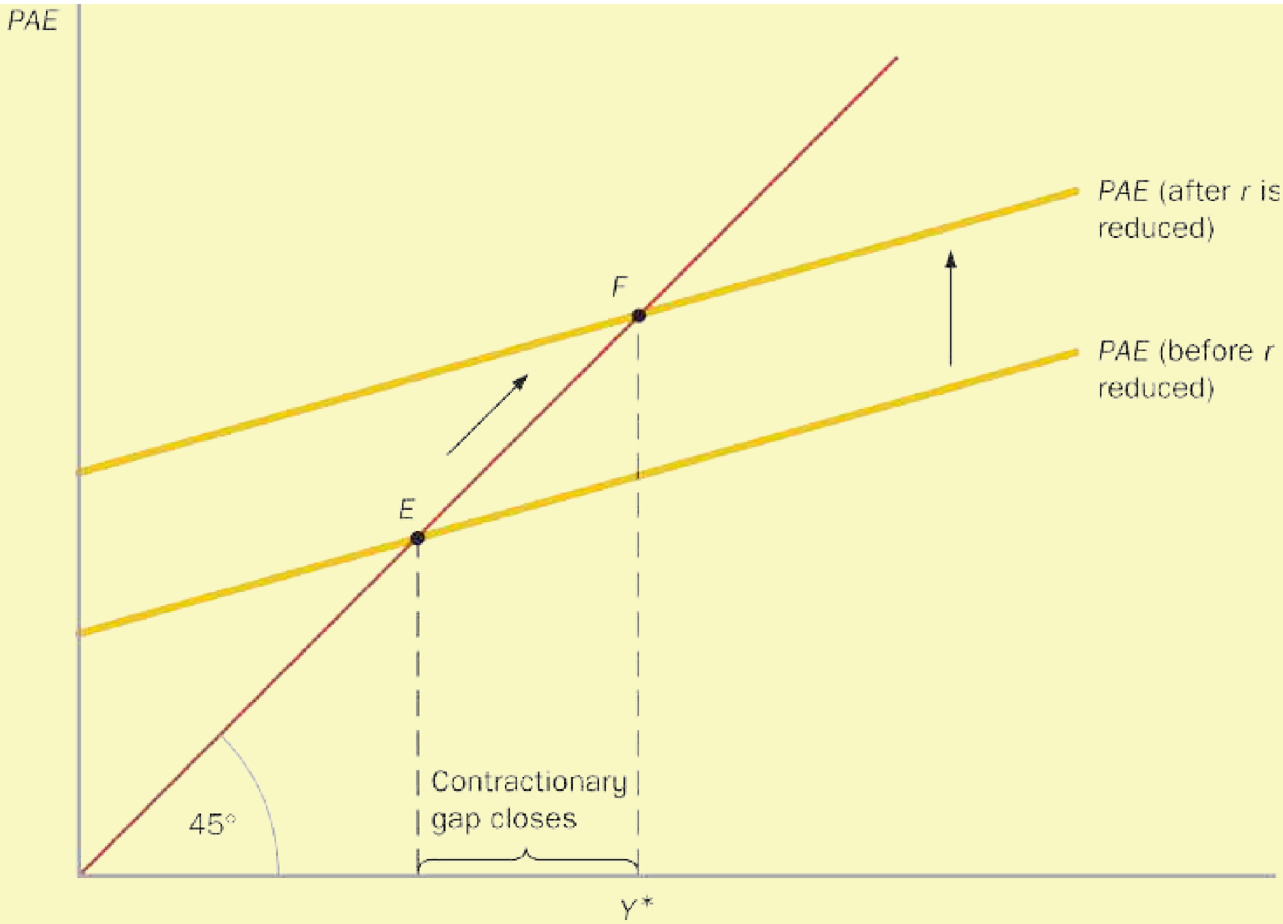

Figure 10.8 **The use of monetary policy to fight the crisis**

Note: An expansionary monetary policy, by lowering interest rates and thereby stimulating planned aggregate expenditure, can be used to combat a contractionary output gap.

Reference

Reserve Bank of Australia (RBA) 2008, 'Minutes of the monetary policy meeting of the Reserve Bank Board, 7 October', www.rba.gov.au/monetary-policy/rba-board-minutes/2008/07102008.html.

BACKGROUND BRIEFING 10.4

Monetary policy and asset price inflation

As Thinking as an Economist 10.1 made clear, monetary policy can be used to combat an output gap. However, the Reserve Bank of Australia has repeatedly made it clear that under normal circumstances it views the main function of monetary policy to be the maintenance of a low rate of inflation. This is encapsulated in a formal 'Statement on the conduct of monetary policy' entered by the Australian Government treasurer and the governor of the Reserve Bank. That statement says:

> Both the Reserve Bank and the Government agree on the importance of low inflation and low inflation expectations. These assist businesses in making sound investment decisions, underpin the creation of jobs, protect the savings of Australians and preserve the value of the currency.
>
> In pursuing the goal of medium-term price stability, both the Reserve Bank and the government agree on the objective of keeping consumer price inflation between 2 and 3 per cent, on average, over the cycle. This formulation allows for the natural short-run variation in inflation over the cycle while preserving a clearly identifiable performance

> benchmark over time.
>
> Since the adoption of inflation targeting in the early 1990s inflation has averaged around the midpoint of the inflation target band. The governor takes this opportunity to express his continuing commitment to the inflation objective, consistent with his duties under the Act. For its part the government indicates that it endorses the inflation objective and emphasises the role that disciplined fiscal policy must play in achieving such an outcome (RBA 2007).

Nevertheless, in the wake of the Global Financial Crisis, the debate about whether monetary policy could be used for other purposes has intensified.

As we explained in Background Briefing 6.3, the bursting of the housing price bubble in the United States is widely believed to have been a key factor in precipitating the Global Financial Crisis (recall that a 'bubble' describes a situation in which price increases cannot be attributed to fundamental changes in supply and demand conditions). Not surprisingly, many commentators have argued that monetary policy should be used to prevent these bubbles from occurring in the first place. Couldn't the Reserve Bank, for example, raise interest rates if it saw a housing price bubble forming, thereby discouraging borrowing and allowing house prices to moderate? However, does a rise in house prices, or indeed the price of any asset, warrant action by the Reserve Bank? The argument for why the Reserve Bank might be concerned about the rise of house prices is that the stock of housing forms a considerable proportion of the household sector's wealth (around 65 per cent); an increase in house prices could therefore be expected to make homeowners feel wealthier. If this boosts consumption expenditure there could potentially be inflationary pressures.

Some economists have argued that it is by no means obvious that the Reserve Bank should be targeting house prices in its deliberations on monetary policy, any more than it should be targeting the price of cars, or sugar or anything else other than the general level of prices. After all, it is an important part of the market mechanism that relative prices in the economy change in response to fundamental market pressures. If the increase in house prices is simply an efficient response to factors affecting the housing market, why should there be any implications for monetary policy?

This debate has been carried out all over the world in recent years, even before the Global Financial Crisis focused the world's attention on these issues. For example, in the United States there was much debate about whether monetary policy should be used to prevent the share market from 'overheating', a debate that was sparked by the incredible increase in share prices in the second half of the 1990s, on the back of the so-called ‘dot com’ boom, and then the subsequent decline in share prices from 2000 onwards.

Much hinges on whether these increases in asset prices are driven by market fundamentals or are instead genuine bubbles. In the case of the United States share market, in hindsight it now seems that much of the enthusiasm for technology shares was the result of ‘irrational exuberance’, a term coined by the former Federal Reserve’s chair, Alan Greenspan. By this, he meant overly optimistic investor sentiment that led to a spectacular run-up of share prices until the bubble burst in 2000. Some people have questioned whether the Federal Reserve should have pre-emptively raised interest rates to rein in investors’ ‘exuberance’. Mr Greenspan himself, however, argued against using monetary policy in this way, since it would have involved raising interest rates to the point where the economy would have moved into a deep recession.

What about the Global Financial Crisis? Could monetary policy have ended the housing price bubble sooner, and in a more orderly fashion than what actually transpired?

One difficulty with this line of reasoning is that identifying asset price bubbles in share markets or real estate is very challenging, especially in their early stages. Often, we are only sure there has been a bubble when it has burst, and then it is too late. For many economists the risk is that there may be a costly interference in the price mechanism if monetary policy responds whenever asset prices increase; if it is a case of asset price increases reflecting the forces of demand and supply, preventing those forces from acting may impose large costs on the economy. Others argue that the Global Financial Crisis has shown that not responding to potential asset price bubbles until they burst may be too late, and far more costly.

Reference

Reserve Bank of Australia (RBA) 2007, ‘Statement on the conduct of monetary policy, The Treasurer and the Governor of the Reserve Bank’, www.rba.gov.au/monetary-policy/framework/stmt-conduct-mp-4-06122007.html.

▹▹ RECAP

By lowering interest rates, the Reserve Bank can stimulate planned aggregate spending in the economy and move the economy's equilibrium real GDP closer to its potential.

If the inflation is the result of an inflationary gap, the Reserve Bank would raise interest rates, lowering planned aggregate spending in the economy and shifting the equilibrium level of real GDP back down towards its potential.

10.4 THE RESERVE BANK'S POLICY REACTION FUNCTION

LO 10.6

As we have seen, the Reserve Bank attempts to stabilise the economy by manipulating the real interest rate. When the economy faces a contractionary gap, the Reserve Bank reduces the real interest rate in order to stimulate spending. When an expansionary gap exists, so that inflation threatens to become a problem, the Reserve Bank restrains spending by raising the real interest rate. Economists sometimes find it convenient to summarise the behaviour of the Reserve Bank in terms of a *policy reaction function*. In general, a **policy reaction function** describes how the action a policymaker takes depends on the state of the economy. Here, the policymaker's action is the Reserve Bank's choice of the real interest rate, and the state of the economy is given by factors such as the output gap or the inflation rate. Thinking as an economist 10.2 describes one well-known attempt to quantify the policy reaction function.

THINKING AS AN ECONOMIST 10.2

What is the Taylor rule?

Examples 10.2 to 10.4 presume that the economy is quite simple to manage. The reality, however, is that management of the economy is enormously difficult, and there is often much uncertainty about how policies should be set. This means that identifying any distinct guiding principles that direct how central banks set interest rates is ordinarily a very difficult task. Despite this, in 1993 economist John Taylor proposed a ‘rule’, now known as the Taylor rule, to describe the behaviour of the US central bank, the Federal Reserve Bank (Taylor 1993). The Taylor rule is now routinely used in relation to the behaviour of many central banks across the world, including the Reserve Bank of Australia.

The rule Taylor proposed is not a rule in any legal sense but is instead an attempt to describe the Federal Reserve’s behaviour in terms of a quantitative policy reaction function. The Taylor rule can be written as:

$$r_t = 0.01 + 0.5\left(\frac{Y - Y^*}{Y^*}\right) + 0.5\,(\pi - \pi^T) \qquad \textbf{Equation 10.2}$$

where *r* is the real interest rate set by the Federal Reserve, expressed as a decimal (e.g. 5% = 0.05); *Y* − *Y** is the difference between potential and actual output; (*Y* − *Y**)/*Y** is the output gap (relative to potential output); π is the inflation rate, expressed as a decimal (e.g. a 2% inflation rate is expressed as 0.02) and πT the Federal Reserve’s desired rate of inflation, also expressed as a decimal. We will assume this desired (or target) rate of inflation is fixed so that the Federal Reserve is assumed to respond to any circumstance in which the inflation rate moves away from the fixed target. Therefore, according to the Taylor rule, the Federal Reserve responds to both output gaps and deviations of the rate of inflation from the target rate of inflation. For example, the formula implies that if a recessionary gap equal to a fraction 0.01 of potential output develops, the Federal Reserve will reduce the real interest rate by 0.5 percentage points (i.e. 0.005). Similarly, if inflation rises by one percentage point above the target (0.01), according to the Taylor rule the Federal Reserve will increase the real interest rate by 0.5 percentage points (0.005). Taylor has shown that his rule did in fact describe the behaviour of the Federal Reserve under chairman Alan Greenspan reasonably accurately. Thus, the Taylor rule is a real-world example of a policy reaction function. We stress again, however, that the Taylor rule is not a fixed legal requirement but a convenient way of summarising the Federal Reserve's likely policy response to changes in output or inflation.

CONCEPT CHECK 10.4

This exercise asks you to apply the concept of the Taylor rule. Suppose target inflation is zero per cent, inflation is 3 per cent and the output gap is zero. According to the Taylor rule, at what value should the Reserve Bank set the real interest rate? The nominal interest rate? Suppose the Reserve Bank were to receive new information showing that there is a 1 per cent recessionary gap (inflation is still 3%). According to the Taylor rule, how should the Reserve Bank change the real interest rate, if at all?

Figure 10.9 shows how a policy reaction function (*prf*) might be graphed and we now assume that the Reserve Bank's policy decisions can be approximated by a *prf*. The vertical axis of the graph shows the real interest rate chosen by the Reserve Bank; the horizontal axis shows the rate of inflation. The upward slope of the policy reaction function captures the idea that the Reserve Bank reacts to increases in inflation by raising the real interest rate. The target inflation rate is shown on the diagram as π^T. According to the Reserve Bank's *prf*, should inflation rise above the target, the Reserve Bank will respond by increasing the interest rate. If, however, inflation falls below the target, the policy response will involve a cut in the interest rate.

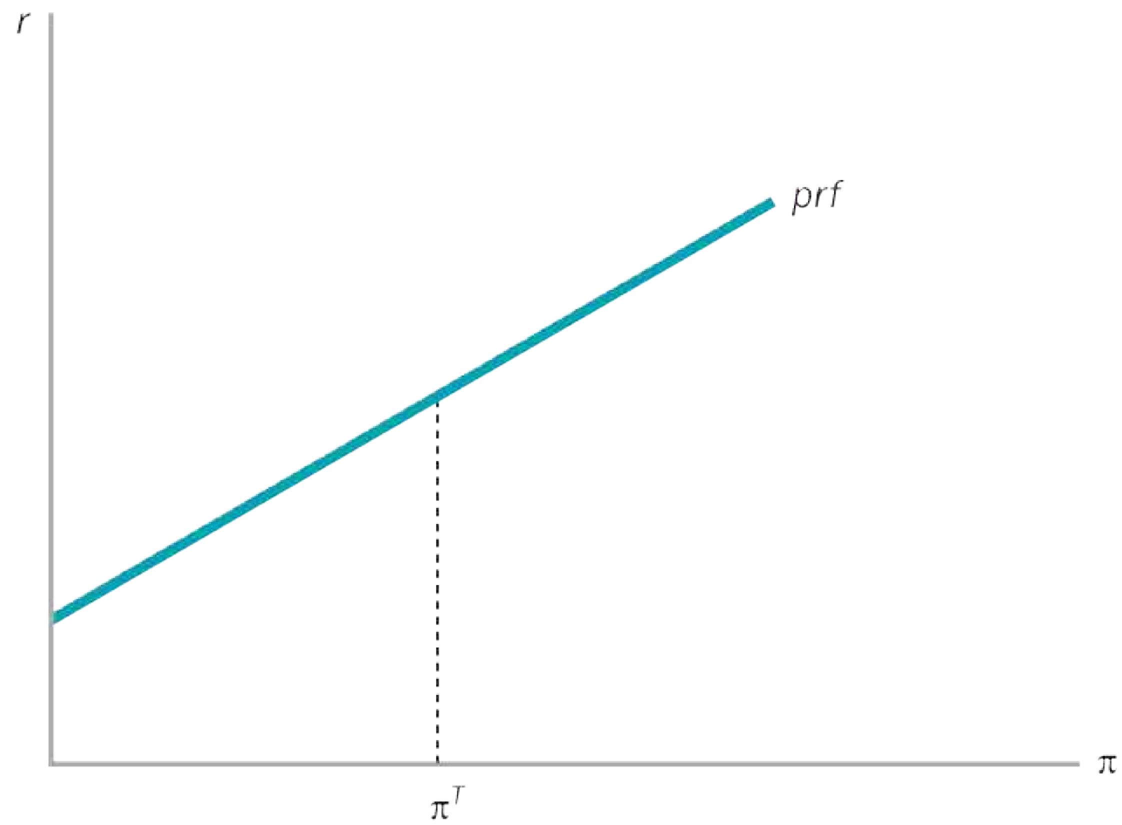

Figure 10.9 **An example of a Reserve Bank policy reaction function**

This hypothetical example of a policy reaction function (*prf*) for the Reserve Bank shows the real interest rate the Reserve Bank sets in response to any given value of the inflation rate. The upward slope captures the idea that the Reserve Bank raises the real interest rate when inflation rises.

Note when drawn this way, there is an implicit assumption being made, namely that all other factors that might affect the real interest rate (including Reserve Bank reactions to any output gap) are unchanging.

In Figure 10.10 we show how to represent a change in the real interest rate in response to a change in the level of output. Suppose a contractionary output gap of 1 per cent has opened with all else, including the rate of inflation, remaining constant. According to Equation 10.2 the Reserve Bank responds by decreasing the real interest rate. In Figure 10.10 this change is represented by a downward shift of the policy reaction function, from prf_0 to prf_1; as a result of the contractionary output gap, each rate of inflation is now associated with a lower real interest rate than was previously the case.

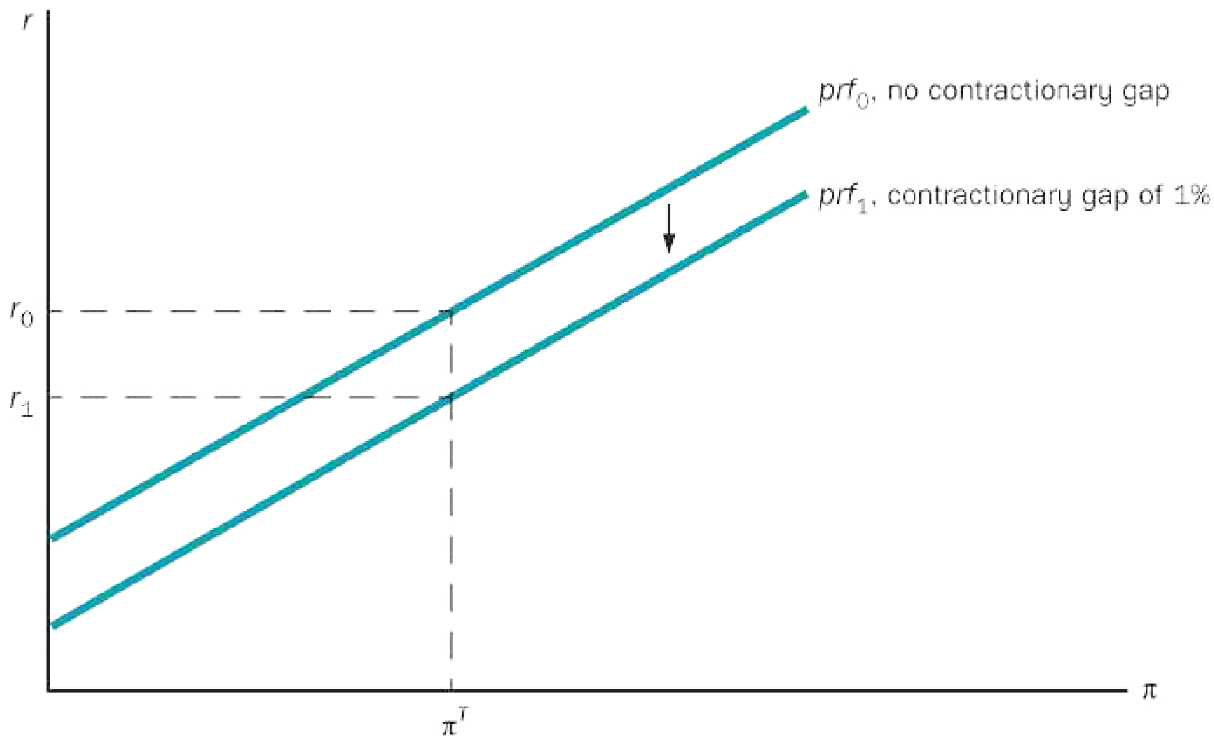

Figure 10.10 **A shift in the policy reaction function**

Note: A contractionary output gap results in the Reserve Bank reducing the real rate of interest. This results in a downward shift in the policy reaction function.

How does the Reserve Bank determine its policy reaction function? In practice, the process is a complex one, involving a combination of statistical analysis of the economy and human judgement. However, two useful insights into the process can be drawn even from the simplified policy reaction function described by Equation 10.2. First, as we discussed in Chapter 4, the real interest rate is ultimately determined by the balance of saving and investment. To illustrate the implication of this fact for the Reserve Bank's choice of policy reaction function, suppose that the Reserve Bank estimates the long-run value of the real interest rate (as determined by the supply and demand for saving) to be 1 per cent, or 0.01 and let us further suppose that the Reserve Bank has a stated inflation rate target of 2 per cent. By examining Equation 10.2 we can see that the Reserve Bank's policy reaction function implies a long-run value of the real interest rate of 1 per cent only if the inflation rate in the long run is equal to the target of 2 per cent (we assume, in the long run, the output gap is zero; we will explore this assumption in more detail in Chapter 11). Thus, the Reserve Bank's choice of this policy reaction function makes sense only if the Reserve Bank is able to achieve its long-run target rate of inflation of 2 per cent.

Second, the Reserve Bank's policy reaction function contains information not only about the long-run inflation target but also about how aggressively the Reserve Bank plans to pursue that target. To illustrate, suppose the Reserve Bank's policy reaction function was very flat, implying that the Reserve Bank changes the real interest rate rather modestly in response to increases or decreases in inflation. In this case we would conclude that the Reserve Bank does not intend to be very aggressive in its attempts to offset movements in inflation away from the target level. In contrast, if the reaction function slopes steeply upward, so that a given change in inflation elicits a large adjustment of the real interest rate by the Reserve Bank, we would say that the Reserve Bank plans to be quite aggressive in responding to changes in inflation.

▹▹ RECAP

An increase in the real interest rate reduces both consumption spending and planned investment spending. Through its control of the real interest rate, the Reserve Bank is thus able to influence planned spending and short-run equilibrium output. To fight a recession (a contractionary output gap), the Reserve Bank should lower the real interest rate, stimulating planned spending and output. Conversely, to fight the threat of inflation (an expansionary output gap), the Reserve Bank should raise the real interest rate, reducing planned spending and output.

The Reserve Bank's policy reaction function relates its policy action (specifically, its setting of the real interest rate) to the state of the economy. Because the Reserve Bank raises the real interest rate when inflation rises, in order to restrain spending, the Reserve Bank's policy reaction is upward sloping. The Reserve Bank's policy reaction function contains information about the central bank's long-run target for inflation and the aggressiveness with which it intends to pursue that target.

10.5 MONETARY POLICYMAKING: ART OR SCIENCE?

In this chapter we analysed the basic economics underlying real-world monetary policy and worked through some examples showing the calculation of the real interest rate that is needed to restore output to its full employment level. While those examples are useful in understanding how monetary policy works—as with our analysis of fiscal policy in Chapter 8 —they overstate the precision of monetary policymaking. The real-world economy is highly complex, and our knowledge of its workings is imperfect. For example, though we assumed in our analysis that the Reserve Bank knows the exact value of potential output, in reality potential output can be estimated only approximately. As a result, at any given time the Reserve Bank has only a rough idea of the size of the output gap. Similarly, Reserve Bank policymakers have only an approximate idea of the effect of a given change in the real interest rate on planned spending, or the length of time before that effect will occur. Because of these uncertainties the Reserve Bank tends to proceed cautiously. Reserve Bank policymakers usually avoid large changes in interest rates and rarely raise or lower the target for the overnight cash rate interest rate by more than one-quarter of a percentage point (e.g. from 5.50% to 5.25%) at any one time. The gravity with which the Global Financial Crisis was viewed was apparent in the Reserve Bank's decision to reduce the target cash interest rate by an unprecedented full percentage point in October 2008.

Is monetary policymaking an art or a science? In practice, it appears to be both. Scientific analyses, such as the development of detailed econometric models of the economy, have proved useful in making monetary policy. But human judgement based on long experience—what has been called the ‘art’ of monetary policy—plays a crucial role in successful policymaking and is likely to continue to do so.

SUMMARY

- Monetary policy is one of two types of stabilisation policy, the other being fiscal policy.
- The Reserve Bank operates monetary policy by targeting the overnight cash interest rate. Open-market operations are used to keep the cash rate at its target. A change in the target is brought about through changing the rate of interest paid by the Reserve Bank on deposits in banks' exchange settlement accounts.
- In the short run, the Reserve Bank can control the real interest rate as well as the nominal interest rate. Recall that the real interest rate equals the nominal interest rate minus the inflation rate. Because the inflation rate adjusts relatively slowly, the Reserve Bank can change the real interest rate by changing the nominal interest rate. In the long run, the real interest rate is determined by the balance of saving and investment.
- The Reserve Bank's actions affect the economy because changes in the real interest rate affect planned spending. For example, an increase in the real interest rate raises the cost of borrowing, reducing consumption and planned investment. Thus, by increasing the real interest rate, the Reserve Bank can reduce planned spending and short-run equilibrium output. Conversely, by reducing the real interest rate, the Reserve Bank can stimulate planned aggregate expenditure and thereby raise short-run equilibrium output. To eliminate a contractionary output gap, the

Reserve Bank will lower the real interest rate. To eliminate an expansionary output gap, the Reserve Bank will raise the real interest rate.

- A *policy reaction function* describes how the action a policymaker takes depends on the state of the economy. For example, a policy reaction function for the Reserve Bank could specify the real interest rate set by the Reserve Bank for each value of inflation.
- In practice, the Reserve Bank's information about the level of potential output and the size and speed of the effects of its actions is imprecise. Thus, monetary policymaking is as much an art as a science.

KEY TERMS

base money 246

forward guidance 252

overnight cash interest rate 245

policy reaction function 260

quantitative easing 252

REVIEW QUESTIONS

1. Show graphically how the Reserve Bank controls the nominal interest rate. Can the Reserve Bank control the real interest rate? LO 10.4 **MEDIUM**
2. What effect does an open-market purchase of bonds by the Reserve Bank have on nominal interest rates? Discuss in terms of: (a) the effect of the purchase on bond prices, and (b) the effect of the purchase on the supply of base money. LO 10.3 **EASY**
3. You hear a news report that employment growth is lower than expected. How do you expect that report to affect market interest rates? Explain. (*Hint*: Assume that Reserve Bank policymakers have access to the same data that you have.) LO 10.6 **MEDIUM**
4. Why does the real interest rate affect planned aggregate expenditure? Give examples. LO 10.5 **MEDIUM**
5. The Reserve Bank faces a recessionary gap. How would you expect it to respond? Explain step by step how its policy change is likely to affect the economy. LO 10.5 **MEDIUM**
6. The Reserve Bank decides to take a contractionary policy action. What would you expect to happen to the nominal interest rate, the real interest rate and the money supply? Under what circumstances would this type of policy action be most likely to be appropriate? LO 10.2 **EASY**
7. Define *policy reaction function*. Sketch a policy reaction function

relating the Reserve Bank's setting of the real interest rate to inflation. LO 10.6 **EASY**

8. Discuss why the analysis of this chapter overstates the precision with which monetary policy can be used to eliminate output gaps. LO 10.6 **HARD**

PROBLEMS

1. An economy is described by the following equations:

$C = 2600 + 0.8\ (Y + T) - 10\,000r$

$I^P = 2000 - 10\,000r$

$G = 1800$

$X = M = 0$

$T = \overline{T} = 3000$

The real interest rate, expressed as a decimal, is 0.10 (i.e. 10%). Find a numerical equation relating planned aggregate expenditure to output. Using a table or other method, solve for short-run equilibrium output. Show your result graphically using a Keynesian cross diagram. LO 10.5 **MEDIUM**

2. For the economy described below:

$C = 2800 + 0.5(Y - T) - 8000r$

$I^P = 2200 - 8000r$

$G = 2200$

$NX = 0$

$T = 3500$

a) Potential output, Y^*, equals 8980. What real interest rate should the Reserve Bank set to bring the economy to full employment? You may take as given that the multiplier for this economy is 2.

b) Repeat part (a) for the case in which potential output $Y^* = 8020$.

c) * Show that the real interest rate you found in part (a) sets national saving at potential output, defined as $Y^* - C - G$, equal to planned investment, I^P. This result shows that the real interest rate must be consistent with equilibrium in the market for saving when the economy is at full employment. LO 10.5 **HARD**

3. Here is another set of equations describing an economy:

$$C = 14\,000 + 0.9\,(Y - T) - 45\,000r$$

$$I^P = 7000 - 20\,000r$$

$$G = 7800$$

$$X = 1800$$

$$T = \overline{T} = 8000$$

$$Y^* = 104\,000$$

a) Find a numerical equation relating planned aggregate expenditure to output and to the real interest rate.

b) At what value should the Reserve Bank set the real interest rate to eliminate any output gap? (*Hint*: Set output Y equal to the value of potential output given above in the equation you found in part (a). Then solve for the real interest rate that also sets planned aggregate expenditure equal to potential output.) LO 10.5 **HARD**

4. Supposing that the Reserve Bank follows the Taylor rule. Find the real interest rate and the nominal interest rate that the Reserve Bank will set in each of the following situations:

a) Inflation of 4 per cent and an expansionary gap equal to 1 per cent of potential output.

b) Inflation of 2 per cent and a recessionary gap equal to 2 per cent of potential output.

c) Inflation of 6 per cent and no output gap.

d) Inflation of 2 per cent and a recessionary gap of 5 per cent. (Can the Reserve Bank set a negative real interest rate? If so, how?) LO 10.6 **MEDIUM**

5. Suppose with inflation at 2 per cent some economists estimate the size of the recessionary gap to be about 2 per cent of potential output. At that same time, the Reserve Bank is holding the (nominal) overnight cash rate at 1.75 per cent. How does the Reserve Bank's setting of the overnight cash rate compare with what would be predicted by the Taylor rule? LO 10.6 **EASY**

6. By law, the Reserve Bank must report twice each year to parliament about monetary policy and the state of the economy. When the monetary policy report is presented, it is customary for the Reserve Bank governor to testify before parliament's Economics Committee, to update MPs on the economic situation.
Obtain a copy of the most recent monetary policy report from the Reserve Bank (https://www.rba.gov.au/monetary-policy/). In the period covered by the report, did monetary policy ease, tighten or remain neutral? What principal developments in the economy led the Reserve Bank to take the actions that it did? LO 10.6 **MEDIUM**

REFERENCES

Banking Act of 1935: Hearings Before the Committee on Banking and Currency, House of Representatives, Seventy-Fourth Congress, https://fraser.stlouisfed.org/title/831?start_page=381.

Coombes T and Reimers D 2009, 'Lifting the cloud of confusion over monetary policy', *Economic Papers*, vol. 28, no. 2, June, pp. 130–8.

Otto G 2007, 'Central bank operating procedures: How the RBA achieves its target for the cash rate', *Australian Economic Review*, vol. 40, no. 2, pp. 216–24.

Reserve Bank of Australia (RBA) n.d., 'Interest rates', www.rba.gov.au/statistics/tables/index.html#interest_rates.

Reserve Bank of Australia (RBA) n.d., 'Statements on monetary policy', https://www.rba.gov.au/monetary-policy/.

Reserve Bank of Australia (RBA) 2007, 'Statement on the conduct of monetary policy, The Treasurer and the Governor of the Reserve Bank', www.rba.gov.au/monetary-policy/framework/stmt-conduct-mp-4-06122007.html.

Reserve Bank of Australia (RBA) 2008, 'Minutes of the monetary policy meeting of the Reserve Bank Board, 7 October', www.rba.gov.au/monetary-policy/rba-board-minutes/2008/07102008.

html.

Stevens G 2013, ‘Statement by Glenn Stevens, Governor: Monetary policy decision’, Media release, www.rba.gov.au/media-releases/2013/mr-13-15.html.

Taylor J 1993, ‘Discretion versus policy rules in practice’, *Carnegie-Rochester Conference Series on Public Policy*, pp. 195–214.

Appendix to Chapter 10

MONETARY POLICY IN THE BASIC KEYNESIAN MODEL

The real interest rate affects consumption and planned investment. To capture these effects, we will modify the equations for those two components of spending as follows:

$$\begin{aligned} C &= \overline{C} + c(Y - T) - ar \\ I^P &= \overline{I} - br \end{aligned}$$

The first equation is the consumption function, (we use c for the marginal propensity to consume) with an additional term, equal to $-ar$. Think of a as a fixed number, greater than zero, that measures the strength of the interest rate effect on consumption. Thus, the term $-ar$ captures the idea that when the real interest rate r rises, consumption declines by a times the increase in the interest rate. Likewise, the second equation adds the term $-br$ to the equation for planned investment spending. The parameter b is a fixed positive number that measures how strongly changes in the real interest rate affect planned investment; for example, if the real interest rate r rises, planned investment is assumed to decline by b times the increase in the real interest rate. We assume that government purchases and exports are exogenous variables, so that $G = \overline{G}$, and $X = \overline{X}$. Taxation is given by $T = \overline{T} + tY$ and imports by $M = mY$.

To solve for short-run equilibrium output, we start as usual by finding the relationship of planned aggregate expenditure to output. The definition of planned aggregate expenditure is

$$PAE = C + I^P + G + NX$$

Substituting the modified equations for consumption and planned investment into this definition, along with the exogenous values of government spending and exports, and the expressions for taxes and imports, we get

$$PAE = \left[\overline{C} - c\overline{T} + \overline{I} + \overline{G} + \overline{X}\right] - (a + b)r + [c(1 - t) - m]Y$$

The term $-(a + b)r$ captures the idea that an increase in the real interest rate reduces consumption and planned investment, lowering planned spending. Notice that the term $-(a + b)r$ is part of exogenous expenditure, since it does not depend on output. Since exogenous expenditure determines the intercept of the expenditure line in the Keynesian cross diagram, changes in the real interest rate will shift the expenditure line up (if the real interest rate decreases) or down (if the real interest rate increases).

To find short-run equilibrium output, we use the definition of short-run equilibrium output to set $Y = PAE$ and solve for Y:

$$
\begin{aligned}
Y &= PAE \\
&= \left[\overline{C} - c\overline{T} + \overline{I} + \overline{G} + \overline{X}\right] - (a+b)r + [c(1-t) - m]Y \\
Y[1 - c(1-t) + m] &= \left[\overline{C} - c\overline{T} + \overline{I} + \overline{G} + \overline{X}\right] - (a+b)r \\
Y &= \left(\frac{1}{1 - c(1-t) + m}\right)\left[\overline{C} - c\overline{T} + \overline{I} + \overline{G} + \overline{X}\right] \\
&\qquad - (a+b)r]
\end{aligned}
$$

Equation A10.1

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Equation 10A.1 shows that short-run equilibrium output once again equals the multiplier, $\left(\frac{1}{1 - c(1-t) + m}\right)$, times exogenous expenditure, $\left[\overline{C} - c\overline{T} + \overline{I} + \overline{G} + \overline{X}\right] - (a+b)r]$. Exogenousexpenditure in turn depends on the real interest rate *r*. The equation also shows that the impact of a change in the real interest rate on short-run equilibrium output depends on two factors: (1) the effect of a change in the real interest rate on consumption and planned investment, which depends on the magnitude of ($a + b$), and (2) the size of the multiplier, $\left(\frac{1}{1 - c(1-t) + m}\right)$, which relates changes in exogenous expenditure to changes in short-run equilibrium output. The larger the effect of the real interest rate on planned spending, and the larger the multiplier, the more powerful will be the effect of a given change in the real interest rate on short-run equilibrium output.

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CHAPTER 11

Aggregate demand, aggregate supply and inflation

After reading this chapter, you should be able to answer the following questions.

11.1 What does an aggregate demand curve show?

11.2 What implication do the Reserve Bank's anti-inflation policies have for the slope of the aggregate demand curve?

a) What other factors influence the slope of the aggregate demand curve?

11.3 For what reasons might the aggregate demand curve shift?

a) For what reason might the economy move along the aggregate demand curve?

11.4 What is meant by the phrase 'inflation inertia'?

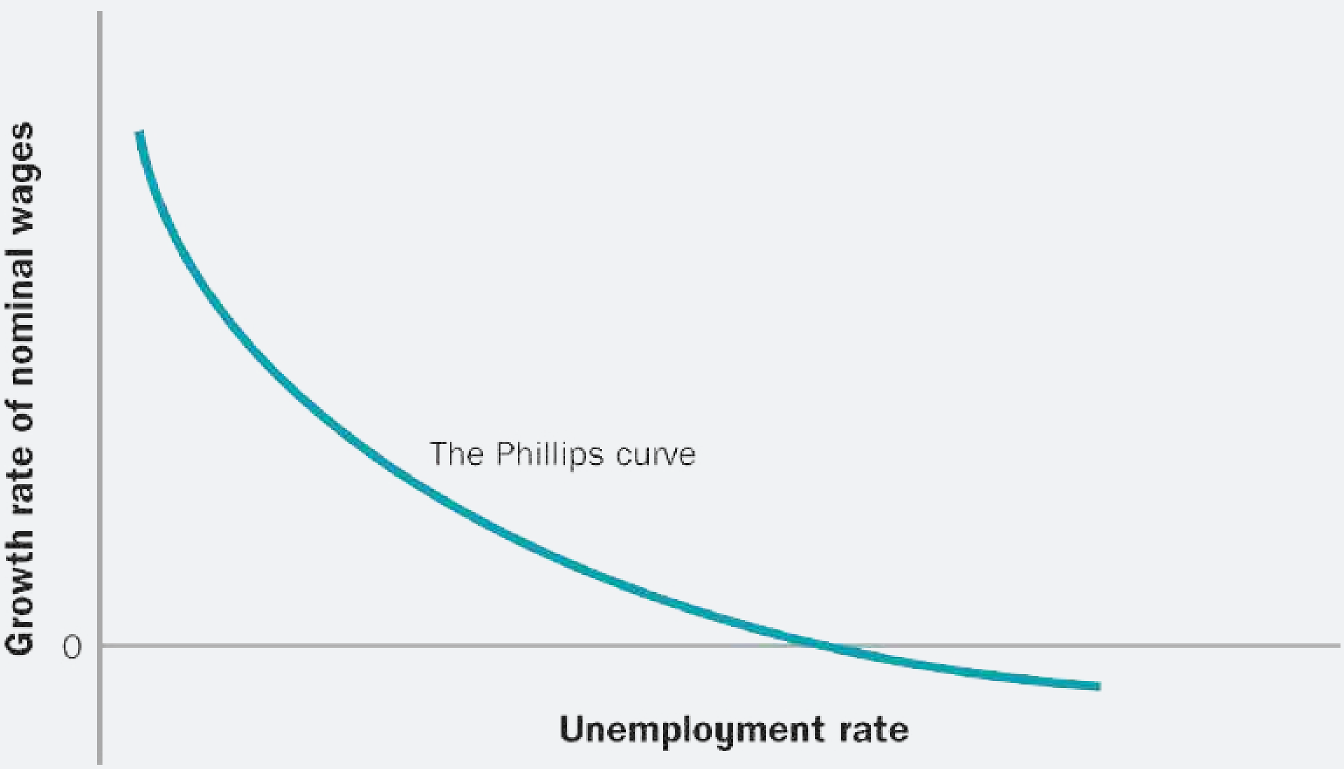
a) Why do macroeconomists believe that inflation is slow to adjust?

- 11.5 How does the output gap affect the rate of inflation?
- 11.6 How is the aggregate demand–aggregate supply diagram constructed?
- 11.7 In what sense is the economy ‘self-correcting’?
- 11.8 What are the main sources of inflation?
- 11.9 What are the effects on the economy of an inflation shock?
  - a) Can inflation shocks affect potential output?
- 11.10 How can monetary policy influence the rate of inflation?

SETTING THE SCENE

In 1958, AW Phillips, a New Zealand economist then working at the London School of Economics, published one of the most celebrated pieces of applied research in the history of macroeconomics. The paper was called ‘The relationship between unemployment and the rate of change of money wages in the United Kingdom 1861–1957’ and was published in the journal *Economica*. In that paper Phillips analysed historical data on the rate of nominal

wage increase and the rate of unemployment in the United Kingdom. He claimed that a systematic relationship existed between these variables such that periods of low wages growth coincided with high rates of unemployment, while periods of high wages growth coincided with low rates of unemployment. A stylised representation of the Phillips Curve, as this relationship quickly became known, is shown below.



The Phillips curve implied that policymakers faced a trade-off; either they could keep aggregate demand high (and hence unemployment low) but then experience a rapid rate of wage increase, which would feed into high inflation, *or* aggregate demand could be kept low (and hence unemployment high), which would be associated with low wages growth and hence low inflation. The idea of a policy trade-off between unemployment and inflation quickly became entrenched in macroeconomics.

The existence of a trade-off between unemployment and inflation, though for a time widely accepted by economists and policymakers, was eventually challenged in a very important contribution to macroeconomics by Milton Friedman (1968, pp. 1–17). A similar point was also made by economist Edmund Phelps (1967). The essential point of Friedman and Phelps' argument was to draw a distinction between how inflation and unemployment interacted in the short run compared to the long run. Their argument identified the possibility of a short-run relation between unemployment and inflation, so that periods of high unemployment would be associated with falling inflation for example, but that in the long run the economy would return to its potential level of output (and from Okun's law to the natural rate of unemployment) regardless of the rate of inflation; hence there is no long-run trade-off between inflation and unemployment. Moreover, attempts to keep the economy at a level of gross domestic product (GDP) above its potential would not only fail in the long run, but lead to an ever-increasing rate of inflation.

In this chapter, we explore why this might be the case.

11.1 INFLATION, SPENDING AND OUTPUT: AGGREGATE DEMAND CURVE

LO 11.1–11.3

To begin incorporating inflation into the model we must extend the time frame we have been using for our analysis. As we have seen, equilibrium output in the short run—the period in which prices are assumed to not respond to aggregate demand changes—is determined by total planned spending in the economy. Over longer periods of time, however, prices are unlikely to remain constant in the economy. Indeed, if we wish to develop a model that explicitly incorporates inflation, we need to consider a longer time horizon than that considered in the basic Keynesian model—one in which prices, as well as output, can change.

The **aggregate demand (AD) curve**, which is shown graphically in Figure 11.1, is an important component of our extended model of inflation, spending and output. The AD curve shows the relationship between equilibrium real output, Y, and the rate of inflation, denoted π. Since equilibrium output equals planned aggregate expenditure, even in an economy in which prices change, we could just as well say that the AD curve shows the relationship between inflation and spending. (It is important to distinguish the AD curve from the planned aggregate expenditure line, introduced as part of the Keynesian cross diagram in Chapter 7. The upward-sloping planned expenditure line shows the relationship between planned aggregate expenditure and output. Again, the AD curve shows the relationship between short-run equilibrium output—which equals planned spending—and inflation.)

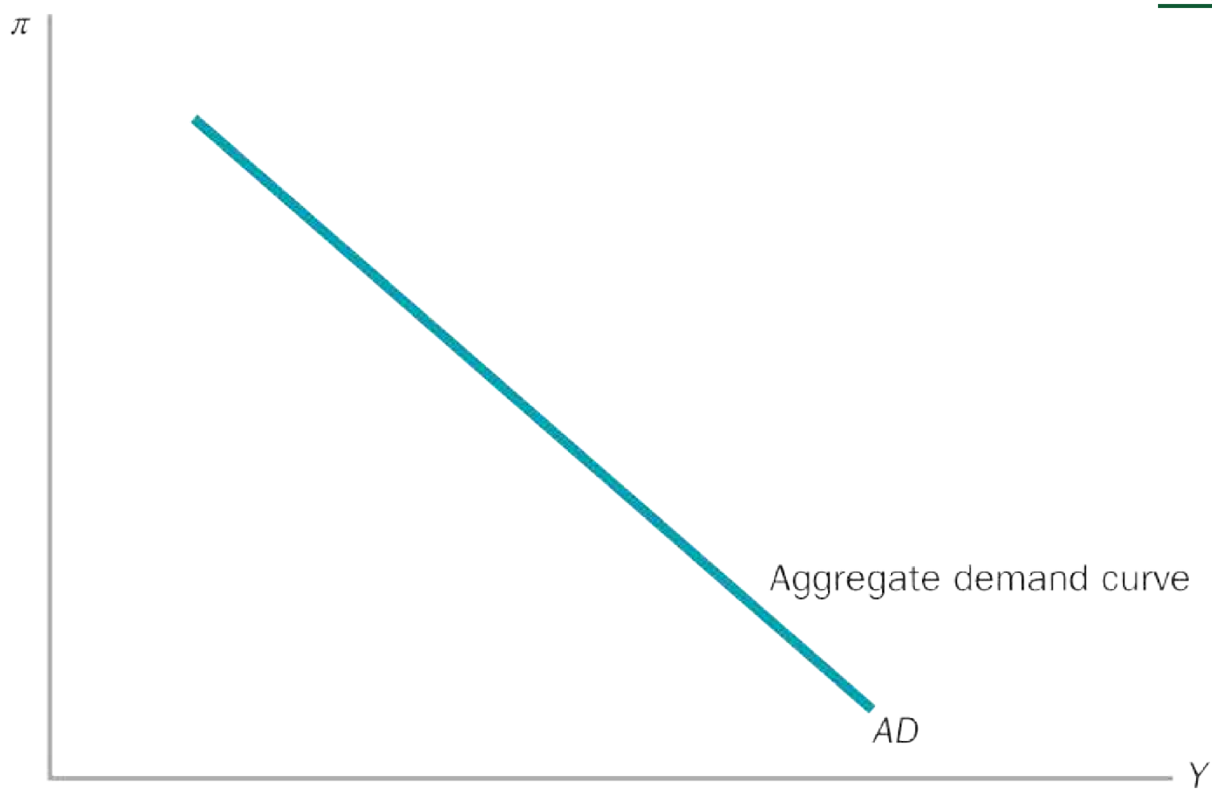


Figure 11.1 **Aggregate demand curve**

Note: The aggregate demand curve, *AD*, shows the relationship between equilibrium output, *Y*, and the rate of inflation, π. Because equilibrium output equals planned spending, *AD* also shows the relationship between inflation and planned spending. The downward slope of *AD* implies that an increase in inflation reduces equilibrium output.

We will see shortly that, all else being equal, *an increase in the rate of inflation tends to reduce equilibrium output*. Therefore, in a diagram showing inflation, π, on the vertical axis and output, *Y*, on the horizontal axis (Figure 11.1), the AD curve (*AD*) is downward sloping. (Economists normally define the AD curve as the relationship between aggregate demand and the *price level*, rather than inflation, which is the *rate of change* of the price level. The definition used here both simplifies the analysis and yields results more consistent with real-world data. For a comparison of the two approaches, see Romer (2000).) Note that we refer to the AD 'curve' even though the relationship is drawn as a straight line in Figure 11.1. In general, the AD curve can be either straight or curving.

Why does higher inflation lead to a lower level of planned spending and equilibrium output? As we will see next, one important reason is the Reserve Bank's response to increases in inflation.

11.1.1 INFLATION, THE RESERVE BANK AND THE AGGREGATE DEMAND CURVE

One of the primary responsibilities of the Reserve Bank, or any central bank, is to maintain a low and stable rate of inflation. For example, in recent years the Reserve Bank has tried to keep inflation in Australia in the range of 2 to 3 per cent. By keeping inflation low, the Reserve Bank tries to avoid the costs high inflation imposes on the economy.

What can the Reserve Bank do to keep inflation low and stable? As we have already mentioned, one situation that is likely to lead to increased inflation is an expansionary output gap, in which short-run equilibrium output exceeds potential output. When output is above potential output, firms must produce at above-normal capacity to meet the demands of their customers. Like Lisa's Ice-Cream Store, described in Chapter 6, firms may be willing to do this for a time. But, eventually, they will adjust to the high level of demand by raising prices, contributing to inflation. To control inflation, the Reserve Bank needs to dampen planned spending and output when they threaten to exceed potential output.

How can the Reserve Bank avoid a situation of economic 'overheating', in which spending and output exceed potential output? As we have seen, the Reserve Bank can act to reduce exogenous expenditure, and hence short-run equilibrium output, by raising the real interest rate. This behaviour by the Reserve Bank is a key factor underlying the link between inflation and output and is summarised by the AD curve. When inflation is high, exceeding its target, the Reserve Bank responds by raising the real interest rate (as implied by the Reserve Bank's *policy reaction function*, introduced in Chapter 10). The increase in the real interest rate reduces consumption and investment spending and hence reduces equilibrium output. Because higher inflation leads, through the Reserve Bank's actions, to a reduction in output, *AD* is downward sloping, as Figure 11.1 shows.

11.1.2 OTHER REASONS FOR THE DOWNWARD SLOPE OF THE

AGGREGATE DEMAND CURVE

Although we focus here on the behaviour of the Reserve Bank as the source of the AD curve's downward slope, there are other channels through which higher inflation reduces planned spending and thus equilibrium output. Hence, the downward slope of the AD curve does not depend exclusively on the Reserve Bank behaving in the way just described.

One additional reason for the downward slope of the AD curve is the effect of inflation on the *real value of net assets (wealth)* held by households and businesses. At high levels of inflation, the purchasing power embedded in people's wealth may decline rapidly. This is especially true for money, which, unlike assets such as real estate, does not experience capital gains in periods of high inflation (in fact, money suffers a capital loss in times of inflation equivalent to the erosion in its purchasing power). This reduction in the public's real wealth may cause households to restrain consumption spending, reducing equilibrium output.

A second channel by which inflation may affect planned spending is through *distributional effects*. Studies have found that people who are less well off are often hurt more by inflation than wealthier people. For example, retirees on fixed incomes and workers receiving a minimum wage (which is set in dollar terms) lose buying power when prices rise rapidly. People at the lower end of the income distribution tend to spend a greater percentage of their disposable income than wealthier individuals. Thus, if a burst of inflation redistributes resources from relatively high-spending, less-affluent households towards relatively high-saving, more-affluent households, overall spending may decline.

A third connection between inflation and aggregate demand arises because higher rates of inflation generate *uncertainty* for households and businesses. When inflation is high, people become less certain about what things will cost in the future, and uncertainty makes planning more difficult. In an uncertain economic environment, both households and firms may become more cautious, reducing their spending as a result.

A final link between inflation and total spending operates through *prices of domestic goods and services sold abroad*. As we will see later in this book, the foreign price of domestic goods depends in part on the rate at which the domestic currency exchanges for foreign currencies. However, for constant rates of exchange between currencies, a rise in domestic inflation causes the prices of domestic goods in foreign markets to rise more quickly. As domestic goods become relatively more expensive to prospective foreign purchasers, export sales decline. Exports are part of aggregate expenditure, and so once more we find that increased inflation is likely to reduce spending. All these factors contribute to the downward slope of the AD curve, together with the behaviour of the Reserve Bank.

In Chapters 16 and 17 we will discuss, in much more detail, the factors that influence the exchange rate between currencies and the determinants of exports and imports.

11.1.3 SHIFTS OF THE AGGREGATE DEMAND CURVE

The downward slope of the aggregate demand curve, or *AD*, shown in Figure 11.1, reflects the fact that, *all other factors being held constant*, a higher level of inflation will lead to lower planned spending and thus lower equilibrium output. Again, a principal reason higher inflation reduces planned spending and output is that the Reserve Bank tends to react to increases in inflation by raising the real interest rate, which in turn reduces consumption and planned investment, two important components of planned aggregate expenditure.

However, even if inflation is held constant, various factors can affect planned spending and equilibrium output. Graphically, as we will see in this section, these factors will cause *AD* to shift. Specifically, for a given level of inflation, if there is a change in the economy that *increases* equilibrium output, *AD* will shift to the *right*. If, on the other hand, the change *reduces* equilibrium output at each level of inflation, *AD* will shift to the *left*. We will focus on two sorts of changes in the economy that shift the AD curve:

a) changes in spending caused by factors other than output or interest rates, which we will refer to as *exogenous* changes in spending

b) changes in the Reserve Bank's monetary policy, as reflected in a shift in the Reserve Bank's policy reaction function.

(A) Exogenous changes in spending

We have seen that planned aggregate expenditure depends both on output (through the consumption function) and on the real interest rate (which affects both consumption and planned investment). However, many factors other than output or the real interest rate can affect planned spending. For example, at given levels of output and the real interest rate, fiscal policy affects the level of government purchases, and changes in consumer confidence can affect consumption spending. Likewise, new technological opportunities may lead firms to increase their planned investment, and an increased willingness of foreigners to purchase domestic goods will raise exports. We will refer to changes in planned spending unrelated to changes in output or the real interest rate as *exogenous* changes in spending.

For a given inflation rate (and thus, for a given real interest rate set by the Reserve Bank—this follows from the policy reaction function), an exogenous increase in spending raises equilibrium output, for the reasons we have discussed in the preceding four chapters. Because it increases output at each level of inflation, *an exogenous increase in spending shifts* AD *to the right*. This result is illustrated graphically in Figure 11.2. Imagine, for example, that a rise in share prices makes consumers more willing to spend (the wealth effect). Then, for each rate of inflation, aggregate spending and short-run equilibrium output will be higher, a change which is shown as a shift of *AD* to the right, from *AD* to *AD′*.

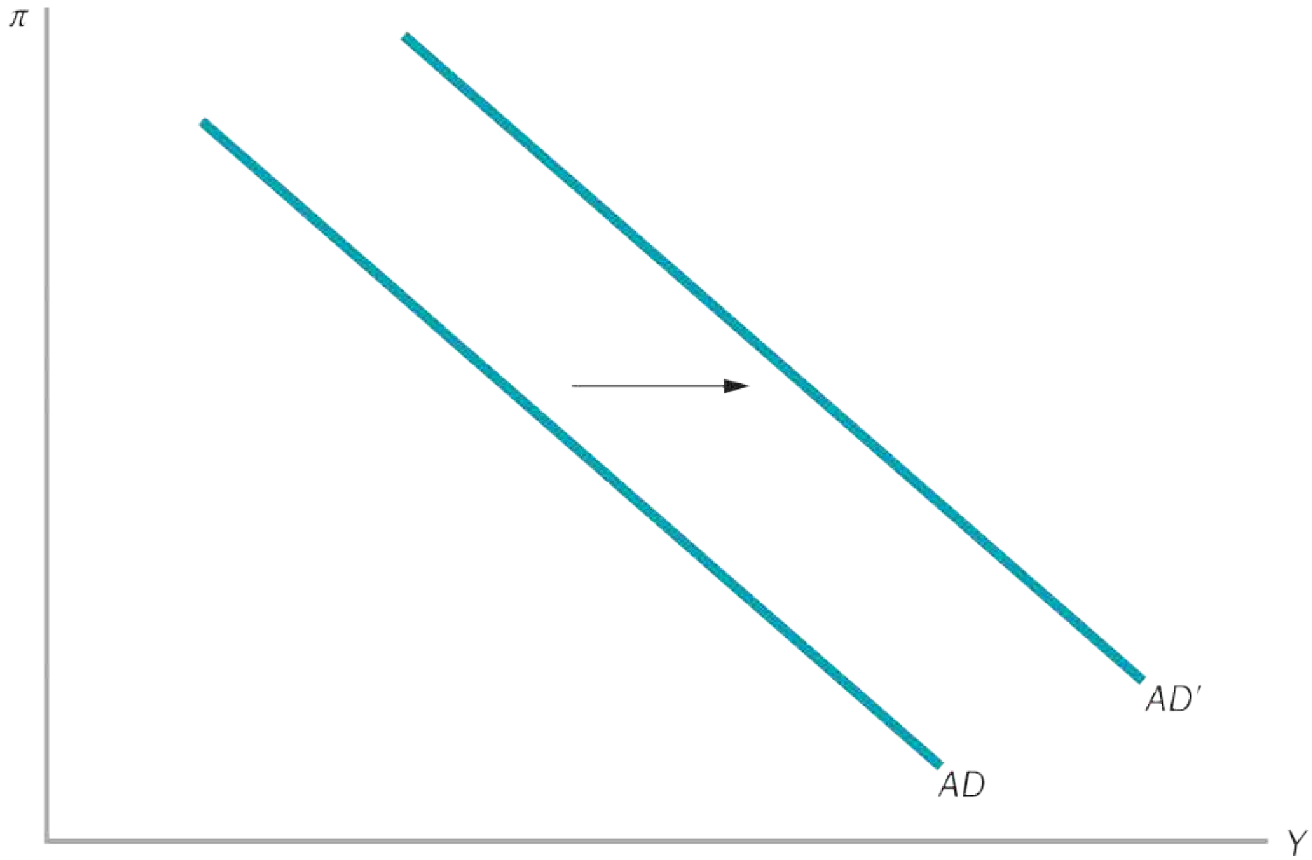


Figure 11.2 **Effect of an increase in exogenous spending**

Note: An exogenous increase in spending shifts the aggregate demand curve (*AD*) to the right (*AD′*).

Similarly, at a given inflation rate, an exogenous decline in spending—for example, a fall in government purchases resulting from a more restrictive fiscal policy—causes equilibrium output to fall. We conclude that *an exogenous decrease in spending shifts AD to the left*.

In Figure 11.2, the AD curve is seen both before (*AD*) and after (*AD′*) an increase in exogenous spending—for example, an increase in consumption spending resulting from a rise in the share market. If the inflation rate and the real interest rate set by the Reserve Bank are held constant, an increase in exogenous spending raises equilibrium output. As a result, the AD curve will shift to the right, from *AD* to *AD′*.

CONCEPT CHECK 11.1

Determine how the following events will affect the AD curve.

a) Due to widespread concerns about future weakness in the economy, businesses reduce their spending on new capital.
b) The government reduces income taxes.

(B) Exogenous changes in the Reserve Bank's policy reaction function

Recall that the Reserve Bank's policy reaction function describes how the Reserve Bank sets the real interest rate at each level of inflation. This relationship is built into the AD curve—indeed, it accounts in part for the curve's downward slope. If the Reserve Bank sets the real interest rate according to an unchanged reaction function, its adjustments in the real rate will not cause the AD curve to shift. The Reserve Bank generally follows a stable policy reaction function.

However, on occasion, the Reserve Bank may choose to be significantly ‘tighter’ or ‘easier’ than normal for a given rate of inflation. For example, if inflation is high and has stubbornly refused to decrease, the Reserve Bank might choose a tighter monetary policy, setting the real interest rate higher than normal at each given rate of inflation; we refer to this as an *exogenous* change in the policy reaction function. This change of policy can be interpreted as an upward shift in the Reserve Bank’s policy reaction function, as shown in Figure 11.3(a). A decision by the Reserve Bank to become more ‘hawkish’ about inflation—that is, to set the real interest rate at a higher level for each given rate of inflation—reduces planned expenditure and thus short-run equilibrium output at each rate of inflation. Thus, an upward shift of the Reserve Bank’s policy reaction function leads *AD* to shift to the left, as shown in Figure 11.3(b).

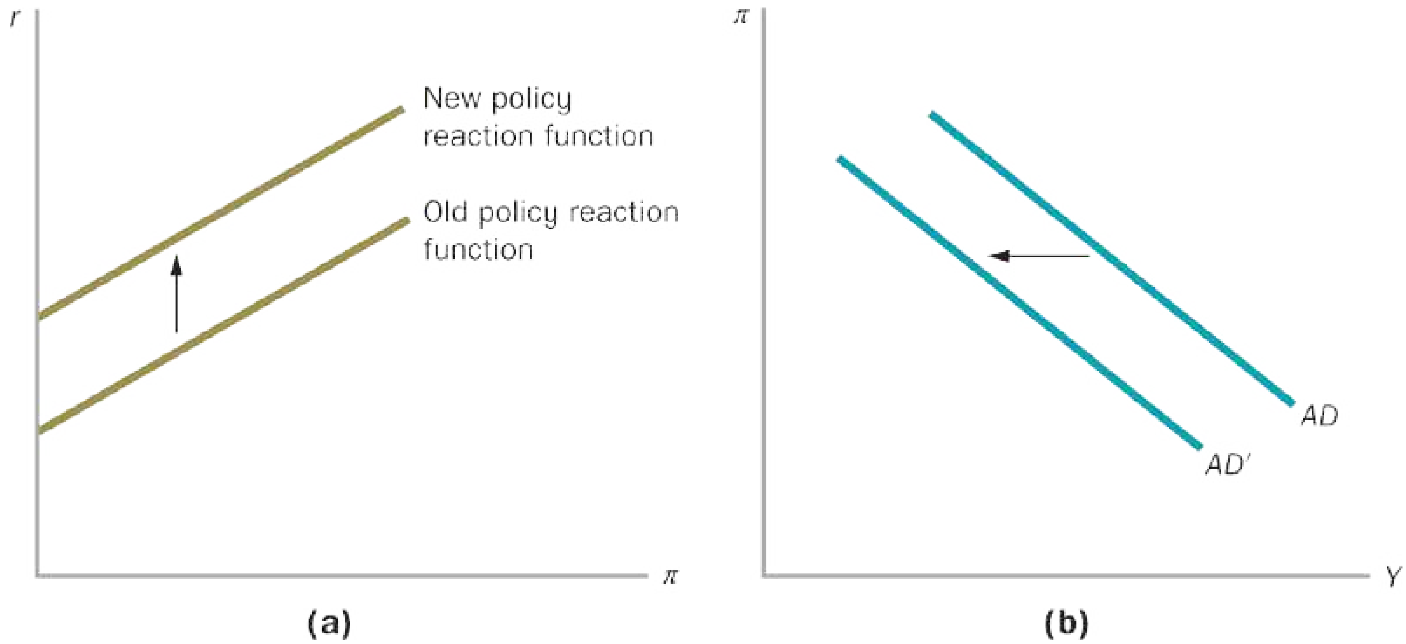


Figure 11.3 **A shift in the Reserve Bank's policy reaction function**

Note: (a) If inflation has remained too high for an extended period, the Reserve Bank may choose a 'tighter' monetary policy, by setting the real interest rate at a higher level than usual for each given rate of inflation. Graphically, this change corresponds to an upward movement in the Reserve Bank's policy reaction function. (b) This change to a tighter monetary policy shifts *AD* to the left. If a protracted recession led the Reserve Bank to decide to set a lower real interest rate at each level of inflation, the Reserve Bank's policy reaction function would shift downwards and *AD* would shift to the right.

Similarly, if the nation is experiencing an unusually severe and protracted recession, the Reserve Bank may choose to change its policies and set the real interest rate lower than normal, given the rate of inflation. This change in policy can be interpreted as a downward shift of the Reserve Bank's policy reaction function. Given the rate of inflation, a lower-than-normal setting of the real interest rate will lead to higher levels of expenditure and equilibrium output. Therefore, a downward shift of the

Reserve Bank's policy reaction function causes the AD curve to shift to the right.

CONCEPT CHECK 11.2

Explain why a shift in monetary policy like that shown in Figure 11.3 can be interpreted as a decline in the Reserve Bank's long-run 'target' for the inflation rate. (*Hint:* In the long run, the real interest rate set by the Reserve Bank must be consistent with the real interest rate determined in the market for saving and investment.)

11.1.4 SHIFTS OF THE AGGREGATE DEMAND CURVE VERSUS MOVEMENTS ALONG THE AGGREGATE DEMAND CURVE

We end Section 11.1 by reviewing and summarising the important distinction between *movements along* the AD curve and *shifts of* the AD curve.

The downward slope of the AD curve captures the inverse relationship between inflation, on the one hand, and equilibrium output, on the other. As we have seen, a rise in the inflation rate leads the Reserve Bank to raise the real interest rate, according to its policy reaction function. The higher real interest rate, in turn, depresses planned spending and hence lowers equilibrium output. The downward slope of the AD curve embodies this relationship between inflation, spending and output. Hence, changes in the inflation rate, and the resulting changes in the real interest rate and equilibrium output, are represented by *movements along* the AD curve. In particular, as long as the Reserve Bank sets the real interest rate in accordance with a fixed policy reaction function, changes in the real interest rate will *not* shift the AD curve.

However, any factor that changes the equilibrium level of output *at a given level of inflation* will *shift* the AD curve—to the right if equilibrium output increases or to the left if equilibrium output decreases. We have identified two factors that can shift the AD curve: exogenous changes in spending (i.e. changes in spending unrelated to output or the real interest rate) and changes in the Reserve Bank's policy reaction function. An exogenous increase in spending or a downward shift of the Reserve Bank's policy reaction function increases equilibrium output at every level of inflation, hence, shifting the AD curve to the right. An exogenous decline in spending or an upward shift in the Reserve Bank's policy reaction function decreases short-run equilibrium output at every level of inflation, shifting the AD curve to the left.

CONCEPT CHECK 11.3

What is the difference, if any, between the following?

a) An upward shift in the Reserve Bank's policy reaction function.

b) A response by the Reserve Bank to higher inflation, for a given policy reaction function.

How does each scenario affect the AD curve?

▹▹ RECAP

The aggregate demand (AD) curve shows the relationship between equilibrium output and inflation. Higher inflation leads the Reserve Bank to raise the real interest rate, which reduces exogenous expenditure and thus short-run equilibrium output. Therefore, the AD curve slopes downwards.

The AD curve may also slope downwards for the following reasons.

1. Higher inflation reduces the real value of money held by the public, reducing wealth and spending.

2. Inflation redistributes resources from less affluent people, who spend a high percentage of their disposable income, to more affluent people, who spend a smaller percentage of disposable income.
3. Higher inflation creates greater uncertainty in planning for households and firms, reducing their spending.
4. For a constant rate of exchange between the dollar and other currencies, rising prices of domestic goods and services reduce foreign sales and hence net exports (a component of aggregate spending).

An exogenous increase in spending raises equilibrium output at each value of inflation, and so shifts the AD curve to the right. Conversely, an exogenous decrease in spending shifts the AD curve to the left.

A change to an easier monetary policy, as reflected by a downward shift in the Reserve Bank's policy reaction function, shifts the AD curve to the right. A change to a tighter, more anti-inflationary monetary policy, as reflected by an upward shift in the Reserve Bank's policy reaction function, shifts the AD curve to the left.

Assuming no change in the Reserve Bank's reaction function, changes in inflation correspond to *movements along* the AD curve; they do not *shift* the AD curve.

11.2 INFLATION AND SUPPLY DECISIONS

LO 11.4–11.6

So far in this chapter we have focused on how changes in inflation affect spending and short-run equilibrium output, a relationship captured by the AD curve. But we have not yet discussed how inflation itself is determined. In the rest of the chapter we will examine the main factors that determine the inflation rate in modern industrial economies, as well as the options that policymakers have to control inflation; in doing so, we will introduce the *aggregate demand–aggregate supply diagram*.

Physicists have noted that a body will tend to keep moving at a constant speed and direction unless it is acted upon by some outside force—a tendency they refer to as *inertia*. Applying this concept to economics, many observers have noted that inflation seems to be inertial, in the sense that it tends to remain roughly constant as long as the economy is at full employment and there are no external shocks to the price level. In Section 11.2.1 we discuss why inflation behaves in this way.

Just as a physical object will change speed if it is acted on by outside forces, so various economic forces can change the rate of inflation. Later in this section we will discuss three factors that can cause the inflation rate to change. The first is the presence of an *output gap*: inflation tends to rise when there is an expansionary output gap and to fall when there is a contractionary output gap. The second factor that can affect the inflation rate is a shock that directly affects prices, which we will refer to as an *inflation shock*. A large increase in the price of imported oil, for example, raises the price of petrol, heating oil and other fuels, as well as of goods made with oil or services using oil. Finally, the third factor that directly affects the inflation rate is a *shock to potential output*, or a sharp change in the level of potential output—a natural disaster that destroys a significant portion of a country's factories and businesses is one extreme example. Together, inflationary shocks and shocks to potential output are known as **aggregate supply shocks**.

11.2.1 INFLATION INERTIA

In low-inflation industrial economies, inflation tends to change relatively slowly from year to year, a phenomenon that is sometimes referred to as *inflation inertia*. If the rate of inflation in one year is 2 per cent, it may be 3 per cent or even 4 per cent in the next year. But unless the nation experiences very unusual economic conditions, inflation is unlikely to rise to 6 per cent or 8 per cent or fall to –2 per cent in the following year. This relatively sluggish behaviour contrasts sharply with the behaviour of economic variables such as share or commodity prices, which can change rapidly from day to day. For example, oil prices might well rise by 20 per cent over the course of a year and then fall 20 per cent over the next year. Yet, since the early 1990s Australia's inflation rate has generally remained in the range of 2–3 per cent per year.

Why does inflation tend to adjust relatively slowly in modern industrial economies? To answer this question we must consider two closely related factors that play an important role in determining the inflation rate: the behaviour of the public's *inflation expectations* and the existence of *long-term wage and price contracts*.

First, consider the public's expectations about inflation. In negotiating future wages and prices, both buyers and sellers consider the rate of inflation they expect to prevail in the next few years. As a result, today's *expectations* of future inflation may help to determine the future inflation rate. Suppose, for example, that office worker Fred and his boss Colleen agree that Fred's performance this past year justifies an increase of 2 per cent in his real wage for next year. What *nominal*, or dollar, wage increase should they agree on? If Fred believes that inflation is likely to be 3 per cent over the next year he will ask for a 5 per cent increase in his nominal wage, to obtain a 2 per cent increase in his real wage. If Colleen agrees that inflation is likely to be 3 per cent she should be willing to go along with a 5 per cent nominal increase, knowing that it implies only a 2 per cent increase in Fred's real wage. Thus, the rate at which Fred and Colleen *expect* prices to rise affects the rate at which at least one price—Fred's nominal wage—*actually* rises.

A similar dynamic affects contracts for production inputs other than labour. For example, if Colleen is negotiating with her office supply company, the prices she will agree to pay for next year's deliveries of copying paper and staples will depend on what she expects the inflation rate to be. If Colleen anticipates that the price of office supplies will not change relative to the prices of other goods and services, and that the general inflation rate will be 3 per cent, then she should be willing to agree to a 3 per cent increase in the price of office supplies. On the other hand, if she expects the general inflation rate to be 6 per cent, then she will agree to pay 6 per cent more for copying paper and staples next year, knowing that a nominal increase of 6 per cent implies no change in the price of office supplies relative to other goods and services.

Economy-wide, then, the higher the expected rate of inflation, the more nominal wages and the cost of other inputs will tend to rise. But, if wages and other costs of production grow rapidly in response to expected inflation, firms will have to raise their prices rapidly as well, in order to cover their costs. Thus, a high rate of expected inflation tends to lead to a high rate of actual inflation. Similarly, if expected inflation is low, leading wages and other costs to rise relatively slowly, actual inflation should be low as well.

CONCEPT CHECK 11.4

Assume that employers and workers agree that real wages should rise by 2 per cent next year.

a) If inflation is expected to be 2 per cent next year, what will happen to nominal wages next year?
b) If inflation is expected to be 4 per cent next year, rather than 2 per cent, what will happen to nominal wages next year?
c) Use your answers from parts (a) and (b) to explain how an increase in expected inflation will tend to affect the following year's actual rate of inflation.

The conclusion that actual inflation is partly determined by expected inflation raises the question of what determines inflation expectations. To a great extent, people's expectations are influenced by their recent experience. If inflation has been low and stable for some time, people are likely to expect it to continue to be low. But if inflation has recently been high, people will expect it to continue to be high. If inflation has been unpredictable, alternating between low and high levels, the public's expectations will likewise tend to be volatile, rising or falling with news or rumours about economic conditions or economic policy.

Figure 11.4 illustrates schematically how low and stable inflation may tend to be self-perpetuating. As the figure shows, if inflation has been low for some time, people will continue to expect low inflation. Increases in nominal wages and other production costs will thus tend to be small. If firms raise prices only by enough to cover costs, then actual inflation will be low, as expected. This low actual rate will in turn promote low expected inflation, perpetuating the ‘virtuous circle’. The same logic applies in reverse in an economy with high inflation: a persistently high inflation rate leads the public to expect high inflation, resulting in higher increases in nominal wages and other production costs. This in turn contributes to a high rate of actual inflation, and so on, in a vicious circle. This role of inflation expectations in the determination of wage and price increases helps to explain why inflation often seems to adjust slowly.

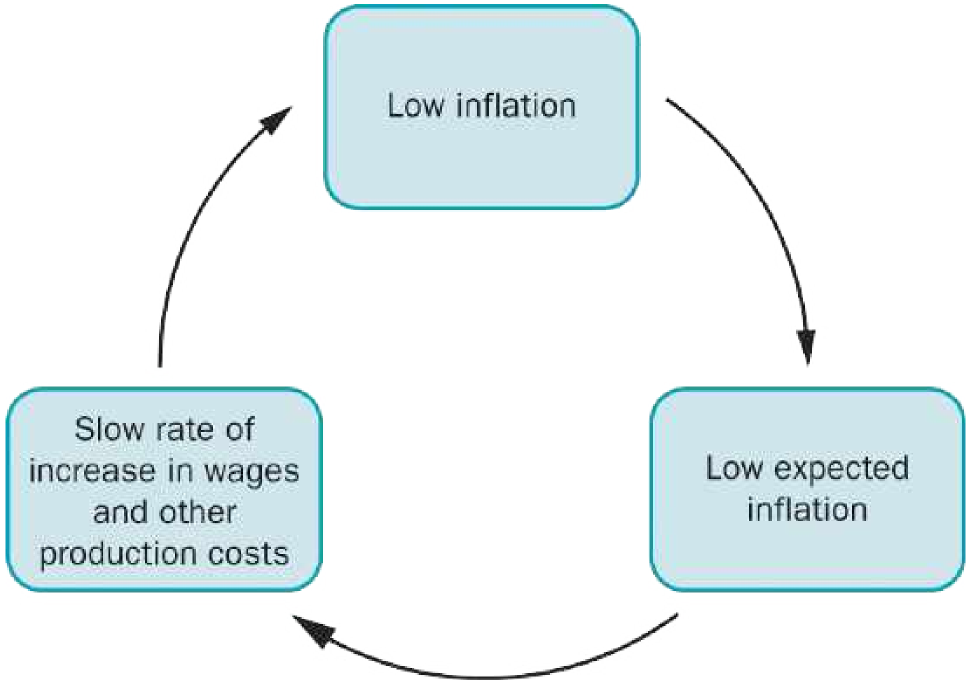


Figure 11.4 **A 'virtuous circle' of low inflation and low expected inflation**

Note: Low inflation leads people to expect low inflation in future. As a result, they agree to accept small increases in wages and in the prices of the goods and services they supply, which keeps inflation—and expected inflation—low. In a similar way, high inflation leads people to expect high inflation, which in turn tends to produce high inflation.

The role of inflation expectations in the slow adjustment of inflation is strengthened by a second key element, the existence of *long-term wage and price contracts*. Wage contracts, for example, often extend for two or three years into the future. Likewise, contracts that set the prices manufacturing firms pay for parts and raw materials often cover several years. Long-term contracts serve to 'build in' wage and price increases that depend on inflation expectations at the time the contracts were signed. For example, a union negotiating in a high-inflation environment is much more likely to demand a rapid increase in nominal wages over the life of the contract than it would in an economy in which prices are stable.

We can summarise this discussion in a more formal manner in the following way. Let π_t^e represent the rate of inflation that is expected in period *t*. Based on the discussion above, we will assume that expectations of inflation are based on people's most recent experience of actual inflation; this will be the actual inflation rate observed in the previous period. A convenient way of writing this assumption is in the form of a simple equation:

$$\pi_t^e = \pi_{t-1}$$

Equation 11.1

Next we write down an equation that describes the way in which expectations of inflation affect the actual inflation rate, assuming any other factor that might affect inflation remains unchanged. Figure 11.4 showed how a particular expected rate of inflation is assumed to flow through to wages and other production costs to affect the actual rate of inflation. Equation 11.2 describes this process.

$$\pi_t = \pi_t^e + \varepsilon_t$$

Equation 11.2

Equation 11.2 implies that the expected inflation rate, π_t^e flows through directly into the actual inflation rate, π_t. You can see that there is a second term on the right-hand side of Equation 11.2, ε_t; this is a *random error term*. If you were to write down the list of numbers, ε_t, each period for, say, 20 periods, what you would have is a sequence of random numbers with no observable pattern or statistical regularities. This means that there is no way to predict in advance what value ε_t might take.

Why is a random error term included in Equation 11.2? The reason is that in practice the expected rate of inflation is unlikely to equal the actual rate of inflation exactly. Although a great deal of time and effort (and sometimes money) is put into predicting what next period's inflation rate will be, in practice such exercises are never infallible. Unpredictable events can occur that affect the actual rate of inflation. As a result, the actual rate of inflation and the expected rate of inflation are almost certain to differ. But if they differ because of events that could not have been predicted, the best statistical representation of such events will be a sequence of random (unpredictable) numbers. For this reason, economists have found it useful to include a random error term such as ε_t when analysing the relation between actual and expected inflation.

If we combine Equations 11.1 and 11.2 we have a simple representation of inflation that shows clearly the existence of inflation inertia:

$$\pi_t = \pi_{t-1} + \varepsilon_t \qquad \textbf{Equation 11.3}$$

Equation 11.3 captures the idea of inflation inertia. According to the equation, inflation in period *t* can be expected to mirror inflation in the previous period, $t - 1$. The presence of the random error term, ε_t, reminds us that events may occur that are unexpected and that have the effect of making actual inflation not necessarily exactly equal to last period's inflation.

One good way of checking whether Equation 11.3 is an accurate representation of what happens in the economy is to construct a scatter diagram in which inflation in the current and immediate past periods are plotted on the respective axes. According to Equation 11.3, such a scatter diagram would *on average* look as if the data are arranged on a 45-degree line from the origin (signifying that this period's inflation is equal to last period's inflation). Note we say that the data should lie on a 45-degree line *on average*. This is because the random error term, ε_t, means that the data cannot be expected to lie exactly on a 45-degree line—remember, random, unpredictable events can cause expected inflation to differ from what was observed in the previous period.

Figure 11.5 plots data for Australia's inflation rate for each quarter since 1961. The data are arranged so that the current quarter's inflation rate, which is measured on the vertical axis, is paired with the inflation rate that existed in the previous quarter, measured on the horizontal axis. As you can see from the diagram, the data lie close to the 45-degree line from the origin. Indeed, to the extent that the data differ from the 45-degree line, those differences do appear to be random. This suggests that our simple model of inflation inertia, captured in Equations 11.1, 11.2 and 11.3, is broadly consistent with what we actually observe.

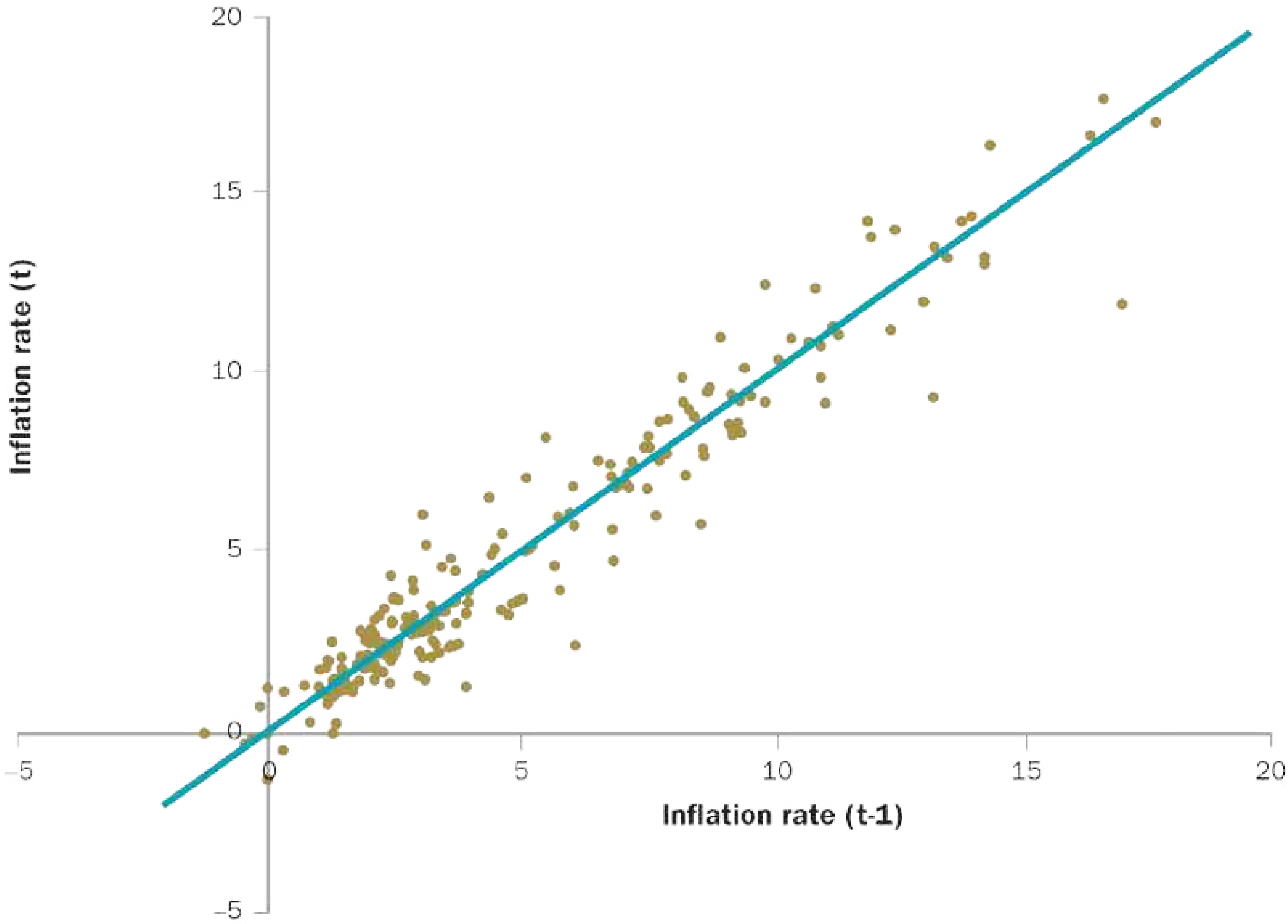


Figure 11.5 **Australia's inertial inflation rate**

Note: Inflation inertia is indicated by a scatter diagram of data representing this period's inflation rate and last period's inflation rate lying close to a 45-degree line drawn from the origin.

Source: Based on data from Reserve Bank of Australia n.d., 'Statistical tables', www.rba.gov.au/statistics/tables/index.html#prices_inflation.

CONCEPT CHECK 11.5

Based on Figures 11.4 and 11.5, discuss why the Reserve Bank has a strong incentive to maintain a low inflation rate in the economy.

Although the rate of inflation tends to be inertial, it does of course change over time. The following section discusses a key factor causing the inflation rate to change.

11.2.2 OUTPUT GAPS AND INFLATION

An important factor influencing the rate of inflation is the output gap, reflecting the difference between actual output and potential output, $100 \times \left(\frac{Y - Y^*}{Y^*}\right)$. Note that going forward, we drop the '100 ×' from the expression for the output gap.

FIND ONLINE

We have seen that, in the short run, firms will meet the demand for their output at previously determined prices. For example, Lisa's Ice-cream Store (see Chapter 6) will serve ice-cream to any customer who comes into the shop at the prices posted behind the counter. The level of output that is determined by the demand at preset prices is called short-run equilibrium output.

At a particular time, the level of short-run equilibrium output may happen to equal the economy's long-run productive capacity, or potential output. But that is not necessarily the case. Output may exceed potential output, giving rise to an expansionary gap, or it may fall short of potential output, producing a contractionary gap. Let us consider what happens to inflation in each of these three possible cases: no output gap, an expansionary gap and a contractionary gap.

If actual output equals potential output, by definition, there is no output gap. When the output gap is zero, firms are satisfied, in the sense that their sales equal their normal production rates. As a result, firms have no incentive either to reduce or increase their prices *relative* to the prices of other goods and services. However, the fact that firms are satisfied with their sales does not imply that inflation—the rate of change in the overall price level—is zero.

To see why, let us go back to the idea of inflation inertia. Suppose that inflation has recently been steady at 3 per cent per year, so that the public has come to expect an inflation rate of 3 per cent per year. If the public's inflation expectations are reflected in the wage and price increases agreed to in long-term contracts, then firms will find that their labour and materials costs are rising at 3 per cent per year. To cover their costs, firms will need to raise their prices by 3 per cent per year. Note that if all firms are raising their prices by 3 per cent per year, the *relative* prices of various goods and services in the economy—say, the price of ice-cream relative to the price of a taxi ride—will not change. Nevertheless, the economy-wide rate of inflation equals 3 per cent, the same as in previous years. We conclude that, *if the output gap is zero, the rate of inflation will tend to remain the same*.

Suppose instead that an expansionary gap exists, so that most firms' sales exceed their normal production rates. As we might expect in situations in which the quantity demanded exceeds the quantity firms desire to supply, firms will ultimately respond by trying to increase their relative prices. To do so, they will increase their prices by *more* than the increase in their costs. If all firms behave this way, then the general price level will begin to rise more rapidly than before. Thus, *when an expansionary gap exists, the rate of inflation will tend to increase*.

Finally, if a contractionary gap exists, firms will be selling an amount less than their capacity to produce, and they will have an incentive to cut their relative prices, so they can sell more. In this case, firms will raise their prices less than needed to cover fully their increases in costs, as determined by the existing inflation rate. As a result, *when a contractionary gap exists, the rate of inflation will tend to decrease*. These important results are summarised in the recap for this section.

To reflect this tendency for inflation to change when there are output gaps, we need to modify Equation 11.3 . Remember, this equation captured the idea of inflation inertia: that inflation for one period would be the same as it was for the previous period except for some random error term. To incorporate the notion that output gaps change inflation we can use Equation 11.4 :

$$\pi_t = \pi_{t-1} + \gamma\left(\frac{Y_t - Y_t^*}{Y_t^*}\right) + \varepsilon_t$$

Equation 11.4

The term γ in Equation 11.4 is a fixed, positive number that reflects the responsiveness of inflation to an output gap. The larger is γ, the greater is the change in inflation in response to a particular size of output gap.

Equation 11.4 incorporates both inflation inertia, the idea that inflation in one period is closely linked to inflation in the previous period, and the idea that output gaps cause inflation to change. Suppose there was no output gap. Equation 11.4 would then look exactly the same as Equation 11.3 — inflation would be no different this period from last period other than some random variation. If, however, a contractionary output gap opened, so that real GDP, Y_t, fell below potential GDP, Y_t^*, the term in brackets in Equation 11.4 would be a negative number. Reading from Equation 11.4, and ignoring the random error term, we would expect that the current inflation rate, π_t, would fall below its value from the previous period, π_{t-1}. In other words, inflation would start to fall. An expansionary output gap, where real GDP, Y_t, exceeded potential GDP, Y_t^*, would, according to Equation 11.4, cause current inflation, π_t, to be above π_{t-1}; the inflation rate would increase.

There is another important implication of Equation 11.4. Look carefully at the right-hand side of the equation. Noting that γ is a positive number, Equation 11.4 implies that with any positive output gap, be it large or small, inflation in the current period will most likely be higher than inflation in the previous period (we can't say this with complete certainty because we do not know what value the random error term might take; for example, it could be a large negative number, thus dragging inflation down despite the positive output gap). Likewise, if we ignore the random error term, any negative output gap will imply that inflation in this period will be lower than in the previous period. In other words, inflation inertia exists if the output gap is zero. If any output gap exists, inflation will be changing.

EXAMPLE 11.1 – SPENDING CHANGES AND INFLATION

In Chapters 6 and 7 we saw that changes in spending can create expansionary or contractionary gaps. Therefore, based on the discussion above, we can conclude that changes in spending also lead to changes in the rate of inflation. If the economy is currently operating at potential output, what effect will a fall in consumer confidence that makes consumers less willing to spend at each level of disposable income have on the rate of inflation in the economy?

A decrease in exogenous consumption spending, $\overline{C}$, for a given level of inflation, output and real interest rates, reduces aggregate expenditure and short-run equilibrium output. If the economy was originally operating at potential output, the reduction in consumption will cause a contractionary gap, since actual output, Y, will now be less than potential output, Y^*. As indicated above, when $Y < Y^*$, the rate of inflation will tend to fall because firms' sales fall short of normal production rates, leading them to slow down the rate at which they increase their prices.

CONCEPT CHECK 11.6

Suppose that firms become optimistic about the future and decide to increase their investment in new capital. What effect will this have on the rate of inflation, if the economy is currently operating at potential output?

▹▹ RECAP

In the absence of external shocks, inflation tends to remain relatively stable over time—at least in low-inflation industrial economies like that of Australia. In other words, inflation is *inertial* (or, as some people put it, 'sticky'). Inflation tends to be inertial for two main reasons. The first is the behaviour of people's expectations of inflation. A low inflation rate leads people to expect low inflation in the future, which results in reduced pressure for wage and price increases. Similarly, a high inflation rate leads people to expect high inflation in the future, resulting in more rapid increases in wages and prices. Second, the effects of expectations are reinforced by the existence of long-term wage and price contracts, which is the second reason inflation tends to be stable over time. Long-term contracts tend to build in the effects of people's inflation expectations.

An important influence on what happens to inflation is the size and direction of any output gap (a difference between potential and actual GDP). Expansionary output gaps are associated with rising inflation, as firms raise prices in response to high demand. A contractionary gap is associated with falling inflation as firms moderate price increases to try to attract more demand. All else being equal, inflation will be unchanged if there is no output gap.

11.3 THE AGGREGATE DEMAND–AGGREGATE SUPPLY DIAGRAM

LO 11.6–11.9

The adjustment of inflation in response to an output gap can be shown conveniently in a diagram. Figure 11.6, drawn with inflation π on the vertical axis and real output Y on the horizontal axis, is an example of an aggregate demand–aggregate supply diagram (or AD–AS diagram). The diagram has three elements, one of which is the downward-sloping AD curve, introduced earlier in the chapter. Recall that the AD curve shows how planned aggregate spending, and hence short-run equilibrium output, depends on the inflation rate. The second element is a vertical line marking the economy's potential output Y^*. Because potential output represents the economy's long-run productive capacity, we will refer to this vertical line as the **long-run aggregate supply (LRAS) line**.

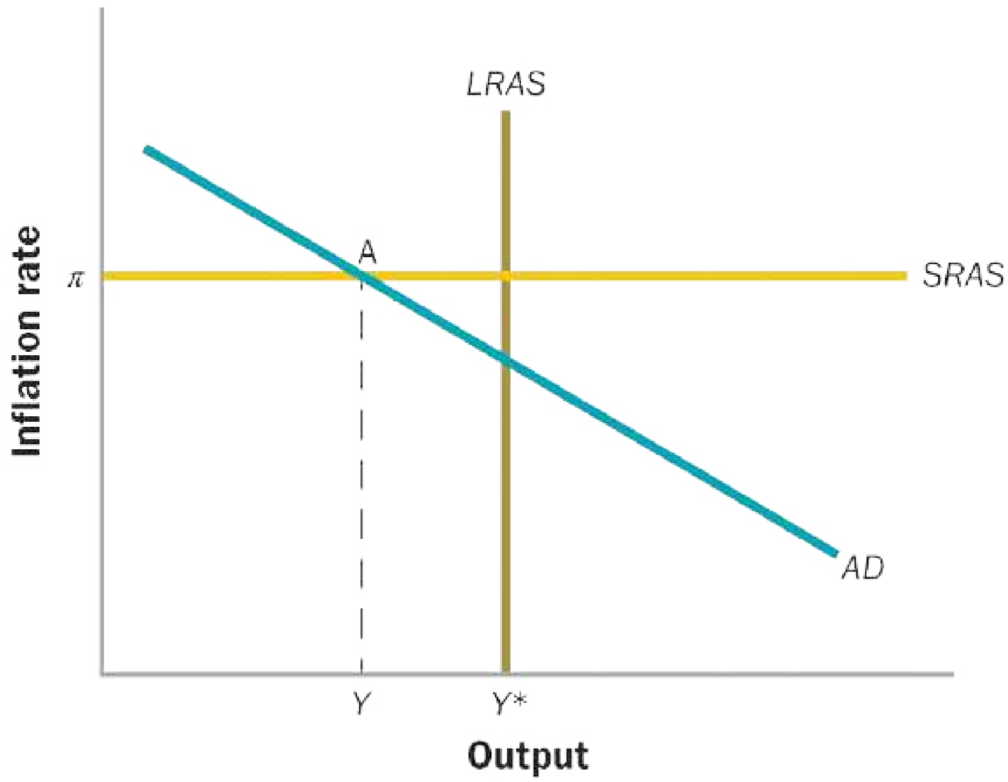


Figure 11.6 **The aggregate demand–aggregate supply (AD–AS) diagram**

Note: The diagram has three elements: The aggregate demand curve (*AD*), which shows how **short-run equilibrium** output depends on inflation; the long-run aggregate supply line (*LRAS*), which marks the economy's potential output *Y**; and the short-run aggregate supply line (*SRAS*), which shows the current value of inflation, π. The short-run equilibrium output, which is equal to *Y* here, is determined by the intersection of *AD* and *SRAS* (point A). Because actual output, *Y*, is less than potential output, *Y**, this economy has a contractionary gap.

The third element in Figure 11.6, and a new one, is the **short-run aggregate supply line**, labelled *SRAS* in the diagram. *SRAS* is a horizontal line that shows the current rate of inflation in the economy, which in the figure is labelled π. We can think of the current rate of inflation as having been determined by expectations of inflation and past pricing decisions. The short-run aggregate supply line is horizontal because in the model we assume that in the short run, producers supply whatever output is demanded at preset prices.

The AD–AS diagram can be used to determine the level of output prevailing at any particular time. As we have seen, the inflation rate at any moment is given directly by the position of the SRAS line—for example, current inflation equals π in Figure 11.6. To find the current level of output, recall that the AD curve shows the level of short-run equilibrium output at any given rate of inflation. Since the inflation rate in this economy is π, we can infer from Figure 11.6 that short-run equilibrium output must equal *Y*, which corresponds to the intersection of *AD* and *SRAS* (point A in the figure). Notice that in Figure 11.6, short-run equilibrium output *Y* is smaller than potential output *Y**, so there is a contractionary gap in this economy.

The intersection of the AD curve and the SRAS line (point A in Figure 11.6) is referred to as the point of short-run equilibrium in this economy. When the economy is in short-run equilibrium, inflation equals the value determined by past expectations and past pricing decisions, and output equals the level of short-run equilibrium output that is consistent with that inflation rate.

Although the economy may be in short-run equilibrium at point A in Figure 11.6, it will not remain there. The reason is that at point A, the economy is experiencing a contractionary gap (output is less than potential output, as indicated by *LRAS*). As we have just seen, when a contractionary gap exists, firms are not selling as much as they would like to and so they slow down the rate at which they increase their prices. Eventually, the low level of aggregate demand that is associated with a recessionary gap causes the inflation rate to fall.

The adjustment of inflation in response to a recessionary gap is shown graphically in Figure 11.7. As inflation declines, the SRAS line moves downward, from *SRAS to SRAS′*. Because of inflation inertia (caused by the slow adjustment of the public's inflation expectations and the existence of long-term contracts), inflation adjusts downward only gradually. However, as long as a contractionary gap exists, inflation will continue to fall, and the SRAS line will move downward until it intersects the AD curve at point B in the figure. At that point, actual output equals potential output and the contractionary gap has been eliminated. Because there is no further pressure on inflation at point B, the inflation rate stabilises at the lower level. A situation like that represented by point B in Figure 11.7, in which the inflation rate is stable and actual output equals potential output, is referred to as 'long-run equilibrium of the economy'. Long-run equilibrium occurs when the AD curve, the SRAS line and the LRAS line all intersect at a single point.

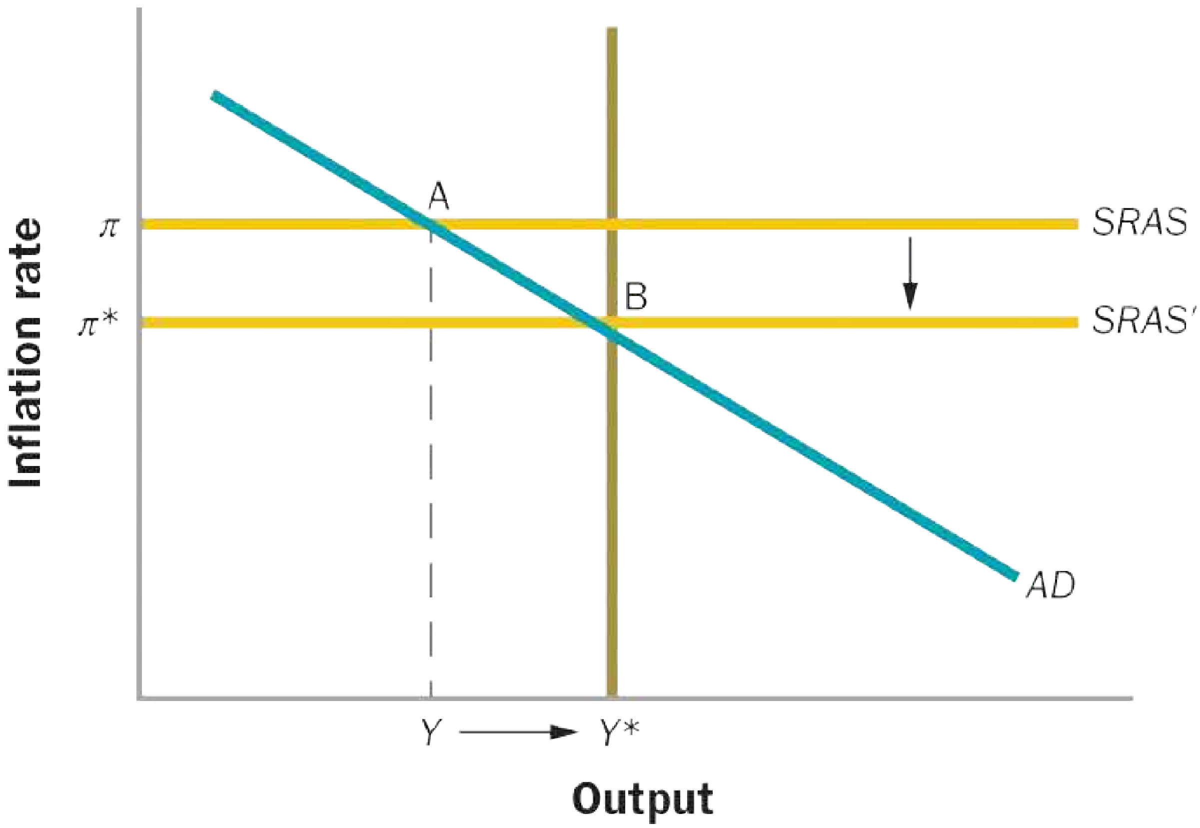


Figure 11.7 **The adjustment of inflation when a contractionary gap exists**

Note: At the initial short-run equilibrium point A, a contractionary gap exists, which puts downward pressure on inflation. As inflation gradually falls, *SRAS* moves downward until it reaches *SRAS′*, and actual output equals potential output (point B). Once the contractionary gap has been eliminated, inflation stabilises at π*, and the economy settles into long-run equilibrium at the intersection of *AD*, *LRAS* and *SRAS′* (point B).

Figure 11.7 illustrates the important point that when a recessionary gap exists, inflation will tend to fall. It also shows that as inflation declines, short-run equilibrium output rises, increasing gradually from *Y* to *Y** as the short-run equilibrium point moves down the AD curve. The source of this increase in output is the behaviour of the Reserve Bank, which lowers the real interest rate as inflation falls, stimulating aggregate demand. Falling inflation stimulates spending and output in other ways, such as by reducing uncertainty. As output rises cyclical unemployment, which by Okun's law is proportional to the output gap, also declines. This process of falling inflation, falling real interest rates, rising output, and falling unemployment continues until the economy reaches full employment at point B in Figure 11.7, the economy's long-run equilibrium point.

What happens if, instead of a contractionary gap, the economy has an expansionary gap, with output greater than potential output? An expansionary gap would cause the rate of inflation to rise, as firms respond to high demand by raising their prices more rapidly than their costs are rising. In graphical terms, an expansionary gap would cause the SRAS line to move upward over time. Inflation and the SRAS line would continue to rise until the economy reached long-run equilibrium, with actual output equal to potential output. This process is illustrated in Figure 11.8. Initially, the economy is in short-run equilibrium at point A, where $Y > Y^*$ (an expansionary gap). The expansionary gap causes inflation to rise over time; graphically, the short-run aggregate supply line moves upward, from *SRAS* to *SRAS′*. As the SRAS line rises, short-run equilibrium output falls—the result of the Reserve Bank's tendency to increase the real interest rate when inflation rises. Eventually the SRAS line intersects the AD curve and LRAS line at point B, where the economy reaches long-run equilibrium, with no output gap and stable inflation.

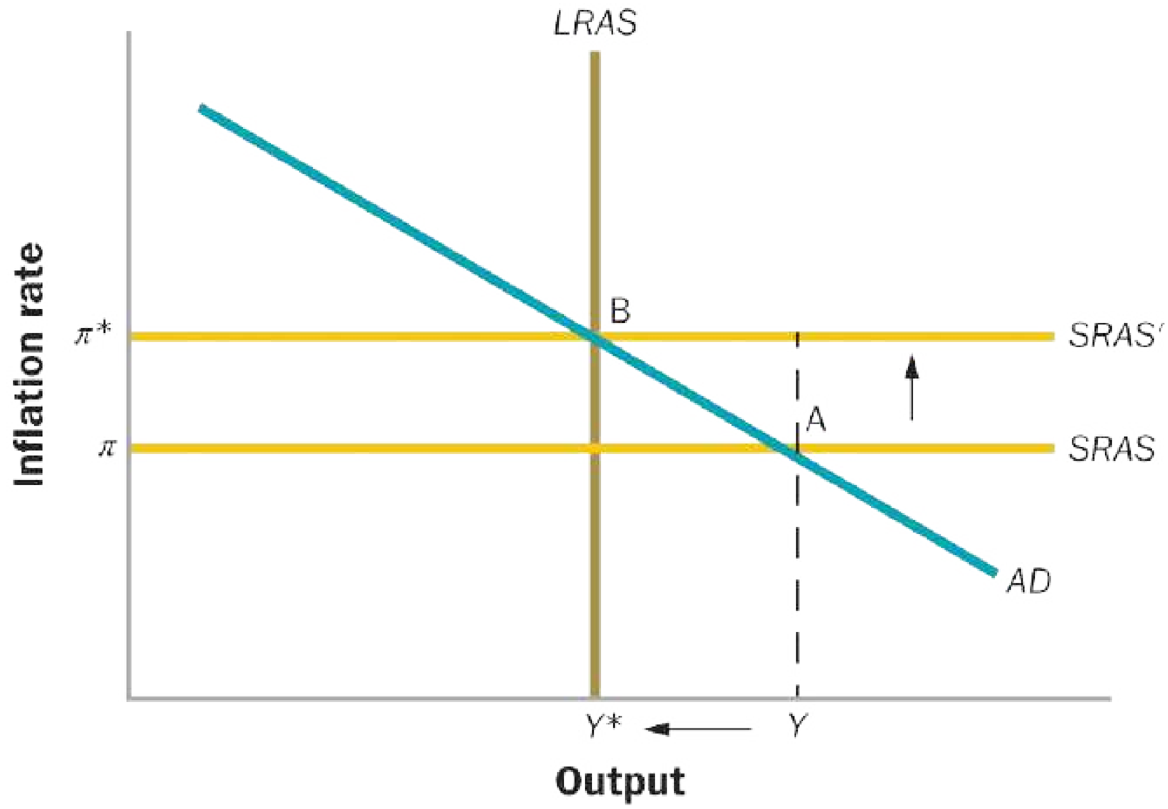


Figure 11.8 **The adjustment of inflation when an expansionary gap exists**

Note: At the initial short-run equilibrium point A, an expansionary gap exists. Inflation rises gradually (*SRAS* moves upward) and output falls. The process continues until the economy reaches long-run equilibrium at point B, where inflation stabilises and the output gap is eliminated.

11.4 THE SELF-CORRECTING ECONOMY

LO 11.7

Our analysis of Figures 11.7 and 11.8 makes an important general point: the economy tends to be self-correcting in the long run. In other words, given enough time, output gaps tend to disappear without changes in monetary or fiscal policy (other than the change in the real interest rate embodied in the Reserve Bank's policy reaction function). Expansionary output gaps are eliminated by rising inflation, while recessionary output gaps are eliminated by falling inflation. This result contrasts sharply with the basic Keynesian model, which does not include a self-correcting mechanism. The difference in results is explained by the fact that the basic Keynesian model concentrates on the short-run period, during which prices do not adjust, and does not consider the changes in prices and inflation that occur over a longer period.

Does the economy's tendency to self-correct imply that aggressive monetary and fiscal policies are not needed to stabilise output? The answer to this question depends crucially on the speed with which the self-correction process takes place. If self-correction takes place very slowly, so that actual output differs from potential for protracted periods, then active use of monetary and fiscal policy can help to stabilise output. But if self-correction is rapid, then active stabilisation policies are probably not justified in most cases, given the lags and uncertainties that are involved in policymaking in practice. Indeed, if the economy returns to full employment quickly, then attempts by policymakers to stabilise spending and output may end up doing more harm than good, for example, by causing actual output to 'overshoot' potential output.

The speed with which a particular economy corrects itself depends on a variety of factors, including the prevalence of long-term contracts and the efficiency and flexibility of product and labour markets. However, a reasonable conclusion is that the greater the initial output gap, the longer the economy's process of self-correction will take. This observation suggests that stabilisation policies should not be used actively to try to eliminate relatively small output gaps, but that they may be quite useful in remedying large gaps —for example, when the unemployment rate is exceptionally high.

▹▹ RECAP

INFLATION, AD–AS AND THE SELF-CORRECTING ECONOMY

- The economy is in short-run equilibrium when inflation equals the value determined by past expectations and pricing decisions, and output equals the level of short-run equilibrium output that is consistent with that inflation rate. Graphically, short-run equilibrium occurs at the intersection of the AD curve and the SRAS line. We refer to the fact that inflation is determined by past inflation (which affects past expectations and pricing decisions) as ‘inflation inertia’.

- The economy is in long-run equilibrium when actual output equals potential output (there is no output gap) and the inflation rate is stable. Graphically, long-run equilibrium occurs when the AD curve, the SRAS line and the LRAS line intersect at a common point.
- Inflation adjusts gradually to bring the economy into long-run equilibrium (a phenomenon called the ‘economy’s self-correcting tendency’). Inflation rises to eliminate an expansionary gap and falls to eliminate a recessionary gap. Graphically, the SRAS line moves up or down as needed to bring the economy into long-run equilibrium.
- The more rapid the self-correction process, the less need for active stabilisation policies to eliminate output gaps. In practice, policymakers’ attempts to eliminate output gaps are more likely to be helpful when the output gap is large than when it is small.

11.5 SOURCES OF INFLATION

LO 11.8

We have seen that inflation can rise or fall in response to an output gap. But what creates the output gaps that give rise to changes in inflation? And are there factors besides output gaps that can affect the inflation rate? In this section, we use the AD–AS diagram to explore the ultimate sources of inflation. We first discuss how excessive growth in aggregate spending can spur inflation; then we turn to factors operating through the supply side of the economy.

11.5.1 EXCESSIVE AGGREGATE SPENDING

One important source of inflation in practice is excessive aggregate spending—or, in more colloquial terms, 'too much spending chasing too few goods'. Example 11.2 illustrates.

EXAMPLE 11.2

Government expenditure: Can the Reserve Bank do anything to prevent inflation caused by excessive

government spending?

Large increases in government spending are sometimes associated with increased inflation. Explain why, using the AD–AS diagram. Can the Reserve Bank do anything to prevent the increase in inflation caused by excessive government expenditure?

Large increases in government spending are potentially inflationary because total demand might increase relative to the economy's productive capacity. In the face of rising sales, firms increase their prices more quickly, raising the inflation rate.

The two panels of Figure 11.9 illustrate this process. Looking first at Figure 11.9(a), suppose that the economy is initially in long-run equilibrium at point A, where the aggregate demand curve (*AD*) intersects both the short-run and long-run aggregate supply lines (*SRAS* and *LRAS*) respectively. Point A is a long-run equilibrium point, with output equal to potential output and stable inflation. Now suppose that the government decides to spend more, perhaps to honour spending promises made in an election campaign. Increased spending such as this is an increase in government purchases, *G*, an exogenous increase in aggregate expenditure. We saw earlier that, for a given level of inflation, an exogenous increase in spending raises short-run equilibrium output, shifting the AD curve to the right. Figure 11.9(a) shows the AD curve shifting rightward, from *AD* to *AD′*, as the result of increased government expenditure. The economy moves to a new, short-run equilibrium at point B, where *AD′* intersects *SRAS*. Note that at point B, actual output has risen above potential, to $Y > Y^*$, creating an expansionary gap. Because inflation is inertial and does not change in the short run, the immediate effect of the increase in government purchases is only to increase output, just as we saw in the Keynesian cross analysis in Chapter 8, Section 8.1.

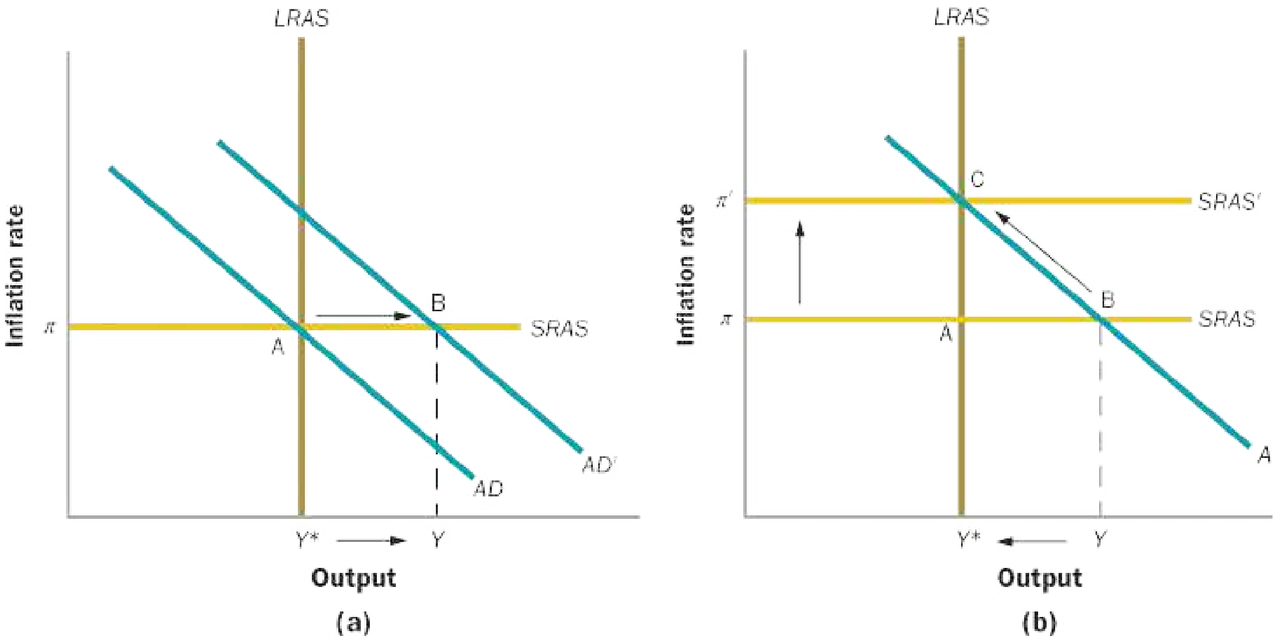


Figure 11.9 **Increased government spending as a source of inflation**

Note: (a) An increase in government spending shifts the AD line to the right, from *AD* to *AD′*. At the new short-run equilibrium point B, actual output has risen above potential output *Y**, creating an expansionary gap. (b) This gap leads to rising inflation, shown as an upward movement of the SRAS line, from *SRAS* to *SRAS′*. At the new long-run equilibrium point C, actual output has fallen back to the level of potential output, but at π′ inflation is higher than it was originally.

The process doesn't stop there, however, because inflation will not remain the same indefinitely. At point B, an expansionary gap exists, so inflation will gradually begin to increase. Figure 11.9(b) shows this increase in inflation as a shift of the SRAS line from its initial position to a higher level, *SRAS′*. When inflation has risen to π′, enough to eliminate the output gap (point C), the economy is back in long-run equilibrium. We see now that the increase in output created by the increased government spending was only temporary. In the long run, actual output has returned to the level of potential output, but at a higher rate of inflation.

Does the Reserve Bank have the power to prevent the increased inflation that is induced by a rise in government spending? The answer is yes. We saw earlier that a decision by the Reserve Bank to set a higher real interest rate at any given level of inflation—an upward shift in the policy reaction function—will shift the AD curve to the left. If the Reserve Bank aggressively tightens monetary policy (shifts its reaction function) as the increased government expenditure proceeds, it can reverse the rightward shift of the AD curve caused by increased government spending. Offsetting the rightward shift of the AD curve in turn avoids the development of an expansionary gap, with its inflationary consequences. The Reserve Bank's policy works because the higher real interest rate it sets at each level of inflation acts to reduce consumption and investment spending. The reduction in private spending offsets the increase in demand by the government, eliminating—or at least moderating—the inflationary impact of the higher government spending.

We should not conclude, by the way, that avoiding the inflationary consequences of higher government spending makes the increase spending costless to society. As we have just noted, inflation can be avoided only if consumption and investment are reduced by a policy of higher real interest rates. Effectively, the private sector must give up some resources so that more of the nation's output can be devoted to government purposes. This reduction in resources reduces both current living standards (by reducing consumption) and future living standards (by reducing investment).

11.5.2 INFLATION SHOCKS

In late 1973, at the time of the Yom Kippur War between Israel and a coalition of Arab nations, the Organization of Petroleum Exporting Countries (OPEC) dramatically cut its supplies of crude oil to the industrialised nations, quadrupling world oil prices. The sharp increase in oil prices was quickly transferred to the price of petrol, heating oil, and goods and services that were heavily dependent on oil, such as air travel. The effects of the oil price increase, together with agricultural shortages that increased the price of food, contributed to a significant rise in the inflation rates of many industrialised nations in 1974.

The increase in inflation in 1974 is an example of what is referred to as an 'inflation shock'. An **inflation shock** is a sudden change in the normal behaviour of inflation, unrelated to the nation's output gap. An inflation shock that causes an increase in inflation, like the large rise in oil prices in 1973, is called an 'adverse inflation shock'. An inflation shock that reduces inflation is called a ‘favourable inflation shock’.

In contrast with the experience of the 1970s, when sharp increases in Page 286 oil prices led to higher inflation, since the mid-1980s the effects of oil price changes on inflation have been much smaller. Thinking as an economist 11.1 gives more details on the economic effects of inflation shocks and discusses explanations for the smaller effects of oil price changes on inflation in more recent years.

THINKING AS AN ECONOMIST 11.1

Why did oil price increases cause inflation to escalate in the 1970s but not in the 2000s?

Having risen in the second half of the 1960s, inflation continued to rise in the 1970s. Already at 6.2 per cent in 1973, inflation jumped to 11.0 per cent in 1974. After subsiding from 1974 to 1978, it began to rise again in 1979, to 11.4 per cent, and reached 13.5 per cent in 1980. Why did inflation increase so much in the 1970s?

We have already described the quadrupling of oil prices in late 1973 and the sharp increases in agricultural prices at about the same time, which together constituted an adverse inflation shock. A second inflation shock occurred in 1979, when the turmoil of the Iranian Revolution restricted the flow of oil from the Middle East and doubled oil prices yet again.

Figure 11.10 shows the effects of an adverse inflation shock on a hypothetical economy. Before the inflation shock occurs, the economy is in long-run equilibrium at point A, at the intersection of *AD*, *LRAS* and *SRAS*. At point A, actual output is equal to potential output Y^*, and the inflation rate is stable at π. However, an adverse inflation shock directly increases inflation so that the SRAS line shifts rapidly upward to *SRAS*′. A new short-run equilibrium is established at point B, where *SRAS*′ intersects the aggregate demand curve, *AD*. In the wake of the inflation shock, inflation rises to π' and output falls, from Y^* to Y'. Thus, an inflation shock creates the worst possible scenario: higher inflation coupled with a contractionary gap. The combination of inflation and recession has been referred to as stagflation, or stagnation plus inflation.

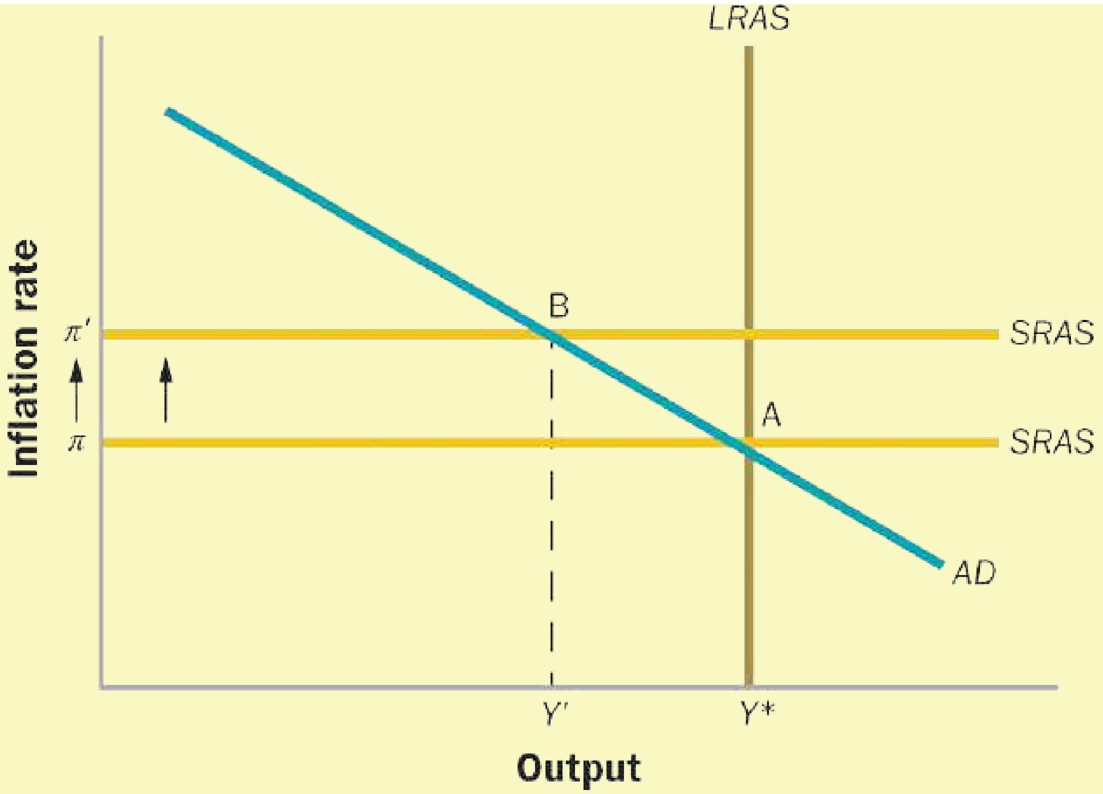


Figure 11.10 **The effects of an adverse inflation shock**

Note: Starting from long-run equilibrium at point A, an adverse inflation shock raises current inflation, causing the SRAS line to shift upwards to *SRAS*′. At the new short-run equilibrium point B, inflation has risen to π′.

An adverse inflation shock poses a difficult dilemma for macroeconomic policymakers. To see why, suppose monetary and fiscal policies were left unchanged following an inflationary shock. In that case, inflation would eventually abate and return to its original level. Graphically, the economy would reach its short-run equilibrium at point B in Figure 11.10 soon after the inflation shock. However, because of the contractionary gap that exists at point B, eventually inflation would begin to drift downward, until finally the contractionary gap is eliminated. Graphically, this decline in inflation would be represented by a downward movement of the SRAS line, from *SRAS′* back to *SRAS*. Inflation would stop declining only when long-run equilibrium is restored, at point A in the figure, where inflation is at its original level of π and output equals potential output.

However, although a 'do-nothing' policy approach would ultimately eliminate both the output gap and the surge in inflation, it would also put the economy through a deep and protracted contraction or recession, as actual output remains below potential output until the inflation adjustment process is completed. To avoid such an economically and politically costly outcome, policymakers might opt to eliminate the contractionary gap more quickly. By aggressively easing monetary policy (more precisely, by shifting down its policy reaction function), for example, the Reserve Bank could shift the AD curve to the right, from *AD* to *AD′*, taking the economy to a new long-run equilibrium, point C in Figure 11.11. This expansionary policy would help to restore output to the full-employment level more quickly, but as the figure shows, it would also allow inflation to stabilise at the new, higher level.

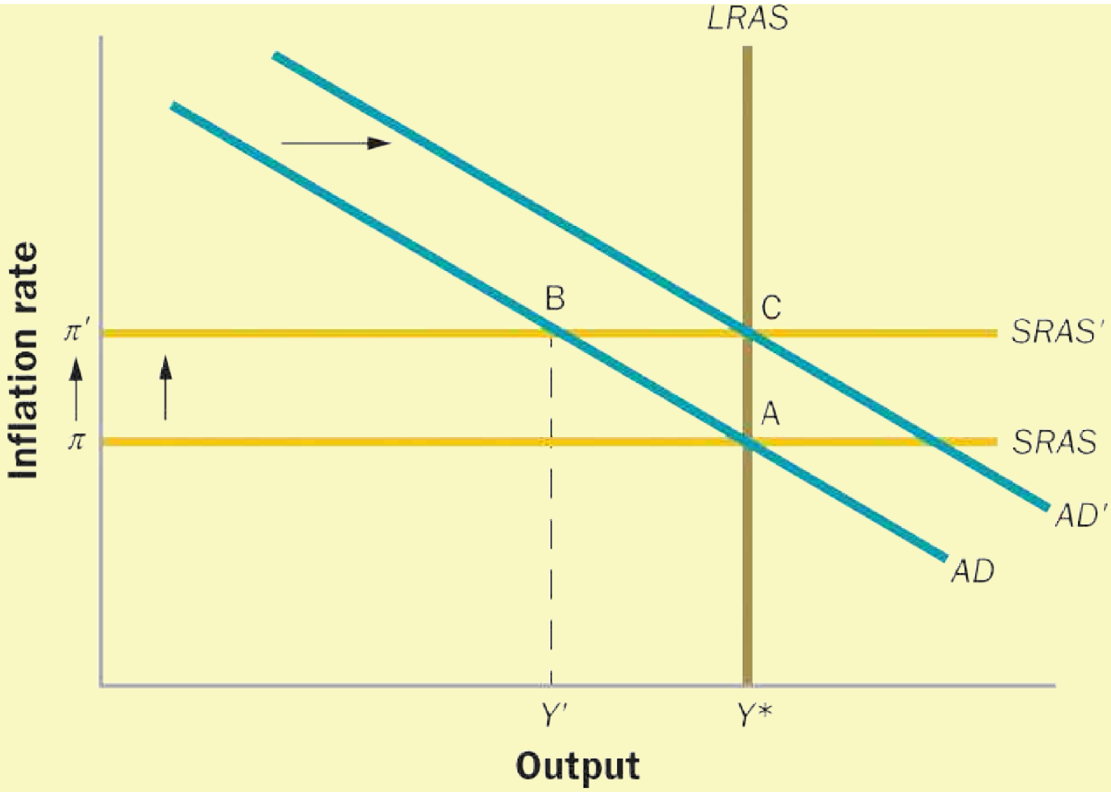


Figure 11.11 **The effects of an aggressive monetary policy response to an adverse inflation shock**

Note: Starting from short-run equilibrium at point B, shifting the AD curve to the right through aggressive monetary policy returns the economy to long-run equilibrium at point C with inflation stabilising at π′.

In sum, inflation shocks pose a true dilemma for policymakers. If they leave their policies unchanged, inflation will eventually subside, but the nation may experience a lengthy and severe recession. If, instead, they act aggressively to expand aggregate spending, the recession will end more quickly, but inflation will stabilise at a higher level.

The 1970s were not the last time, however, that oil prices sharply increased. Since the late 1990s, oil prices have swung even more wildly than in the 1970s, yet inflation has remained relatively stable. Why did the oil price increases of the 2000s not lead to the effects analysed in Figures 11.10 and 11.11?

Economists proposed different answers to this important question, and it appears that for a full explanation, several factors should be combined. For example, the economists Olivier Blanchard and Jordi Galí (2010), who studied this question, focused on the following three explanations for the United States, and concluded that all three are likely to have played an important role. These explanations are likely to also apply to Australia. First, labour markets have become more flexible, and wages less sticky, since the 1970s. If wages and prices adjust more quickly, the economy in Figure 11.10 would return to point A more quickly, even with a do-nothing policy by the Reserve Bank. Second, the share of oil in the economy has declined since the 1970s. With oil less important in both production and consumption, the effects of oil price changes on the economy are expected to be smaller.

Third, and most closely related to the discussion in this chapter, the public's expectations regarding the Reserve Bank's reaction to oil price increases were dramatically different in the 2000s compared with those in the 1970s. Specifically, in the 1970s, people did not believe that the Reserve Bank would return inflation to a low level following an oil price increase. As a result, firms responded by increasing their prices more quickly, and workers demanded wage increases to reflect higher costs of living. But in the 2000s, people were more willing to believe the Reserve Bank was committed to keeping inflation low. Hence, expectations of inflation were much more stable and, as a result, the oil price shocks did not lead to extended periods of increases in wages and other prices.

In Chapter 9, Money, prices and the Reserve Bank, we discussed the long-run relationship between inflation and money growth. The example of an inflation shock shows that inflation does not always originate from excessive money growth; it can arise from a variety of factors. However, our analysis also shows that, in the absence of monetary easing, inflation that arises from factors such as inflation shocks will eventually die away. By contrast, sustained inflation requires that monetary policy remain easy, that is, policymakers allow the money supply to rise rapidly. In this respect, our analysis of this chapter is constant with the earlier long-run analysis, which concluded that sustained inflation is possible only if monetary policy is sufficiently expansionary.

CONCEPT CHECK 11.7

Inflation shocks can also be beneficial for the economy, such as when oil prices declined in the late 1990s. What effect would a decrease in oil prices have on output and inflation?

THINKING AS AN ECONOMIST 11.2

What caused the Great Inflation?

The period roughly from the mid to late 1960s to around the early 1990s is colloquially known as the Great Inflation. During this period the inflation rate in many countries, including Australia, remained stubbornly high. This is illustrated in Figure 11.12, which shows the inflation experience of a variety of countries, highlighting the period of the Great Inflation.

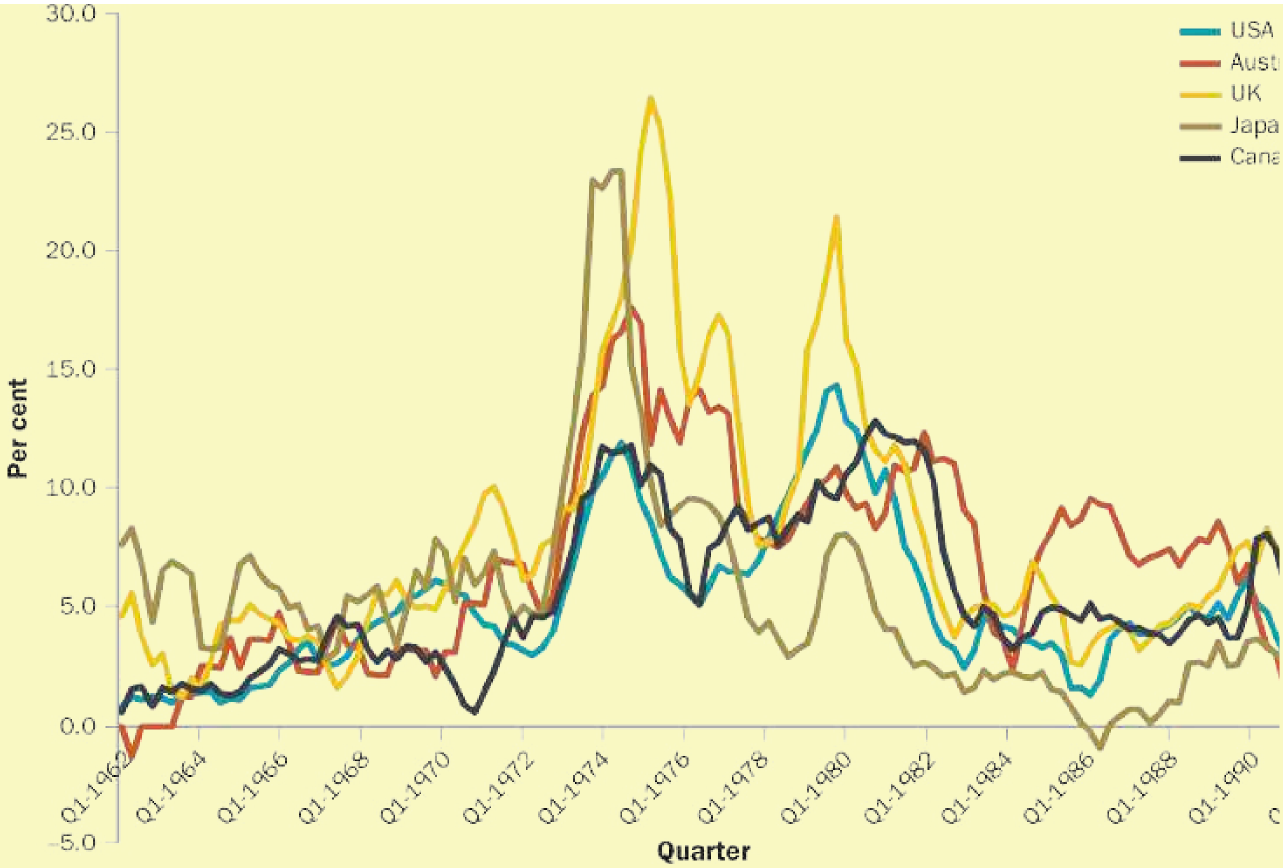


Figure 11.12 **The Great Inflation**

Note: The Great Inflation refers to a prolonged period of relatively high inflation, lasting from roughly the mid-1960s to the early 1990s.

Source: Based on data from US Bureau of Labor Statistics n.d., 'Consumer price index for all urban consumers: All items', retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/CPIAUCSL/; OECD 2010, 'Main economic indicators–complete database', http://dx.doi.org/10.1787/data-00052-en, accessed 13 November 2018.

What explains this increase in inflation? This is a matter of ongoing debate among macroeconomists. Many of the theories focus on the period around 1973–74 (as shown in Figure 11.12, the increase in inflation began some time before that but the 1973–74 rapid increase in inflation was spectacular, so it is understandable why many macroeconomists have focused their attention on that period).

One explanation for why inflation could get out of hand in this period relates to the lack of reliable information available to policymakers on the true state of the economy. This led to mistakes in policy that could have been avoided had policymakers been better informed. Orphanides (2003), for example, in a very influential piece of research, has argued that the key to understanding the Great Inflation is a slowdown that occurred in productivity beginning in the late 1960s leading to a fall in potential GDP. However, up-to-date (or what are known as real-time) data about what is happening to potential GDP are very hard to come by. What policymakers saw at the time looked like an economic contraction. In fact, when potential output falls the economy experiences not a contractionary output gap but instead an expansionary output gap. Failure to appreciate this led policymakers to adopt the wrong policies. To quote from Orphanides' paper, 'The dismal economic outcomes of the Great Inflation may have resulted from an unfortunate pursuit of activist policies in the face of bad measurement, specifically, overoptimistic assessments of the output gap associated with the productivity slowdown of the late 1960s and early 1970s'. We illustrate Orphanides' argument in Figures 11.13 and 11.14.

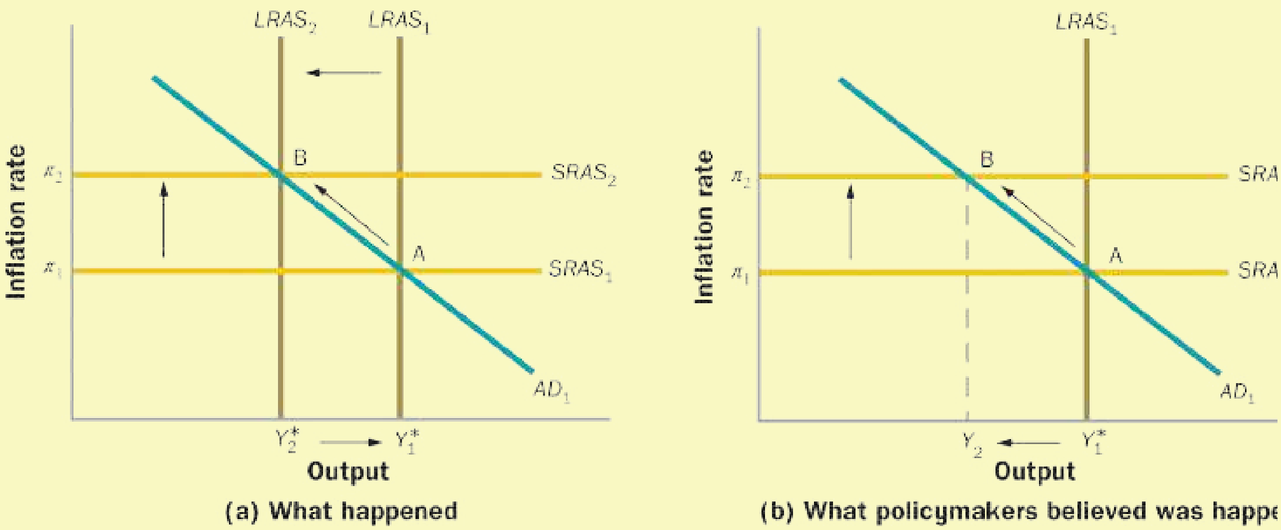


Figure 11.13 **Policy mistakes as an explanation for the Great Inflation**

Note: While a productivity slowdown in the early 1970s meant a fall in potential GDP and an expansionary output gap, policymakers mistakenly thought that they were observing a fall in aggregate demand and a contractionary output gap.

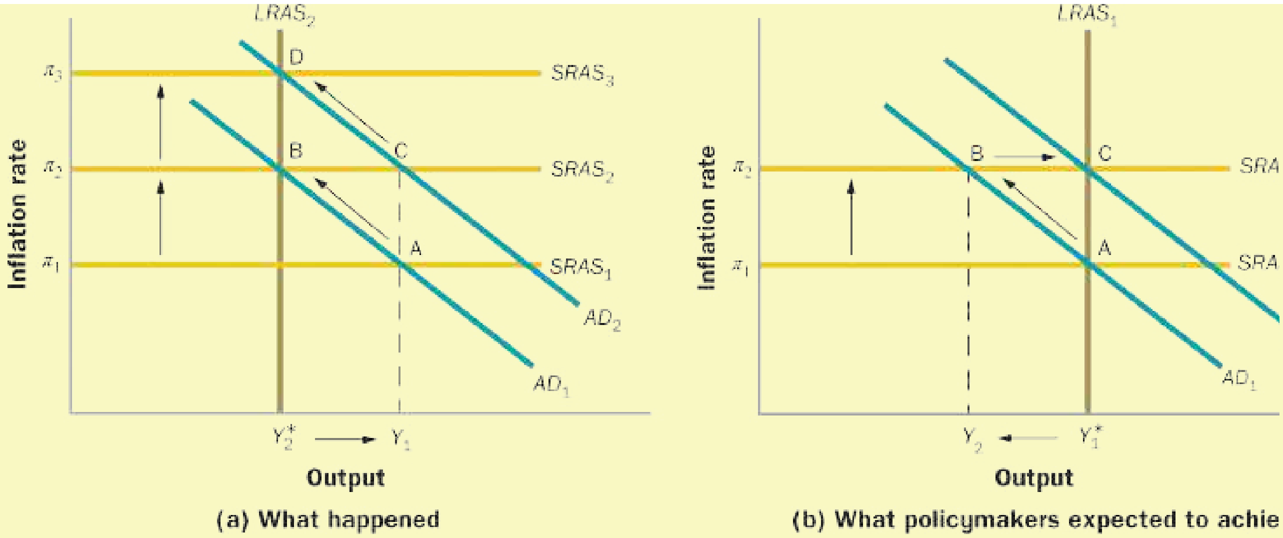


Figure 11.14 **Policy mistakes as an explanation for the Great Inflation**

Note: In response to a perceived contractionary output gap, expansionary policies were adopted.

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In Figure 11.13(a) we have drawn on the diagram what, according to Orphanides' argument, may have happened at the beginning of the Great Inflation to economies such as Australia's and the United States' and in Figure 11.13(b) what policymakers thought was happening. The fall in the economy's potential GDP from Y_1^* to Y_2^* illustrated in Figure 11.13(a) was a consequence of a slowdown in productivity. The reasons why productivity fell in the late 1960s and early 1970s are complex and still debated by economists. However, there is widespread agreement that one factor that made the slowdown all the worse was the rapid increase in oil prices that followed military action in the Middle

East in October 1973, a classic example of an adverse inflation shock (see Section 11.5.2 Inflation shocks)

A significant and sustained increase in oil prices reduces the stock of capital equipment used by firms seeking to lower costs, thereby shifting the economy's potential GDP. An increase in inflation results from the expansionary output gap and the economy's aggregate supply curve shifts upwards. In Figure 11.13(a) the result is a new long-run equilibrium point at *B*.

The problem for policymakers at the time was that all they could observe was the fall in GDP and the rise in inflation. Hindsight provides us with the explanation that what was happening was a fall in potential GDP. However, at the time the fall in GDP was widely interpreted as being the result of adverse inflation shocks (such as the rise in oil prices) leading to a movement along the AD curve from point A to point B; this is shown Figure 11.13(b).

You can see from Figure 11.13 that what happened and what policymakers thought was happening imply exactly the same effects on real output and inflation. Since falls in potential output had not been observed since World War II, policymakers can perhaps be forgiven for not understanding that what they were observing were the effects of a fall in potential GDP. Nonetheless, there is an important difference in the two diagrams drawn in Figure 11.13. In Figure 11.13(a), point B represents long-run equilibrium for the economy with potential and actual GDP equal at Y_2^*— there is no output gap. However, in Figure 11.13(b), point B is perceived to be a short-run equilibrium, characterised by a contractionary output gap $\frac{Y_2 - Y_1^*}{Y_1^*}$.

What happened next was crucial. Policymakers, mistakenly thinking they were observing a contractionary output gap, implemented expansionary monetary and fiscal policies, pushing the AD curve to the right. Figure 11.14 shows the effects, both in reality and as expected by policymakers.

Let's start with Figure 11.14(b). This shows what policymakers expected to achieve with the implementation of expansionary polices. Concern about what was thought to be a contractionary output gap led to a conventional Keynesian response, shifting the AD curve to the right from AD_1 to AD_2. The anticipated result was a shift of the economy to a new long-run equilibrium point at C. While the new inflation rate of π_2, corresponding to the new expected inflation rate at 'potential' output Y^*, would be locked in, the payoff would be the elimination of the contractionary output gap.

What happened is illustrated in Figure 11.14(a). Following the shift of the AD curve from AD_1 to AD_2, a new expansionary output gap opened, $\left(\frac{Y_1 - Y_2^*}{Y_2^*}\right)$, consistent with the economy being at point C.

The result will be another increase in inflation, in this case to π_3, an upward shift of the economy's short-run aggregate supply curve to $SRAS_3$, and a movement along the aggregate demand curve, AD_2, from point C to a new long-run equilibrium point D. Compared to what policymakers had expected, as illustrated in Figure 11.14(b), the consequences of the expansionary monetary and fiscal policies were higher inflation and lower output. Moreover, because what had happened was a fall in potential output, there was no contractionary output gap and hence no automatic fall in inflation. This, according to Orphanides' argument, resulted in the Great Inflation.

▹▹ RECAP

SOURCES OF INFLATION

- Inflation may result from excessive spending, which creates an expansionary output gap and puts upward pressure on inflation. An example is a military build-up, which raises government purchases. Monetary policy or fiscal policy can be used to offset excessive spending, preventing higher inflation from emerging.

- Inflation may also arise from an aggregate supply shock, either an inflation shock or a shock to potential output. An inflation shock is a sudden change in the normal behaviour of inflation, unrelated to the nation's output gap. An example of an inflation shock is a run-up in energy and food prices large enough to raise the overall price level. In the absence of public beliefs that the central bank is committed to maintaining low inflation, an inflation shock would lead to stagflation, a combination of recession and higher inflation.

- Stagflation poses a difficult dilemma for policymakers. If they take no action, eventually inflation will subside and output will recover, but in the interim the economy may suffer a protracted period of recession. If they use monetary or fiscal policy to increase aggregate demand, they will shorten the recession but will also lock in the higher level of inflation.
- A shock to potential output is a sharp change in potential output. Like an adverse inflation shock, an adverse shock to potential output results in both higher inflation and lower output. Because lower potential output implies that productive capacity has fallen, however, output does not recover following a shock to potential output, as it

eventually does following an inflation shock.

11.6 CONTROLLING INFLATION

LO 11.10

FIND ONLINE

High or even moderate rates of inflation can impose significant costs to the economy. Indeed, over the past several decades a consensus has developed among economists and policymakers that low and stable inflation is important and perhaps necessary for sustained economic growth. What, then, should policymakers do if the inflation rate is too high? As Example 11.3 will show, inflation can be slowed by policies that shift the AD curve leftward. Unfortunately, although they produce long-term gains in productivity and economic growth, such policies are likely to impose significant short-run costs in the form of lost output and increased unemployment.

EXAMPLE 11.3 – THE EFFECTS OF ANTI-INFLATIONARY MONETARY POLICY

How will output, unemployment and inflation react to a monetary policy tightening?

Suppose that, although the economy is at full employment, the inflation rate is 10 per cent—too high to be consistent with economic efficiency and long-term economic growth. The Reserve Bank decides to tighten monetary policy to reduce the inflation rate to 4 per cent. What will happen to output, unemployment and inflation in the short run? Over the long run?

The economic effects of a monetary tightening are very different in the short and long run. Figure 11.15(a) shows the short-run effect. Initially, the economy is in long-run equilibrium at point A, where actual output equals potential output. But at point A, the inflation rate (10%) is high, as indicated by the aggregate supply line, *SRAS*.

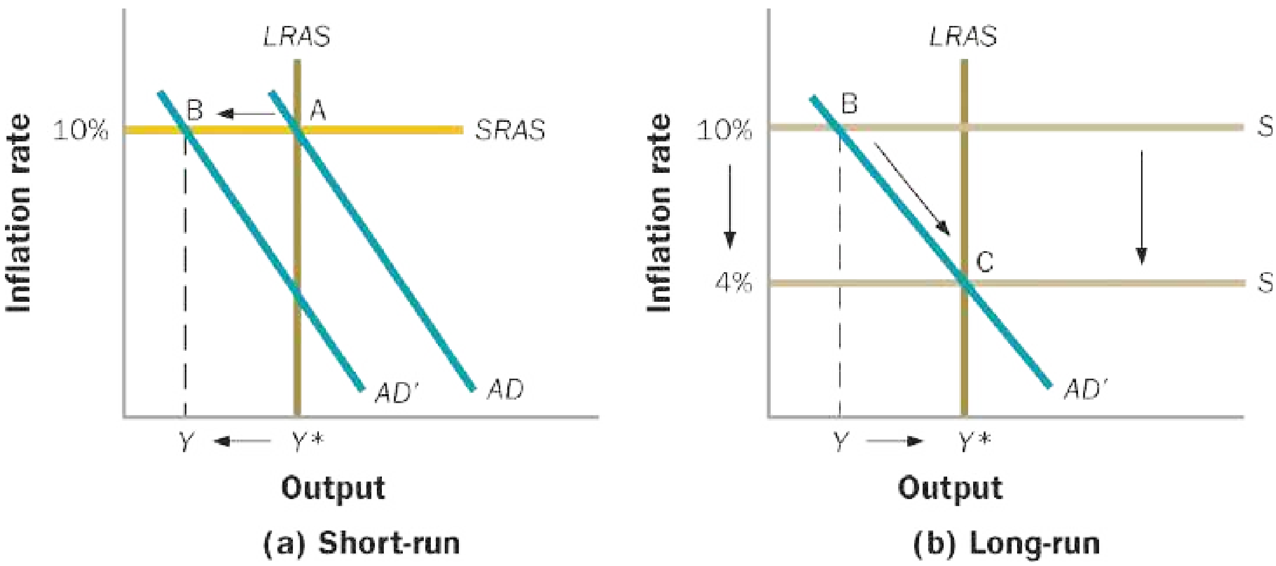

Figure 11.15 **Short-run and long-run effects of an anti-inflation monetary policy**

Note: In the short run, anti-inflationary monetary policy results in a contractionary output gap with no change to the rate of inflation. In the long run, the contractionary output gap causes inflation to fall and the economy returns to its potential GDP with inflation stabilised at a lower rate.

To bring inflation down to 4 per cent, what can policymakers do? To get 'tough' on inflation, the Reserve Bank must set the real interest rate at a level higher than normal, given the rate of inflation. In other words, the Reserve Bank must shift its policy reaction function upward, as in Figure 11.15(a). At a constant rate of inflation, an increase in the real interest rate set by the Reserve Bank will reduce consumption and investment spending, lowering aggregate demand at every inflation rate. This monetary tightening by the Reserve Bank causes the AD curve to shift leftward, from *AD* to *AD′* in Figure 11.15(a).

After the Reserve Bank's action, *AD′* and *SRAS* intersect at point B in Figure 11.15(a), the new short-run equilibrium point. At point B actual output has fallen to *Y*, which is less than potential output *Y**. In other words, the Reserve Bank's action has allowed a contractionary gap to develop, one result of which will be that unemployment will exceed the natural rate. At point B, however, the inflation rate has not changed, remaining at 10 per cent. We conclude that in the short run, a monetary tightening pushes the economy into recession but has little or no effect on the inflation rate, because of inflation inertia.

The short-run effects of the anti-inflationary shift in monetary policy—lower output, higher unemployment, and little or no reduction of inflation—are to say the least not very encouraging, and they explain why such policy shifts are often highly unpopular in their early stages. Fortunately, however, we have not reached the end of the story—because the economy will not remain at point B indefinitely. The reason is that the existence of a contractionary gap at that point eventually causes inflation to decline, as firms become more reluctant to raise their prices in the face of weak demand.

Graphically, the eventual decline in inflation that results from a recessionary gap is represented by the downward movement of the short-run aggregate supply line, from *SRAS* to *SRAS'* in Figure 11.15(b). Inflation will continue to fall until the economy returns to long-run equilibrium at point C. At that point, actual output has returned to potential, and the inflation rate has stabilised at 4 per cent. So, we see that a tight monetary policy inflicts short-term pain (a decline in output, high unemployment and a high real interest rate) to achieve a long-term gain (a permanent reduction in inflation). Incidentally, the result that an upward shift in the monetary policy reaction function leads to a permanently lower rate of inflation suggests a useful alternative way to think about such shifts: an upward shift in the Reserve Bank's reaction function is equivalent to a decline in its long-term target for inflation (see Concept Check 11.2). Similarly, a downward shift in the Reserve Bank’s reaction function could be interpreted as an increase in the Reserve Bank’s long-term inflation target.

CONCEPT CHECK 11.8

Show the typical time paths of output, inflation and the real interest rate when the Reserve Bank employs an anti-inflationary monetary policy. Draw a separate graph for each variable, showing time on the horizontal axis. Be sure to distinguish the short run from the long run. Specific numerical values are not necessary.

THINKING AS AN ECONOMIST 11.3

How did the Great Inflation end?

If you look back at Figure 11.12 you will see that the Great Inflation ended sometime around the early 1990s. Here, we are going to focus on Australia’s experience, where the end of the Great Inflation coincided with the early 1990s recession. To what extent does this decline in inflation fit with the predictions made from the AD–AS model?

Table 11.1 shows some selected macroeconomic data for the period 1985–99. A key feature of these data is the rapid rise in the real interest rate in 1989, which came about as a result of a tightening of monetary policy by the Reserve Bank (an upward shift of its policy reaction function). This policy change was designed to curtail spending and bring on a **disinflation**. You can see from the table that, with one important exception, the data fit our analysis of anti-inflationary monetary policy quite well. First, as our model predicts, in the short run the Reserve Bank's sharp tightening of monetary policy led to a recession. Note that growth in real GDP was negative in 1991; the unemployment rate also rose significantly, peaking at 10.9 per cent in 1993. Inflation began to decline dramatically after 1990. All these results are consistent with the short-run analysis in Figure 11.15(a).

TABLE 11.1 Australian macroeconomic data, 1985–99

	NOMINAL INTEREST RATE (%)	REAL INTEREST RATE (%)	GROWTH IN REAL GDP (%)	UNEMPLOYMENT RATE (%)
1985	15.98	9.24	5.17	8.26
1986	16.45	6.87	1.59	8.08
1987	13.75	4.53	5.55	8.11

1988	12.80	5.32	4.29	7.23
1989	17.61	10.13	4.37	6.18
1990	14.54	7.03	1.36	6.92
1991	10.23	6.87	−1.30	9.58
1992	6.47	5.49	3.01	10.73
1993	5.15	3.47	4.09	10.87
1994	5.66	3.65	4.74	9.72
1995	7.73	3.07	3.08	8.47
1996	7.15	4.54	4.04	8.51
1997	5.40	5.57	4.15	8.36
1998	5.00	4.19	5.00	7.68
1999	5.01	3.80	4.11	6.87

Note: Inflation is measured by the consumer price index (CPI). The nominal interest rate is the average annual value of the 90-day bill rate. The real interest rate equals the nominal interest rate minus the inflation rate.

Source: Based on data from OECD 2010, ‘Main economic indicators – complete database’, http://dx.doi.org/10.1787/data-00052-en, accessed 13 November 2018.

Where the data do not follow exactly the predictions of the AD–AS model is with the rate of unemployment. International evidence shows that the unemployment rate often tends to lag behind any economic recovery. This was certainly true for Australia's experience, but the length of time it took for Australia's unemployment rate to fall—well into the second half of the 1990s—surprised many commentators and suggests that factors other than the business cycle were acting to keep the unemployment rate relatively high.

▹▹ RECAP

CONTROLLING INFLATION

Inflation can be controlled by policies that shift the AD curve leftward, such as a move to a 'tighter' monetary policy (an upward shift in the monetary policy reaction function). In the short run, the effects of an anti-inflationary monetary policy are felt largely on output, so that a disinflation (a substantial reduction in inflation) may create a significant contractionary gap. According to the theory, in the long run, output should return to potential and inflation should decline.

THINKING AS AN ECONOMIST 11.4

The Global Financial Crisis

As outlined in Chapters 6 to 10, the Global Financial Crisis led to sharp falls in aggregate spending in many countries, precipitating severe recessions. We discussed in those chapters the variety of policy responses that were adopted, both fiscal and monetary. Although the causes of the crisis were undoubtedly very complex, the fact that countries fell into recession and that inflation subsequently fell is entirely consistent with the AD–AS framework. This is illustrated in Figure 11.16.

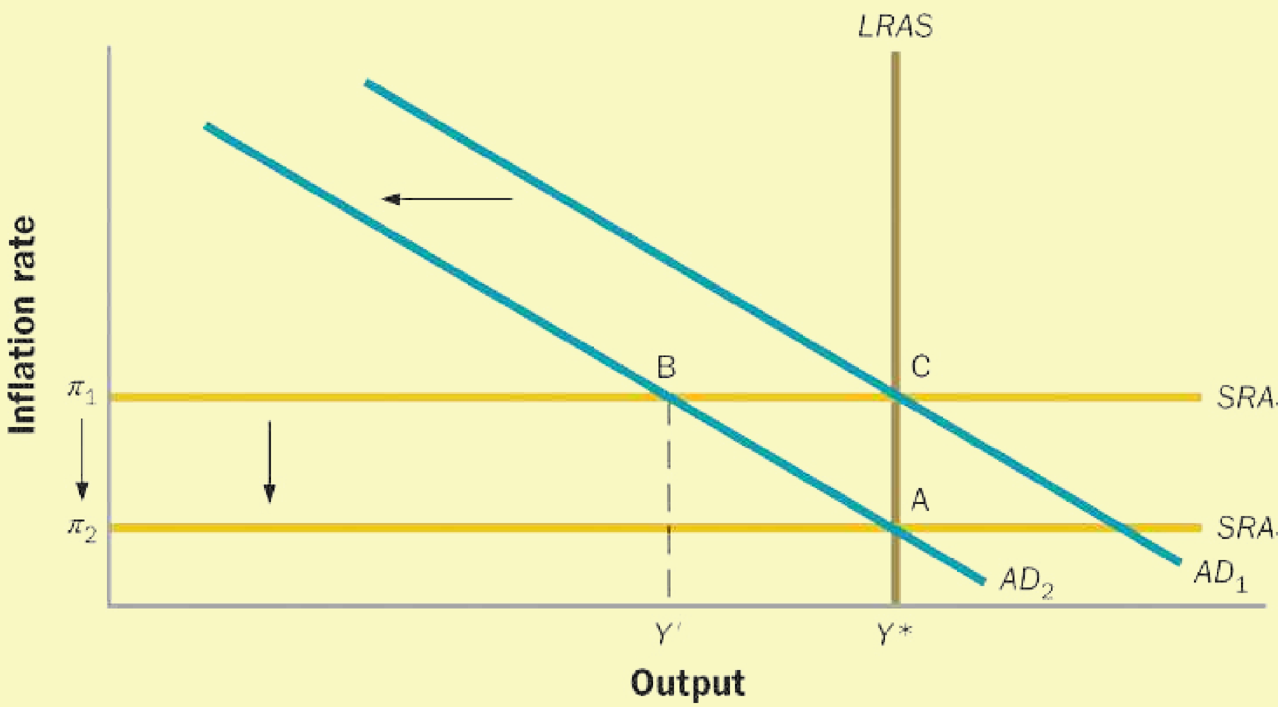

Figure 11.16 **The Global Financial Crisis led to recession in many countries and a fall in inflation, consistent with the predictions of the aggregate demand–aggregate supply (AD–AS) model**

We described previously how events that unfolded in the US housing market led to a fall in planned aggregate expenditure. In the context of the AD–AS diagram, Figure 11.16, this is illustrated by the leftward shift in the AD curve, from AD_1 to AD_2, with a new short-run equilibrium being established at point B and the creation of a contractionary output gap given by $\left(\frac{Y' - Y^*}{Y^*}\right)$. Consistent with Equation 11.4, we would expect there to be a fall in inflation. Further falls in inflation would be expected, as expectations of inflation adjusted downwards, resulting in the aggregate supply curve shifting downwards.

Recall that in the AD–AS model the economy moves along the AD curve because of changes in interest rates brought about by monetary policy responses to changes in inflation. What happened in the wake of the Global Financial Crisis is entirely consistent with this framework. Figure 11.17 shows the official interest rates for a collection of countries—these are the interest rates targeted by the countries' respective central banks. All of these countries cut their interest rates aggressively as the crisis unfolded (of course, interest rates were cut not just because inflation fell, but also as an attempt to reverse the leftward shift of the AD curve).

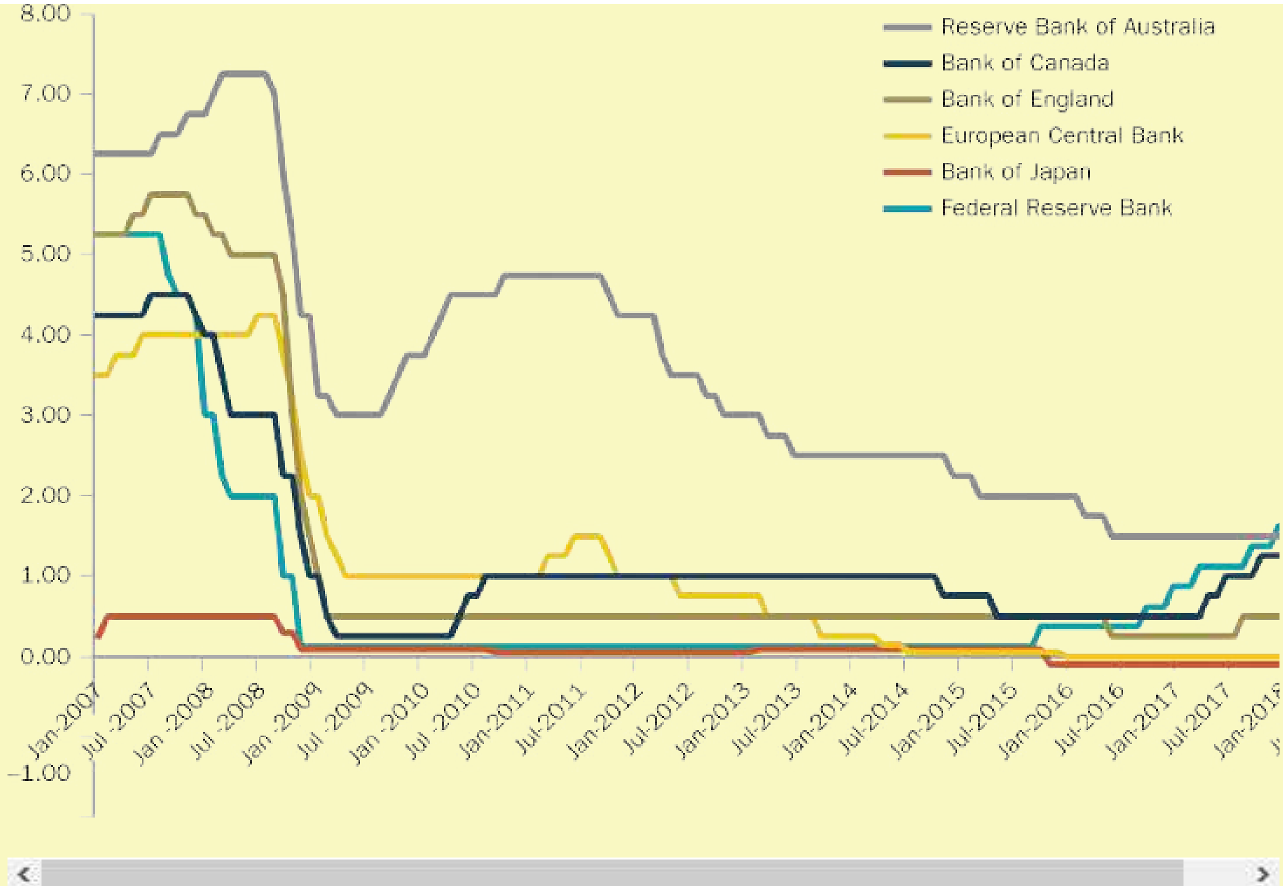

Figure 11.17 **Monetary policy responses to the Global Financial Crisis**

Note: Official interest rates were cut aggressively in the wake of the Global Financial Crisis.

Source: Based on data from Reserve Bank of Australia 2018, 'Statistical tables', https://www.rba.gov.au/statistics/tables/#interest-rates.

Figure 11.17 highlights a key policy challenge that many governments and central banks encountered in the Global Financial Crisis. This relates to limitations on the extent to which monetary policy can be expansionary. You can see from Figure 11.17 that in response to the onset of the crisis, official rates were driven to almost zero in Japan and the United States. Once the official interest rate became very low, there existed little scope for further monetary policy easing; monetary policy had done all that it could do to stimulate the economy. Such was the concern about the contraction in economic activity that very expansionary fiscal policies were implemented alongside monetary policy to boost further aggregate demand. These fiscal policies resulted in very large budget deficits. In Chapter 4, we discussed how the government's budget balance affects national saving and the balance between saving and investment. Countries like the United States that ran large budget deficits in response to the crisis experienced significant falls in their national saving. Moreover, the borrowing needed to finance the large budget deficits meant that many countries experienced historically high levels of government indebtedness.

In Background briefing 4.2 we canvassed some of the reasons for concern about high levels of government indebtedness, in particular the intergenerational equity problem of people in the future having to find the resources to repay the loans plus interest. Facing a similar situation, the government of the United Kingdom embarked on a program of government cutbacks to try to rein in the government debt. Similar initiatives announced in Greece in the northern hemisphere spring of 2010 led to riots as many of the measures proposed to wind back expenditure were very unpopular.

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Ten years on from the crisis and most economies have recovered. Unemployment, for example, is around 3 per cent in the United States and other economies' economic performance has also improved. However, a debate continues among economists and politicians about the effectiveness of the aggressive expansionary monetary and fiscal policies enacted in 2008. Most economies, Australia's being a notable exception, experienced major recessions in the wake of the crisis. Would those recessions have been larger if not for the expansionary policies is a matter for research and debate. The framework outlined in these chapters, both the basic Keynesian and the AD–AS models, guided policymakers in their response to the fall in aggregate demand that accompanied the crisis. Notwithstanding these policies, for many economies, the recession was still deep and protracted—an important lesson about the complexities of managing modern economies.

SUMMARY

- This chapter extended the basic Keynesian model to include inflation. First, we showed how planned spending and short-run equilibrium output are related to inflation, a relationship that is summarised by the aggregate demand (AD) curve. Second, we discussed how inflation itself is determined. In the short run, inflation is determined by past expectations and pricing decisions, but in the longer run inflation adjusts as needed to eliminate output gaps.
- The AD curve shows the relationship between short-run equilibrium output and inflation. Because short-run equilibrium output is equal to planned spending, the AD curve also relates spending to inflation. Increases in inflation reduce planned spending and short-run equilibrium output, so the AD curve is downward-sloping.
- The inverse relationship of inflation and short-run equilibrium output is the result, in large part, of the behaviour of the Reserve Bank. To keep inflation low and stable, the Reserve Bank reacts to rising inflation by increasing the real interest rate. A higher real interest rate reduces consumption and planned investment, lowering planned aggregate expenditure and hence short-run equilibrium output. Other reasons that the AD curve slopes downward include the effects of inflation on the real value of money, distributional effects (inflation redistributes wealth from

the poor, who save relatively little, to the more affluent, who save more), uncertainty created by inflation, and the impact of inflation on foreign sales of domestic goods.

- For any given value of inflation, an exogenous increase in spending (i.e. an increase in spending at given levels of output and the real interest rate) raises short-run equilibrium output, shifting the AD curve (*AD*) to the right. Likewise, an exogenous decline in spending shifts the AD curve to the left. The AD curve can also be shifted by a change in the Reserve Bank's policy reaction function. If the Reserve Bank gets tougher shifting up its reaction function and thus choosing a higher real interest rate at each level of inflation, the AD curve will shift to the left. If the Reserve Bank gets 'easier' shifting down its reaction function and thus setting a lower real interest rate at each level of inflation, the AD curve will shift to the right.
- In low-inflation industrial economies like Australia today, inflation tends to be inertial, or slow to adjust to changes in the economy. This inertial behaviour reflects the fact that inflation depends in part on people's expectations of future inflation, which in turn depend on their recent experience with inflation. Long-term wage and price contracts tend to build in the effects of people's expectations for multiyear periods. In the aggregate demand–aggregate supply (AD–AS) diagram, the short-run aggregate supply (SRAS) line (*SRAS*) is a horizontal line that shows the current rate of inflation, as determined by past expectations and pricing decisions.

- Although inflation is inertial, it does change over time in response to output gaps. An expansionary gap tends to raise the inflation rate because firms raise their prices more quickly when they are facing demand that exceeds their normal productive capacity. A recessionary gap tends to reduce the inflation rate as firms become more reluctant to raise their prices.
- The economy is in short-run equilibrium when the inflation rate equals the value determined by past expectations and pricing decisions and output equals the level of short-run equilibrium output that is consistent with that inflation rate. Graphically, short-run equilibrium occurs at the intersection of the AD curve and the SRAS line. If an output gap exists, however, the inflation rate will adjust to eliminate the gap. Graphically, the SRAS line moves upward or downward as needed to restore output to its full-employment level. When the inflation rate is stable and actual output equals potential output, the economy is in long-run equilibrium. Graphically, long-run equilibrium corresponds to the common intersection point of the AD curve, the SRAS line and the long-run aggregate supply (LRAS) line, a vertical line that marks the economy's potential output.
- Because the economy tends to move towards long-run equilibrium on its own through the adjustment of the inflation rate, it is said to be self-correcting. The more rapid the self-correction process, the smaller the need for active stabilisation policies to eliminate output gaps. In practice, the larger the output gap, the more useful such policies are.

- One source of inflation is excessive spending, which leads to expansionary output gaps. Aggregate supply shocks are another source of inflation. Aggregate supply shocks include both inflation shocks—sudden changes in the normal behaviour of inflation, created, for example, by a rise in the price of imported oil and shocks to potential output. Adverse supply shocks both lower output and increase inflation (assuming an absence of public beliefs that the central bank is committed to maintaining low inflation). This creates a difficult dilemma for policymakers.
- To reduce inflation, policymakers must shift the AD curve to the left, usually through a shift in monetary policy towards greater tightness. In the short run, the main effects of an anti-inflationary policy may be reduced output and higher unemployment as the economy experiences a recessionary gap. These short-run costs of disinflation must be balanced against the long-run benefits of a lower rate of inflation. Over time, output and employment will return to normal levels and inflation declines.

KEY TERMS

aggregate demand (AD) curve 270

aggregate supply shocks 276

disinflation 293

inflation shock 285

long-run aggregate supply (LRAS) line 281

short-run aggregate supply (SRAS) line 281

short-run equilibrium 281

REVIEW QUESTIONS

1. What two variables are related by the aggregate demand (AD) curve? Explain how the behaviour of the Reserve Bank helps to determine the slope of this curve. List and discuss two other factors that lead the curve to have the slope that it does. LO 11.1 **EASY**
2. State how each of the following affects the AD curve and explain why this happens: LO 11.3 **EASY**
   a) an increase in government purchases
   b) a cut in taxes
   c) a decline in planned investment spending by firms
   d) a decision by the Reserve Bank to lower the real interest rate at each level of inflation.
3. Why does the overall rate of inflation tend to adjust more slowly than prices of commodities, such as oil or grain? LO 11.4 **MEDIUM**
4. Discuss the relationship between output gaps and inflation. How is this relationship captured in the aggregate demand–aggregate supply (AD–AS) diagram? LO 11.5 **MEDIUM**
5. Sketch an aggregate demand–aggregate supply (AD–AS) diagram depicting an economy away from long-run equilibrium. Indicate the economy's short-run equilibrium point. Discuss how the economy reaches long-run equilibrium over a period of time. Illustrate the process in your diagram. LO 11.6 **MEDIUM**

6. True or false: The economy's self-correcting tendency makes active use of stabilisation policy unnecessary. Explain. LO 11.7 **MEDIUM**

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7. What factors led to increased inflation in Australia in the 1970s? LO 11.8 **HARD**

8. Why does an adverse inflation shock pose a particularly difficult dilemma for policymakers? LO 11.9 **MEDIUM**

9. How does a tight monetary policy, like that conducted by the Reserve Bank in the late 1980s, affect output, inflation and the real interest rate in the short run? In the long run? LO 11.10 **MEDIUM**

10. Most central banks place great value on keeping inflation low and stable. Why do they view this objective as so important? LO 11.10 **MEDIUM**

PROBLEMS

1. Suppose the relationship between short-run equilibrium output, Y, and the real interest rate, r, set by the Reserve Bank is given by:

$$Y = 1\ 000 - 1\ 000r$$

Suppose also that the Reserve Bank's reaction function is the one shown in Table 11A.1 in Section A of the Appendix to this chapter. For whole-number inflation rates between 0 and 4 per cent, find the real interest rate by the Reserve Bank and the resulting short-run equilibrium output. Graph the aggregate demand (AD) curve numerically. LO 11.1 **HARD**

2. For the economy in Problem 1, suppose that potential output, Y^* = 960. From the policy reaction function in Table 11A.1, what can you infer about the Reserve Bank's objective for the inflation rate in the long term? LO 11.1 **MEDIUM**

3. An economy's AD curve (the relationship between short-run equilibrium output and inflation) is described by the equation:

$$Y = 13\ 000 - 20\ 000\pi$$

Initially the inflation rate is 4 per cent, or $\pi = 0.04$. Potential output, Y^*, equals 12 000. LO 11.5 **HARD**

a) Find inflation and output in short-run equilibrium.

b) Find inflation and output in long-run equilibrium.

Show your work.

4. This problem asks you to trace out the adjustment of inflation when the economy starts with an output gap. Suppose that the economy's AD curve is:

$$Y = 1\ 000 - 1\ 000\pi$$

where Y is short-run equilibrium output and π is the inflation rate, measured as a decimal. Potential output, Y^*, equals 950 and the initial inflation rate is 10 per cent ($\pi = 0.10$). LO 11.5 **HARD**

a) Find output and inflation for this economy in short-run equilibrium and in long-run equilibrium.

b) Suppose that, each quarter, inflation adjusts according to the following rule:

This quarter's inflation = last quarter's inflation – 0.0004 (Y^* – Y)

Starting from the initial value of 10 per cent for inflation, find the value of inflation for each of the next five quarters. Does inflation come close to its long-run value?

5. For each of following, use an AD–AS diagram to show the short-run and long-run effects on output and inflation. Assume the economy starts in long-run equilibrium. LO 11.6 **MEDIUM**

a) An increase in consumer confidence that leads to higher consumption spending

b) A reduction in taxes

c) An easing of monetary policy by the Reserve Bank (a downward shift in the policy reaction function)

d) A sharp drop in oil prices

e) A war that raises government purchases.

6. Suppose that the government cuts taxes in response to a recessionary gap, but because of legislative delays the tax cut is not put in place for 18 months. Using an AD–AS diagram and, assuming that the government's objective is to stabilise output and inflation, show how this policy action might actually prove to be counterproductive. LO 11.8 **HARD**

7. Suppose that a permanent increase in oil prices both creates an inflationary shock and reduces potential output. Use an *AD–AS* diagram to show the effects of the oil price increase on output and inflation in the short run and the long run, assuming that there is no policy response. What happens if the Reserve Bank responds to the oil price increase by tightening monetary policy? LO 11.9 **MEDIUM**

8. An economy is initially in recession. Using the *AD–AS* diagram, show the process of adjustment:

a) if the Reserve Bank responds by easing monetary policy (moving its reaction function down)

b) if the Reserve Bank takes no action.

What are the costs and benefits of each approach, in terms of output loss and inflation? LO 11.2 **MEDIUM**

9. Planned aggregate expenditure in Lotusland depends on real GDP

and the real interest rate according to the following equation:

$$PAE = 3\ 000 + 0.8\ Y - 2\ 000r$$

The Bank of Lotusland, the central bank, has announced that it will set the real interest rate according to the following policy reaction function:

RATE OF INFLATION, π	REAL INTEREST RATE, r
0.0	0.02
0.01	0.03
0.02	0.04
0.03	0.05
0.04	0.06

For the rates of inflation given, find exogenous expenditure and short-run equilibrium output in Lotusland. Graph the *AD* curve. LO 11.1 **MEDIUM**

10. An economy is described by the following equations: LO 11.1 **HARD**

$$\begin{aligned} C &= 1600 + 0.6(Y - T) - 2\ 000r \\ I^P &= 2\ 500 - 1\ 000r \\ G &= \overline{G} = 2\ 000 \\ X &= \overline{X} = 50,\ M = 0 \\ T &= \overline{T} = 2\ 000 \end{aligned}$$

Suppose also that the central bank's policy reaction function is the same as in Problem 9 above.

a) Find an equation relating planned spending to output and real interest rate.

b) Construct a table showing the relationship between short-run equilibrium output and inflation, for inflation rates between 0 and 4 per cent. Using this table, graph the AD curve for the economy.

c) Repeat parts (a) and (b), assuming that government purchases have increased to 2 100. How does an increase in government purchases affect the AD curve?

11. For the economy described in Problem 10, suppose that the central bank's policy reaction function is as follows: LO 11.2 **HARD**

RATE OF INFLATION, π	REAL INTEREST RATE, r
0.0	0.04
0.01	0.045
0.02	0.05
0.03	0.055
0.04	0.06

a) Construct a table showing the relationship between short-run equilibrium output and the inflation rate for values of inflation between 0 and 4 per cent. Graph the AD curve of the economy.

b) Suppose that the central bank decides to lower the real interest rate by 0.5 percentage point at each value of inflation. Repeat part (a). How does this change in monetary policy affect the AD curve?

Appendix to Chapter 11

ALGEBRA OF AGGREGATE DEMAND AND AGGREGATE SUPPLY

In this section we will derive the aggregate demand (AD) curve algebraically. Then we will show how, together, aggregate demand and aggregate supply determine the short-run and long-run equilibrium points of the economy.

Aggregate demand curve

In the Appendix to Chapter 10, Equation $A10.1$ showed that short-run equilibrium output depends on both exogenous components of expenditure and the real interest rate:

$$Y = \left(\frac{1}{1 - c(1-t) + m}\right)[\overline{C} - c\overline{T} + \overline{I} + \overline{G} + \overline{X} - (a+b)r] \qquad \textbf{Equation (A10.1)}$$

where $\left(\frac{1}{1 - c(1-t) + m}\right)$ is the multiplier, $\overline{C} - c\overline{T} + \overline{I} + \overline{G} + \overline{X}$ is the exogenous component of planned spending, the term in square brackets is exogenous expenditure and a and b are positive numbers that measure the effect of changes in the real interest rate on consumption and planned investment, respectively.

The AD curve incorporates the behaviour of the Reserve Bank, as described by its policy reaction function. According to its policy reaction function, when inflation rises, the Reserve Bank raises the real interest rate (for simplicity, we will assume the target rate of inflation is zero). Thus, the Reserve Bank's policy reaction function can be written as an equation relating the real interest rate, r, to inflation, π:

$$r = \bar{r} + g\pi \qquad \textbf{Equation (A11.1)}$$

where $\bar{r}$ and g are positive constants chosen by Reserve Bank officials. This equation states that when inflation, π, rises by one percentage point—say from 2 to 3 per cent per year—the Reserve Bank responds by raising the real interest rate by g percentage points. So, for example, if $g = 0.5$, an increase in inflation from 2 to 3 per cent would lead the Reserve Bank to raise the real interest rate by 0.5 per cent. The intercept term, $\bar{r}$, tells us at what level the Reserve Bank would set the real interest rate if inflation happened to be zero (so that the term $g\pi$ dropped out of the equation).

Equations *A*10.1 and *A*11.1 together allow us to derive the AD curve. We can think of the curve as being derived in two steps: first, for any given value of inflation, π, use the policy reaction function, Equation *A*11.1, to find the real interest rate by the Reserve Bank. Second, for that real interest rate, use Equation *A*10.1 to find short-run equilibrium output, Y. The relationship between inflation and short-run equilibrium output derived in these two steps is the AD curve.

Alternatively, we can combine the equation for short-run equilibrium output with the equation for the policy reaction function by substituting the right-hand side of Equation $A11.1$ for the real interest rate r in Equation 10.7:

$$Y = \left(\frac{1}{1 - c(1-t) + m}\right)[\overline{C} - c\overline{T} + \overline{I} + \overline{G} + \overline{X} - (a+b)(\overline{r} + g\pi)]$$

Equation (A11.2)

This equation, which is the general algebraic expression for the AD curve, summarises the link between inflation and short-run equilibrium output. Note that Equation $A11.2$ implies that an increase in inflation, π, reduces short-run equilibrium output, Y, so that the AD curve is downward sloping.

For a numerical illustration, assume that:

$$\overline{C} = 640,\ \overline{T} = 250,\ \overline{I} = 250,\ \overline{G} = 300,\ X = 20,\ c = 0.8,\ a = 400,\ b = 600$$
$$\overline{C} = 640,\ \overline{T} = 250,\ \overline{I} = 250,\ \overline{G} = 300,\ \overline{X} = 20,\ M = 0,\ \left(\frac{1}{1 - c(1-t) + m}\right) = 5$$
$$m = 0,\ t = 0,\ c = 0.8,\ a = 400,\ b = 600$$

To derive the AD curve, we also need values for the Reserve Bank's policy reaction function; for illustration, we use the following policy reaction function.

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Table A11.1 relates the Reserve Bank's choice of the real interest rate to the inflation rate. To derive the AD curve, it will be useful to express the policy reaction function in the form of an equation like Equation *A*11.1. To do this, note that when inflation, π, equals zero, the real interest rate, *r*, equals 2 per cent. Therefore, the constant term in the Reserve Bank's policy reaction function, $\bar{r}$, equals 2 per cent, or 0.02. Second, Table A11.1 shows that the real interest rate rises one point for each point that inflation rises; therefore, the slope, *g*, of the reaction function equals 1.0. So, the Reserve Bank's policy reaction function can be expressed as:

$$r = 0.02 + \pi$$

TABLE A11.1

RATE OF INFLATION, π	REAL INTEREST RATE SET BY THE RESERVE BANK, *r*
0.00 (= 0%)	0.02 (=2%)
0.01	0.03
0.02	0.04
0.03	0.05
0.04	0.06

which is Equation *A*11.1 with $\bar{r} = 0.02$ and $g = 1$.

Substituting these numerical values into Equation $A11.2$ and simplifying, we get the following numerical equation for the *AD* curve:

$$Y = 5[640 - 0.8(250) + 250 + 300 + 20 - (400 + 600)(0.02 + \pi)] \quad \text{Equation (A11.3)}$$

$$Y = 4\ 950 - 5\ 000\pi \quad \text{Equation (A11.4)}$$

Note that in Equation $A11.4$ higher values of inflation imply lower values of short-run equilibrium output, so the AD curve is downward sloping. To check this equation, suppose that inflation is 3 per cent, so that the Reserve Bank sets the real interest rate at 5 per cent (see Table A11.1). Setting $\pi = 0.03$ in Equation $A11.4$ yields $Y = 4\ 800$.

Shifts of aggregate demand curve

Recall that exogenous changes in spending or in the Reserve Bank's policy reaction function will shift the AD curve. These results follow from Equation $A11.2$. First, the equation shows that for a given rate of inflation, π, an increase in exogenous spending, $\overline{C} - c\overline{T} + \overline{I} + \overline{G} + \overline{X}$, will raise short-run equilibrium output, Y. Thus, an increase in exogenous spending shifts the AD curve to the right; conversely, a decrease in exogenous spending shifts the AD curve to the left.

A shift in the Reserve Bank's policy reaction can be captured by a change in the intercept term $\overline{r}$ in Equation $A11.1$. For example, suppose the Reserve Bank tightens monetary policy by setting the real interest rate 1 per cent higher than before at every level of inflation. Such a change is equivalent to raising the intercept term, $\bar{r}$, in the policy reaction function by 0.01. If you look at Equation $A11.2$ you will see that with the level of inflation held constant, an increase in $\bar{r}$ reduces short-run equilibrium output. Thus, a tightening of monetary policy (an upward movement in the monetary policy reaction function) shifts the AD curve to the left. Conversely, an easing of monetary policy (represented by a decline in $\bar{r}$ or a downward shift in the policy reaction function) shifts the AD curve to the right.

EXERCISE A1

a) For the economy described above, find an algebraic equation for the AD curve after an exogenous increase in spending (say, in planned investment) of 10 units.

b) For the economy described above, find an algebraic equation for the AD curve after a tightening of monetary policy which involves setting the real interest rate 1 per cent higher at each level of inflation.

Short-run equilibrium

When the economy is in short-run equilibrium, the level of output is given by the AD curve, Equation $A11.2$. For instance, in the economy described above, suppose the current value of inflation is 5 per cent. The value of short-run equilibrium output is therefore:

$$\begin{aligned} Y = 4\ 950 - 5\ 000\pi &= 4\ 950 - 250 \\ &= 4\ 700 \end{aligned} \qquad \text{Equation (A11.5)}$$

Long-run equilibrium

In long-run equilibrium, actual output, Y, equals potential output, Y^*. Thus, in long-run equilibrium, the inflation rate can be obtained from the equation for the AD curve by substituting Y^* for Y. To illustrate, let's write the equation for the AD curve in this sample economy, Equation $A11.4$, once again:

$$Y = 4\ 950 - 5\ 000\pi$$

Suppose, in addition, that potential output, Y^* = 4 900. Substituting this value for Y in the aggregate demand equation yields:

$$4\ 900 = 4\ 950 - 5\ 000\pi$$

Solving for the inflation rate π we get:

$$\pi = 0.01 = 1\%$$

When this economy is in long-run equilibrium the inflation rate will be 1 per cent. If we start from the value of inflation in short-run equilibrium, 5 per cent, we can see that the short-run aggregate supply line must shift downwards until inflation reaches 1 per cent before long-run equilibrium can be achieved.

REFERENCES

Blanchard OJ and Gali J 2010, ‘The macroeconomic effects of oil price shocks: Why are the 2000s so different from the 1970s?’ In *International Dimensions of Monetary Policy*, University of Chicago Press.

Friedman M 1968, ‘The role of monetary policy: Presidential address to the AEA’, *American Economic Review*, vol. 58, no. 1.

OECD 2010, ‘Main economic indicators–complete database’, http://dx.doi.org/10.1787/data-00052-en, accessed 13 November 2018.

Orphanides A 2003, ‘The quest for prosperity without inflation’, *Journal of Monetary Economics*, vol. 50, pp. 633–63.

Phelps E 1967, ‘Phillips curves, expectations of inflation and optimal employment over time’, *Economica*, vol. 34, no. 3, pp. 254–81.

Phillips AW 1958, ‘The relationship between unemployment and the rate of change of money wages in the United Kingdom 1861–1957’, *Economica*, vol. 25, no. 100, pp. 283–99.

Reserve Bank of Australia n.d., ‘Statistical tables’, www.rba.gov.au/statistics/tables/index.html#prices_inflation.

Reserve Bank of Australia 2018, ‘Statistical tables’, https://www.rb a.gov.au/statistics/tables/#interest-rates.

Romer D 2000, ‘Keynesian macroeconomics without the LM curve’, *Journal of Economic Perspectives*, vol. 14, no. 2, Spring, pp. 149–70.

US Bureau of Labor Statistics n.d., ‘Consumer price index for all urban consumers: All items’, retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/CPIAUCSL/.

CHAPTER 12

Macroeconomic policy

After reading this chapter, you should be able to answer the following questions.

12.1 What are the policy options available to a central bank in response to demand shocks and inflation shocks?

12.2 What are the roles played by anchored inflationary expectations and central bank credibility in keeping inflation low?

12.3 How does fiscal policy affect both aggregate demand and aggregate supply?

12.4 Why is macroeconomic policy as much an art as a science?

SETTING THE SCENE

We have now analysed the basic economics underlying fiscal and monetary policy. We worked through examples showing how much policymakers would have to increase government spending, cut taxes or engage in active monetary policy to eliminate a specific contractionary gap and restore output to its full employment level in the short run. While those examples are useful in understanding how fiscal and monetary policy works, they overstate the precision of policymaking.

In analysing macroeconomic policy, one might be tempted to think of the economy as an automobile and the policymaker as its driver. By judiciously steering, braking or accelerating at the appropriate times, the driver of a car can safely control it. They can steer it around obstacles. They can accelerate when the car is sluggish going up hills or if it needs an extra boost to pass another car. And they can step on the brake if the car is going too fast down a hill or if a hazard lies ahead.

Unfortunately, conducting macroeconomic policy is much more difficult than driving a car. The driver of a car typically always knows exactly where they are. They also know their destination and can clearly see the road ahead. They have precise control over the accelerator, brake and steering wheel. Finally, in most instances, they know from experience how and when the car will respond to their actions. The real-world economy, on the other hand, is more complex because the economic policymaker has less information and control than the driver of a car. As one of us wrote, ‘if making monetary policy is like driving a car, then the car is one that has an unreliable speedometer, a foggy windshield, and a tendency to respond unpredictably and with a delay to the accelerator or the brake’.

It is this uncertainty that makes policymaking more of an art than a science. And when you look at the deliberations of policymakers, you can see how uncertainty bedevils almost everything.

Every three months, the Reserve Bank of Australia releases a ‘Statement on monetary policy’ (RBA 2018). It is instructive to look at one of these statements through the lens of uncertainty; the August 2018 statement contains the following phrases: ‘The risks to the outlook have evolved’; ‘There is uncertainty about how much spare capacity there is in the economy’; ‘The outlook for administered prices and retail competition is unclear’; ‘The outlook for consumption remains uncertain’; ‘Trade protectionism risks have increased’; ‘US growth could be stronger than expected’ and so on. Even the Reserve Bank, with its expertise and available resources, is unclear about the true state of the economy.

How then to proceed? One answer is the Blinder principle, named after the economist Alan Blinder (1998) who considered this problem. His advice for central banks? To establish the appropriate change in the target interest rate assuming away any uncertainty—and to then change the rate just a little less than would otherwise be indicated. By recommending caution in economic policymaking, Blinder is recognising an inconvenient truth—the limits to our knowledge of the true state of the economy and of our ability to affect it.

12.1 WHAT IS THE ROLE OF STABILISATION POLICY?

LO 12.1, 12.2

In the previous chapter, we discussed the economy's self-correcting property, which is the fact that output gaps will not last indefinitely but will be closed by rising or falling inflation rates. Does the economy's tendency to self-correct imply that aggressive monetary and fiscal policies are not needed to stabilise output? The answer to this question depends crucially on the speed with which the self-correction process takes place. If self-correction takes place very slowly, so that actual output differs from potential for protracted periods, then active use of monetary and fiscal policy can help to stabilise output.

On the other hand, if self-correction is rapid, active stabilisation policies are probably not justified given the lags and uncertainties that are involved in policymaking. (For example, in Chapter 8 we identified these types of problems as they apply to fiscal policy.) Indeed, if the economy returns to full employment quickly, then attempts by policymakers to stabilise spending and output may end up doing more harm than good, for example, by causing actual output to go beyond potential output.

The speed with which an economy corrects itself depends on a variety of factors, including the prevalence of long-term contracts and the efficiency and flexibility of product and labour markets. Specifically, the self-correcting mechanism assumes that firms change their prices and/or alter their costs in response to output gaps. However, long-term contracts and market imperfections can slow this process and cause output gaps to persist for long periods.

In general, economists believe that the greater the initial output gap, the longer it will take the economy's self-correction process to return the economy to long-run equilibrium. This suggests that stabilisation policies should not be used actively to try to eliminate relatively small output gaps, but that they may be quite useful in remedying large gaps such as the one created by the Global Financial Crisis.

The underlying causes of the output gap are also important in considering the role of stabilisation policy. Stabilisation policy affects the economy in different ways depending on whether the economy was hit by a demand shock or an inflation shock.

12.1.1 STABILISATION POLICY AND DEMAND SHOCKS

Suppose that a large negative demand shock knocks the economy out of its initial long-run equilibrium and into a deep recession; Figure 12.1(a) illustrates this situation. Notice, in the first instance the demand shock affects only output and not the inflation rate (as shown by the movement from point A to point B). In the absence of stabilisation policy, the economy's self-correcting mechanism will drive the short-run aggregate supply (SRAS) line downward and re-establish a long-run equilibrium at point C with a lower inflation rate, π_2.

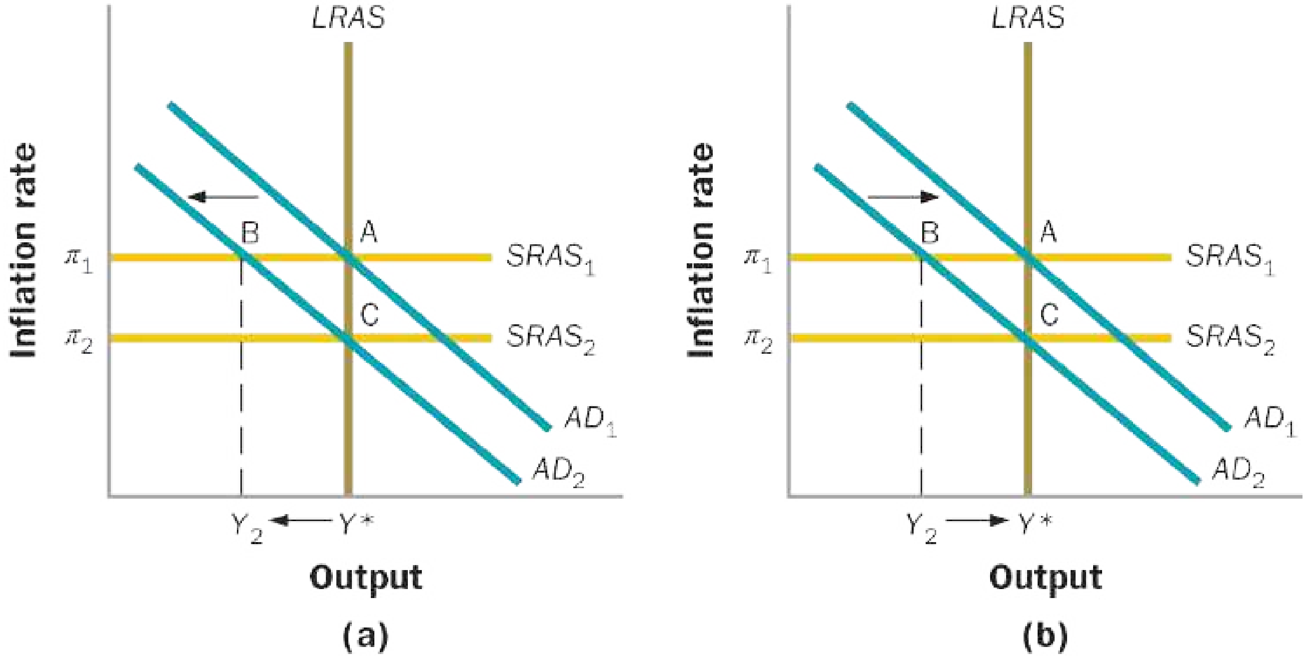

Figure 12.1 **Stabilisation policy and negative demand shocks**

Note: In the short run, the economy is in a recession at output Y_2. In this case, expansionary fiscal policy and/or expansionary monetary policy can be applied, returning the economy to its initial long-run equilibrium at point A without causing higher inflation.

The self-correcting process could take many months or even years in the case of a large output gap. If the government recognises this, it can employ fiscal or monetary policy to increase aggregate demand and bring the economy back to long-run equilibrium at point A, without inflation exceeding its original rate. This is shown in Figure 12.1(b).

As we discussed in previous chapters, macroeconomic policies can increase aggregate demand in two ways. First, expansionary fiscal policy can be undertaken through a combination of government spending increases and tax cuts. This will increase planned spending directly (through the increased government spending) and indirectly (through increased consumption induced by lower taxes and increased disposable income). Second, the Reserve Bank can apply expansionary monetary policy. This will lower interest rates, stimulate increased investment spending and increase planned spending and output. Thus, in the case of a negative demand shock, active stabilisation policy returns the economy to the output and inflation rate that prevailed before the recession. Because inflation and output both return to their pre-recession values, shocks in aggregate demand do not require a difficult choice to be made between inflation and the stability of output.

12.1.2 STABILISATION POLICY AND INFLATION SHOCKS

FIND ONLINE

Unlike aggregate demand shocks, shocks to aggregate supply do create a dilemma for policymakers with respect to targeting a low inflation rate and securing output stability. We discussed this dilemma briefly in Thinking as an economist 11.2. There we saw that if the Reserve Bank maintains the initial inflation rate in the face of a supply shock, the economy may experience a protracted output gap. If, on the other hand, it wants to hasten the return to potential gross domestic product (GDP), the Reserve Bank may have to accept a rate of inflation that differs from its original value.

The dilemma that faces the Reserve Bank in the face of shock to aggregate supply is particularly acute if, as is the case with Reserve Bank currently, there is an explicitly stated target for the inflation rate. We illustrate this in Figures 12.2 and 12.3. In both figures, the economy is initially in long-run equilibrium at point A with output Y^* equal to potential output and inflation equal to π_1, which we will suppose is also to the Reserve Bank's long-run target for inflation. An adverse inflation shock then shifts the SRAS line from $SRAS_1$ to $SRAS_2$ in each figure. The Reserve Bank responds to the increase in inflation by following the monetary policy rule and increasing the real interest rate; the increase in the real interest rate causes planned spending to decline (a movement along AD_1) and output falls from Y^* to Y^1 (the economy has moved from point A to point B).

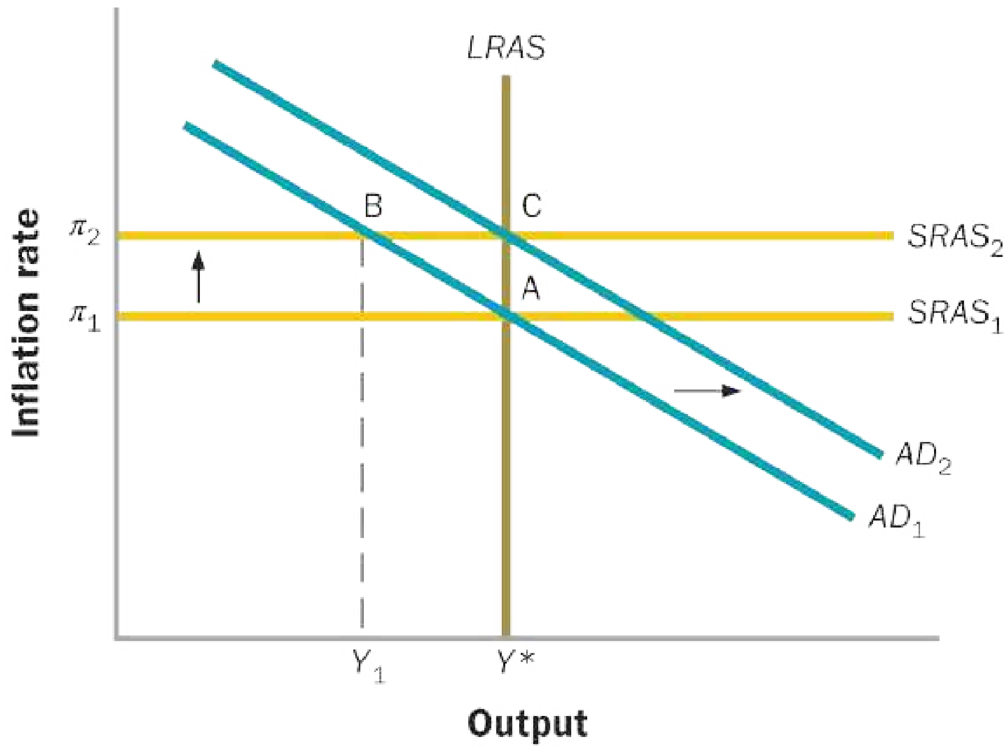

Figure 12.2 **Accommodating an inflation shock**

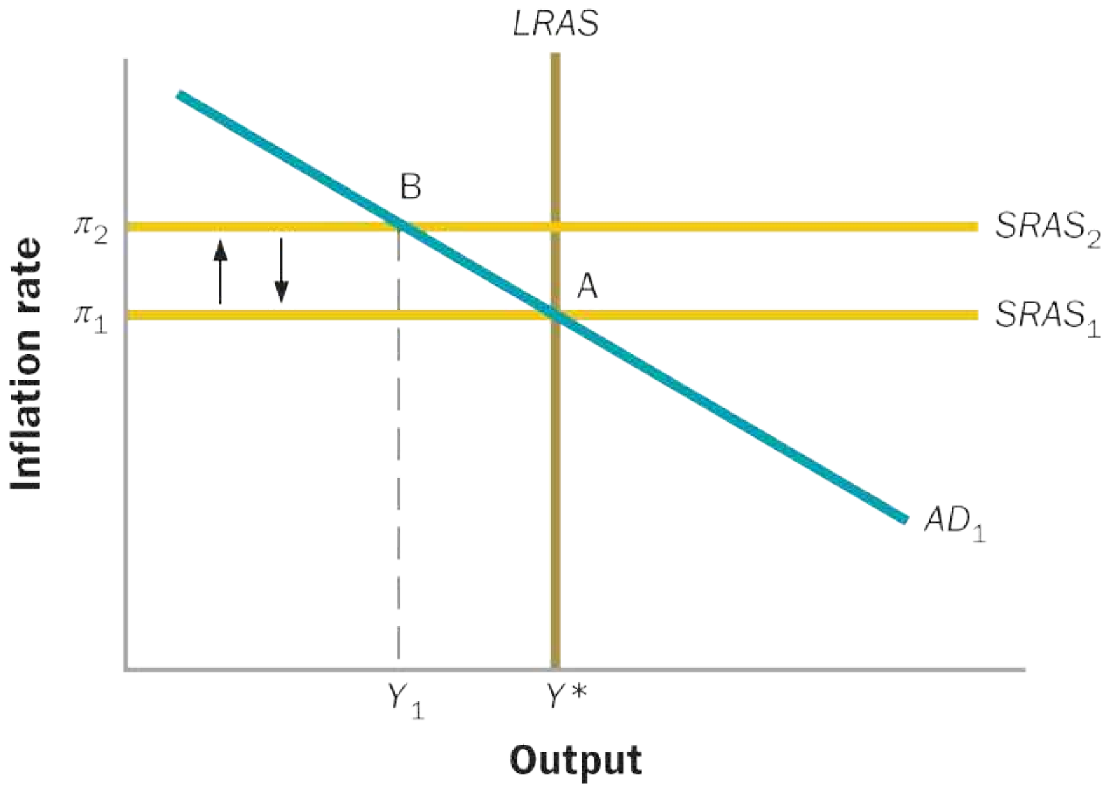

Figure 12.3 **Maintaining low inflation after an adverse inflation shock**

With the economy in a recession at output Y_1 and inflation rate π_2, above the target, the Reserve Bank faces a choice: engage in active monetary policy—that is, reduce the target cash interest rate in order to increase aggregate demand—or follow its monetary policy rule and bring inflation back down to its target of π_1. Figure 12.2 shows the consequences for output and inflation if the Reserve Bank loosens monetary policy. This would require the Reserve Bank to raise the long-run inflation target to π_2, which would then become the rate of inflation that workers and firms expect when the economy returns to potential output. The Reserve Bank thus lowers the real interest rate at each level of inflation and shifts the AD curve to the right, from AD_1 to

AD_2. The SRAS line thus remains at $SRAS_2$ and the economy eventually returns to potential output with the new, higher long-run inflation rate π_2 locked in. Consequently, the higher inflation rate caused by the adverse inflation shock will be sustained.

Economists use the term **accommodating policy** to describe a policy that allows the effects of a shock to remain. In this example, the Reserve Bank's accommodating policy is to allow the inflation shock to decrease output in the short run and increase inflation in the short run and the long run. There are two important implications of this accommodating policy. First, in the short run, the economy experiences a period of contraction and higher inflation caused by the inflation shock, followed by an increase in output. Second, in the long run, the economy returns to potential output, where it began, but now has a higher inflation rate. A possibly shorter and shallower recession is paid for with a higher long-run inflation rate.

The alternative to accommodating the adverse inflation shock is for the Reserve Bank to stick to the current long-run inflation target, π_1. To do this, the Reserve Bank must keep the real interest rate above the long-run target level and *not* lower it as when it accommodates the adverse inflation shock. Figure 12.3 illustrates this situation. The economy most likely remains at Y_1 for a longer time than when the Reserve Bank accommodates the shock—that is, the recession caused by the adverse inflation shock is longer than when the Reserve Bank lowers its target interest rate. Eventually, the economy's tendency to self-correct will restore the long-run equilibrium at point A.

In deciding which of these two policy alternatives to follow, the Reserve Bank might like to know how long it would take for the economy to return to potential output if it did not change monetary policy. The answer depends on the speed with which the SRAS line shifts down when an adverse inflation shock creates a contractionary gap. If the SRAS line shifts down quickly, the Reserve Bank is more likely to keep the target inflation rate unchanged at π_1 because any recession will probably be short. If, on the other hand, the SRAS line shifts down very slowly, the Reserve Bank may be more inclined to increase the target inflation rate to avoid a lengthy recession.

The speed with which the SRAS line shifts back down following an adverse inflation shock depends partly on the public's expectation of how the Reserve Bank will act. If people are confident that the Reserve Bank will maintain the original target inflation rate, their expectations of future inflation will not change even if inflation rises temporarily. If this is the case, we describe people's **expectations of inflation as being anchored**. When an adverse inflation shock increases inflation, people with anchored expectations believe that the Reserve Bank will act to ensure that inflation quickly falls back to the initial level. Workers will then be less likely to ask for inflationary wage increases and firms will be less likely to raise prices. The aggregate supply line will shift back to $SRAS_1$ more rapidly, and output will return to potential more quickly. Because any recession will be shorter if inflationary expectations are anchored, the Reserve Bank also will be comfortable keeping the target inflation rate unchanged.

If, on the other hand, the Reserve Bank has frequently accommodated higher inflation rates in the past, expectations of inflation may not be anchored. If the public believes the Reserve Bank will raise the target inflation rate, expectations of future inflation will be higher. Workers will then demand larger wage increases and firms will raise prices more rapidly. In that event, the short-run aggregate supply line will shift down more slowly, and the return to full employment will be prolonged. Thus, the Reserve Bank has a stake in convincing the public that it will maintain its original target inflation rate.

BACKGROUND BRIEFING 12.1

How was the United States' inflation conquered in the 1980s?

After reaching double-digit levels in the late 1970s and 13.5 per cent in 1980, inflation in the United States fell all the way to 3.2 per cent in 1983, and it remained in the 2–5 per cent range for the rest of the decade. In the 1990s, inflation fell even lower, in the 2–3 per cent range in most years. How was inflation conquered in the 1980s?

The person who was most directly responsible for the conquest of inflation in the 1980s was the Federal Reserve's chairman, Paul Volcker. Following an unusual and secret Saturday meeting he called on 6 October 1979, the Federal Open

Market Committee agreed to adopt a strongly anti-inflationary monetary policy. The results of this policy change on the US economy are shown in Table 12.1, which includes selected macroeconomic data for the period 1978–85.

TABLE 12.1 **US macroeconomic data, 1978–85**

YEAR	GROWTH IN REAL GDP (%)	UNEMPLOYMENT RATE (%)	INFLATION RATE (%)	NOMINA INTERES RATE (%
1978	5.6	6.1	9.0	8.3
1979	3.2	5.8	13.3	9.7
1980	−0.2	7.1	12.5	11.5
1981	2.6	7.6	8.9	14.4
1982	−1.9	9.7	3.8	12.9
1983	4.6	9.6	3.8	10.5
1984	7.3	7.5	3.9	11.9
1985	4.2	7.2	3.8	9.6

Source: Based on data from Chairman of the (US) Council of Economic Advisers, n.d., ‘Economic report of the President’, 1947–2018, https://fraser.stlouisfed.org/title/45, accessed 14 November 2018.

The data in Table 12.1 fit our analysis of anti-inflationary monetary policy quite well. First, as our model predicts, in the short run the Federal Reserve's maintenance of its low target rate of inflation and its unwillingness to accommodate inflation shocks led to a recession. In fact, two recessions followed the Federal Reserve's action in 1979, a short one in 1980 and a deeper one in 1981–82. Note that growth in real GDP was negative in 1980 and 1982, and the unemployment rate rose significantly, peaking at 9.7 per cent in 1982. Nominal and real interest rates also rose, a direct effect of the shift in monetary policy. Inflation, however, did not respond much during the period 1979–1981. All these results are consistent with the short-run analysis in Figure 10.3.

By 1983, however, the situation had changed markedly. The economy had recovered, with strong growth in real GDP in 1983–85. In 1984 the unemployment rate, which tends to lag the recovery, began to decline. Interest rates remained relatively high, perhaps reflecting other factors besides monetary policy. Most significantly, inflation fell in 1982–83 and stabilised at a much lower level. Inflation has remained low in the United States ever since.

CONCEPT CHECK 12.1

Suppose the inflation rate is currently equal to the Reserve Bank’s target. Then, there is a significant fall in the price of imported food due to good harvests in overseas suppliers. Assuming the Reserve Bank keeps the inflation target unchanged, explain what happens in the short run and in the long run to inflation and real GDP.

▹▹ RECAP

In response to changes in spending that create shocks in aggregate demand, fiscal and monetary policy can be applied to return output to potential and inflation to its long-run expected rate. Shocks to aggregate supply (such as inflation shocks), however, force the Reserve Bank to choose between maintaining inflation and stabilising output. If inflationary expectations are anchored, however, the return to potential output following an inflation shock will occur more rapidly.

12.2 INFLATIONARY EXPECTATIONS AND CREDIBILITY

LO 12.2

As we have seen, macroeconomic performance may be improved if inflationary expectations are anchored. But what determines whether expectations are anchored? Most economists believe that it depends on the **credibility of monetary policy**, which is the degree to which the public believes the central bank's promises to keep inflation low, even if doing so may impose short-run economic costs.

The importance of credibility was illustrated in our earlier analysis of an adverse inflation shock. In that case, the Reserve Bank's credibility as an inflation-fighter hastened the return to full employment at the original rate of inflation. Economists have identified several institutional characteristics that may affect the credibility of a central bank's pronouncements to keep inflation low and thus its ability to do so. These include the degree of central bank independence, the announcement of explicit inflation targets, and the establishment of a reputation for fighting inflation.

12.2.1 CENTRAL BANK INDEPENDENCE

The credibility of monetary policy may be enhanced if central bankers are insulated from short-term political considerations, a condition that is sometimes referred to as **central bank independence**. Independent central banks will be better able to take a long-term view of the economy. They can pursue anti-inflation policy when it is necessary, even if it leads to a temporary economic contraction. Elected politicians, on the other hand, face frequent re-elections, and they may be swayed by short-term political considerations to allow the economy to over expand at the cost of higher inflation in the long run. Because of its enhanced credibility, an independent central bank may find it easier to anchor the public's expectations of inflation, reducing the duration of any expansionary or contractionary gap and promoting overall economic stability.

Various factors contribute to a central bank's independence. Among the many possible factors, we list four:

1. The length of appointments to the central bank. Central banks are more independent if their board members are appointed for long terms, especially if the terms are staggered so that they cannot be replaced all at once.
2. Whether the central bank's actions are subject to frequent interference, review or veto by the government. Central banks are more independent if their actions are not subject to frequent interference or review.
3. Whether the central bank has the obligation, as it does in some countries, to finance the national deficit by buying newly issued government bonds. The obligation to do so reduces a central bank's independence.
4. The degree to which the central bank's budget is controlled by the

government. Central banks are more independent if they are allowed to set and control their own budgets.

The Reserve Bank of Australia is generally considered to be a relatively independent central bank. The governor and deputy governor are appointed for seven-year terms and the other members of the Reserve Bank's board are appointed for five-year terms. This contrasts with the members of the Australian House of Representatives who must face re-election every three years. The daily policy actions of the Reserve Bank are not subject to review, approval or veto by the government. Finally, the Reserve Bank is under no obligation to finance the national deficit, and it controls its own budget.

Empirical evidence supports the proposition that countries should foster the independence of their central banks. Countries whose central banks are more independent have lower rates of inflation on average. More importantly, the lower inflation does not appear to come at the cost of lower output or higher unemployment, according to most studies. By enhancing a central bank's credibility, greater central bank independence leads to better overall economic outcomes.

12.2.2 ANNOUNCING A NUMERICAL INFLATION TARGET

FIND ONLINE

Many economists believe that expectations are more firmly anchored, and the central bank is perceived as more credible in those countries in which the central bank announces an explicit, numerical target for inflation. We have already introduced the idea of a target rate of inflation in our discussion of the monetary policy rule. Central banks must have an idea of the inflation rate they would like to achieve in order to make sensible policy. The more controversial question is whether central banks should announce their target inflation rate to the public. Proponents argue that announcing a numerical target for long-run inflation, and then sticking to it, will increase credibility and better anchor inflation expectations.

Many central banks publicly announce their inflation target. The Reserve Bank of Australia began announcing a target range for inflation of between 2 and 3 per cent in 1993. The Bank of Canada began announcing its inflation target in 1991. Since 1995, that target has been 2 per cent. In March 2011, the Bank of England's inflation target was 2 per cent, and the Central Bank of Brazil's target was 4.5 per cent. Other central banks provide a range for their target rather than, or in addition to, a single number. The Bank of Israel and the Reserve Bank of New Zealand, for example, both had a 1–3 per cent target range as of March 2011; in Chile the range is 2–4 per cent.

Central banks that announce their targets typically provide additional information to the public. This information may include their forecasts of inflation, real GDP and other variables, as well as some discussion of the specific policies that will be needed to meet their targets. Advocates believe that announcing inflation targets and accompanying them with supporting information enhances the credibility of the central bank and reduces uncertainty among households and firms. This helps to anchor inflation expectations, keep inflation low and maintain full employment.

Note that it makes sense for a central bank to announce a long-run inflation target, in that the central bank can control the rate of inflation in the long run. It would *not* make sense for a central bank to announce a long-run target for real GDP or employment because these variables are determined by a host of factors (such as productivity and the supply of labour) that are not under the control of the central bank.

Once an inflation target is announced, the central bank may choose to adhere to it strictly, or it may be more flexible. A central bank that sets a strict target tries to meet the target all the time without regard for the consequences for output. As we have seen, this policy keeps output at potential when the economy is beset by spending shocks, but it may result in a recession if the central bank acts to eliminate even the initial bulge in inflation following a shock to aggregate supply such as an inflation shock.

In practice, virtually all central banks that announce an inflation target are flexible inflation targeters—they try to hit their inflation target in the long run or on average over a long period while responding to short-term shocks to aggregate supply in a way that takes account of both output gaps and inflation. In these cases, the announced inflation targets correspond to the target inflation rate in the monetary policy rule.

Advocates of announcing explicit numerical targets believe that this practice reduces uncertainty in financial markets and among the public. Reduced uncertainty allows people to plan more effectively, save the resources used to protect themselves from unexpected inflation, and improve market functioning. By putting the prestige of the central bank behind its commitment to meet the target, the advocates also believe that explicit inflation targets enhance the central bank's credibility and anchor inflation expectations.

Supporters of inflation targets emphasise that it has been successful in both developing and industrialised countries. They believe that explicit targets in Brazil, Chile, Mexico and Peru are one important reason why the central banks in nine of the most populous Latin American countries were able to reduce their inflation rates from 160 per cent per year in the 1980s and 235 per cent during the first half of the 1990s to only 13 per cent per year in 1995–99 and less than 8 per cent in the period 2000–04.

Those central banks that do not announce an explicit target to the public still may have a target or range in mind when making policy. Instead of announcing a specific number to the public, these banks typically state that they are interested in keeping inflation low, without defining exactly what that means. Proponents of this approach believe that a system of publicly announced targets is too rigid and may reduce the flexibility of the central bank to deal with unexpected circumstances. They worry that having an explicit inflation target may lead the central bank to pay too much attention to inflation and not enough attention to stabilising output and maintaining full employment.

THINKING AS AN ECONOMIST 12.1

The inflation target

Why shouldn’t the inflation target be zero?

Because central banks often state that they are in favour of stable prices, the logical long-run target for inflation is 0 per cent. However, most economists believe that an inflation target of zero is too low, and central banks that announce an explicit inflation target usually choose values that are low but above zero. Why shouldn’t the inflation target be zero?

Several reasons have been offered. First, because hitting the target always is impossible in practice, an inflation target of 0 per cent increases the risk that the economy will experience periods of deflation (negative inflation). The deflationary experiences of the United States in the 1930s, and more recently in Japan, illustrate that deflation can be difficult to stop once it starts, and it can lead to painful and persistent declines in real GDP, especially if people expect it to continue. Many policymakers prefer to reduce the risk of deflation by choosing an inflation target above 0 per cent.

Second, there are times when a central bank may wish to counteract negative shocks to the economy with a negative real interest rate, but this requires that inflation be greater than zero. Recall that the real interest rate is equal to the nominal interest rate minus the rate of inflation. Thus, a negative real interest rate requires setting a nominal interest rate less than inflation. If inflation is zero (or less than zero), a negative real interest rate would require a negative nominal interest rate. But the cash rate cannot fall far below zero because banks would rather keep funds in their exchange settlements accounts than lend them out at a negative nominal interest rate. Consequently, a negative real interest rate must usually be accompanied by inflation greater than zero.

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Finally, some economists believe that a small amount of inflation is necessary to 'grease' our economic engine. For example, the perfectly competitive model of the labour market considered in Chapter 5 indicated that technological change and shifts in product demand may require real wages in some industries or occupations to fall in an efficiently operating economy, even when real wages in other industries and occupations are rising. If inflation is positive, workers' real wage will fall whenever their nominal wage rises by less than the rate of inflation. If, for example, the nominal wage rises by 4 per cent but prices rise by 5 per cent, the real wage (i.e. the amount of goods and services workers can buy with their earnings) will fall. If, however, inflation is 0 per cent and prices are not changing, the only way in which a worker's real wage can fall is if their nominal wage itself falls. Some evidence suggests that workers will strenuously resist cuts in their nominal wages. They seem to be less resistant to having their nominal wages rise by a smaller per cent than inflation even though this, too, reduces their real wage. Consequently, inflation can provide the 'grease' required to reduce real wages in some industries and achieve economic efficiency. Critics of the 'grease' theory argue that workers will become less resistant to nominal wage cuts at very low or zero rates of inflation. In a low inflation environment, nominal wage cuts would, of necessity, be more common and workers would get used to the idea.

12.2.3 CENTRAL BANK REPUTATION

Ultimately, credibility can be won and maintained only by performance, and a central bank's performance will depend partly on its reputation as being an 'inflation hawk' or an 'inflation dove'. An **inflation hawk** is committed to achieving and maintaining low inflation, even at some short-run cost in reduced output and employment. An **inflation dove** is not strongly committed to achieving and maintaining low inflation.

Inflation hawks believe that low and stable inflation allows the economy to grow more rapidly in the long run and therefore will be worth the possible short-run cost. Somewhat paradoxically, inflation hawks also may achieve more stable output and employment, even in the short run. Central banks that have acquired reputations as an inflation hawk will find it easier to anchor inflationary expectations. As we have learned, anchored expectations increase the speed with which short-run aggregate supply shifts down following an adverse inflation shock or demand shock. Consequently, by anchoring expectations, a central bank that is viewed as an inflation hawk may be better able to stabilise output at potential GDP, even in the short run.

But how does a central bank acquire a reputation as an inflation hawk? Some central bankers acquire this reputation only after conducting monetary policy like an inflation hawk. Sometimes, people can be selected to serve as central bank officials who already have acquired reputations as inflation hawks, based on their professional or academic backgrounds.

▹▹ RECAP

Macroeconomic performance may be improved if expectations of inflation are anchored. Anchored expectations, in turn, depend on the extent to which a central bank's anti-inflation pronouncements are viewed as credible. Several institutional characteristics may help to enhance a central bank's credibility: the extent to which the central bank is independent from the executive and legislative branches of the government, the announcement of a numerical inflation target, and the reputation of the central bank as an 'inflation hawk'.

12.3 FISCAL POLICY AND THE SUPPLY SIDE

LO 12.3

So far, we have focused on monetary policy and its effects. Now, we turn our attention to fiscal policy. Recall that in Chapters 7 and 8 we looked at the role of fiscal policy—government spending and taxes—in the determination of aggregate expenditure and aggregate demand. We saw, for example, that increased government spending or lower taxes can expand the economy by increasing aggregate demand. However, most economists agree that fiscal policies affect the economy's productive capacity, or potential output, as well as aggregate demand. In general, a **supply-side policy** is a policy that affects potential output (the 'supply side' of the economy). As we discuss here, fiscal policies are often supply-side policies in this sense.

Government expenditures on public capital increase aggregate spending, as we have already discussed. However, they also may increase the economy's potential output. For example, government expenditure that leads to an improved national roads system is a case in point: by lowering the costs of long-distance transportation, improved national highways make the economy more productive and increase potential output. Thus, spending on public capital may be a supply-side policy as well as an influence on aggregate demand.

Government tax and transfer programs affect the incentives, and thus the economic behaviour, of households and firms. To the extent that changes in behaviour in turn affect potential output, tax and transfer programs also have supply-side effects. A lower tax rate on interest income (as opposed to all income), for example, may increase people's willingness to save for the future, freeing resources for domestic investment. Although greater saving implies lower consumption expenditures and thus weaker aggregate demand in the short run, greater saving also leads to more investment in the long run and a faster rate of capital formation in the economy. As a result, potential output will grow more rapidly.

Tax and transfer policies also affect potential output by affecting the supply of labour. For example, lower tax rates on earnings may increase potential output by inducing people to work more hours. To illustrate, suppose that Tom earns $10 per hour before taxes and his tax rate is 40 per cent. Thus, for each hour he works, Tom earns $10; pays 40 per cent of $10, or $4, in taxes; and takes home $6 in after-tax earnings. Tom's situation is depicted in the first line of Table 10.2. Now suppose his tax rate is reduced to 30 per cent. If Tom's before-tax wage rate remains equal to $10, his taxes on each hour of work fall to 30 per cent of $10, or $3, and he takes home $7 in after-tax earnings, as illustrated in the second line of Table 12.2. Consequently, a *reduction* in Tom's tax rate from 40 per cent to 30 per cent *increases* his after-tax wage from $6 to $7 per hour.

TABLE 12.2 The effects of a reduction in tax rates on Tom's after-tax wage rates

BEFORE-TAX WAGE	TAX RATE	TAXES PAID	AFTER-TAX WAGE
$10	40% (=0.40)	$4	$6
$10	30% (=0.30)	$3	$7

Reductions in tax rates may increase the number of hours people want to work because the opportunity cost of staying home has risen. Tom's opportunity cost of watching an additional hour of television, for example, is equal to the amount of after-tax earnings he could have earned during that hour, which has risen from $6 to $7.

According to the cost–benefit principle, individuals make decisions by comparing the extra benefits with the extra costs. In examining the effects of tax rates on economic incentives, therefore, economists focus on people's **marginal tax rate** , which is the tax rate on the *marginal* or extra dollar of income, or the amount by which taxes rise when before-tax income rises by one dollar.

Changes in marginal tax rates may affect other aspects of the labour supply decision besides the number of hours worked. For example, consider a student’s decision about whether to invest the time and money necessary to become a doctor. From an economic perspective, the return on that investment in human capital is the extra income that the student will be able to earn as a doctor, relative to what they might earn without a medical degree. If the marginal tax rate on earnings is high, the economic incentive to become a doctor will be lower, and the student may decide not to make that investment. Likewise, a lower marginal tax rate increases the incentive for people to be entrepreneurial and to take risks—for example, by starting their own companies—since they know that they will be able to keep a larger portion of the returns from their efforts.

In Figure 12.4 we illustrate one scenario in which a cut in marginal tax rates increases both aggregate demand and long-run aggregate supply. As before, the tax cut shifts the aggregate demand curve to the right, from AD_1 to AD_2. Now, however, the tax cut also increases potential output. As a result, real output will increase in both the short run and the long run. Whether the rate of inflation also will increase depends on the relative size of the two shifts. For simplicity, we have drawn them so that inflation remains constant, but this need not be the case.

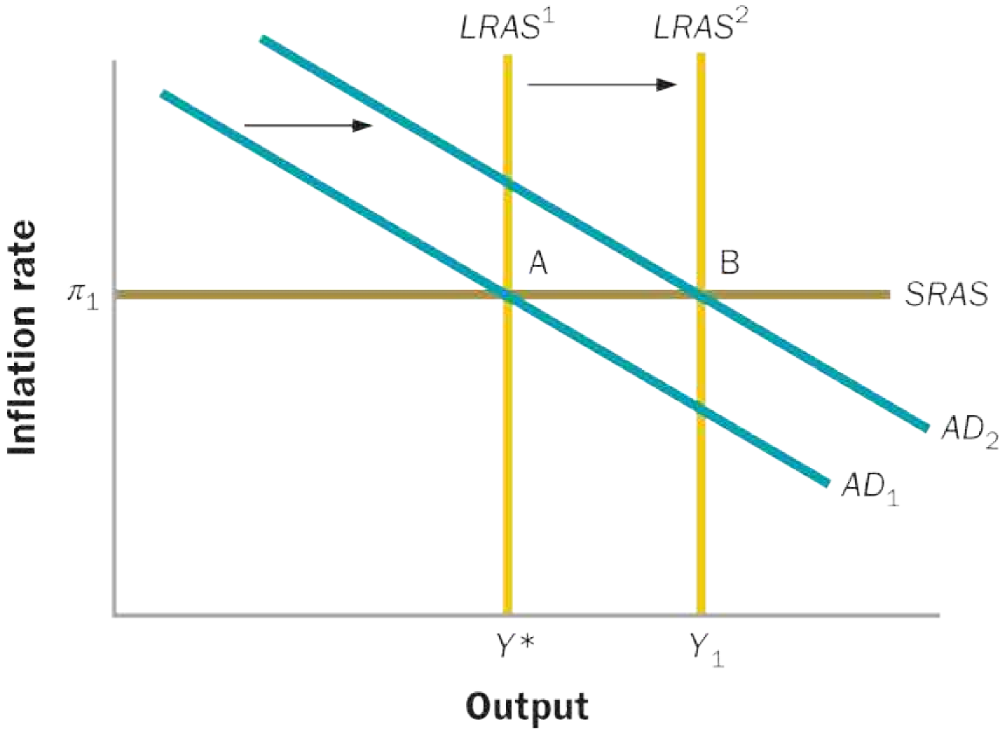

Figure 12.4 **The potential effects of tax rate reductions on aggregate demand and aggregate supply**

Note: The economy is initially in equilibrium with output ***Y**** equal to potential output and inflation π_1 equal to expected inflation and the central bank's long-run inflation target. A reduction in the marginal tax rate shifts the AD curve from AD_1 to AD_2. If the supply-side effects of the tax-rate reduction are strong, inflation remains at π_1 and output rises from to Y_1.

Although economists agree that tax rates affect economic behaviour, the magnitude and sometimes even the direction of the effects can be controversial. In our earlier example, we showed that a decline in Tom's tax rate implies an increase in his after-tax wage rate. The increase in Tom's after-tax wage gives him an incentive to work more hours and to cut back on activities such as watching television because the opportunity cost of watching television instead of working has risen. On the other hand, the reduction in Tom's tax rate also might increase his after-tax wage to such an extent that he may feel that he can afford to work even fewer hours and still pay his bills. Empirical studies of the labour market suggest that the responsiveness of an individual's labour supply to changes in taxes depends on many factors, including age, sex, marital status and education. For example, married women have traditionally been more likely to move in and out of the labour force and appear to be more responsive to changes in after-tax wages than are their husbands, who have historically tended to remain in the labour market on a full-time basis even when tax rates change.

CONCEPT CHECK 12.2

Suppose the government levies a tax on firms' purchases of capital equipment. What will be the effects on real GDP and the inflation rate?

If lower tax rates tend to increase potential output, why not reduce taxes to zero? The answer is that, ultimately, government expenditures can be paid for only through taxes. Of course, the government can run a deficit for a while, borrowing to cover the difference between what it spends and what it collects in taxes. But deficits can be harmful (e.g. they reduce national saving), and in any case the government's borrowing eventually must be repaid with future taxes. Thus, in the long run, taxes should be set at a level commensurate with the government's rate of spending.

The important message is that fiscal policy can affect potential output as well as aggregate demand. Thus, in making fiscal policy, government officials should consider not only the need to stabilise aggregate demand but also the likely effects of government spending, taxes and transfers on the economy’s productive capacity.

▹▹ RECAP

- A supply-side policy is a policy that affects potential output. Fiscal policies affect aggregate demand, but they also may be supply-side policies.
- Government expenditures on public capital—such as roads, airports and schools—increase aggregate expenditure but also may increase potential output.
- Government tax and transfer programs affect the incentives, and thus the economic behaviour, of households and firms.
- People may respond to reductions in their marginal tax rates by working more hours, investing more in education and taking more entrepreneurial risks, all of which contribute to greater potential output. The size of the effect of tax changes on labour supply remains somewhat controversial.
- Fiscal policymakers should take into account the effects of spending and tax decisions on potential output as well as on aggregate demand.

12.4 POLICYMAKING: ART OR SCIENCE?

LO 12.4

Perfect macroeconomic policy would require each of the following: (1) accurate knowledge of the current state of the economy, (2) knowledge of the future path of the economy if no policy changes are implemented, (3) the precise value of potential output to determine the existence and size of any output gap, (4) complete and immediate control over the tools of fiscal and monetary policy and (5) knowledge of how and when the economy will respond to changes in policy.

Unfortunately, macroeconomic policy is far from this ideal. The current levels of many macroeconomic indicators such as real GDP often are not known until several months later, and even after that they are subject to multiple revisions. Because policymakers do not have very precise knowledge of the current state of the economy, they may not be able to act decisively.

Further, policymakers are often unsure about the future path of the economy if no policy changes are implemented. If the economy will move to its potential level soon in the absence of any policy changes, it will be unnecessary and often unwise for policymakers to act now to eliminate an output gap. Instead of hastening the move back to full employment, policy changes may lead the economy to overshoot, necessitating a policy reversal in the future and potentially destabilising the economy.

Economists are also unsure about the exact levels of potential output and the natural rate of unemployment. For example, most economists now believe that macroeconomic policy was often too expansionary (and, hence, too inflationary) during the 1970s because policymakers overestimated the potential level of output and hence underestimated the natural rate of unemployment (see Thinking as an economist 11.1).

Even when policy changes are needed, it can take a long time for policymakers to implement the appropriate policy changes. The **inside lag of macroeconomic policy** refers to the delay between the date a policy change is needed and the date that policy change is implemented. During this period, the policymakers' economic advisers must recognise that a persistent output gap exists and determine the correct policy change. The policymakers must then accept the desirability of that policy change and implement it.

The inside lag for monetary policy is substantially shorter than the inside lag for fiscal policy. Once monetary policymakers accept the desirability of a change in the cash rate, they must wait only until the next meeting of the Reserve Bank board. Since the board meets monthly, the maximum delay is no more than four weeks. And once the board decides to change the target cash rate, the actual cash rate changes almost instantly.

The inside lag for fiscal policy, on the other hand, is considerably longer. After the Australian Government's budget is handed down in May, parliament must approve it. This process can take a long time, especially if the composition of parliament has made the swift passage of legislation through the house of representatives and the senate difficult.

Finally, economists have only an approximate idea of the exact output effect of a change in policy. The marginal propensity to consume is not known with certainty and need not be the same for all changes in income. Similarly, economists at the Reserve Bank have only an approximate idea of the effect of a given change in the real interest rate on planned spending. Economists have constructed econometric models of the economy that track the historical performance of the economy reasonably well. Yet these same models have often yielded disappointing and unreliable forecasts of the future path of the economy. Part of the problem is that it is difficult to predict the values of the exogenous variables in the economy, such as government spending or tax rates. In addition, the economic structure of the economy itself occasionally changes over time. The extent to which investment responds to changing real interest rates, for example, has varied over time.

Furthermore, both fiscal and monetary policymakers are never sure about the length of time before the effects on planned spending will occur. The **outside lag of macroeconomic policy** refers to the delay between the date a policy change is implemented and the date by which most of its effects on the economy have occurred. Although fiscal policy has a longer inside lag than monetary policy, its outside lag may be shorter. Changes in government spending have an immediate effect on real GDP and the economy, although the multiplier effects continue. Similarly, households often respond to tax cuts by increasing their consumption expenditures immediately. On the other hand, investment responds more slowly when the Reserve Bank changes the real interest rate since the interest rate is one among many factors that businesses look at before building a new factory or buying an expensive new machine.

Because our knowledge of the economy is imperfect, policymaking at Page 315 its best also will be imperfect. In terms of our aggregate supply–aggregate demand model, policymakers don’t know exactly how much or how fast the aggregate demand curve will shift in response to policy changes. They also don’t know how fast the SRAS line shifts up when output exceeds its potential level or how fast it shifts down if output is less than potential.

During the 1960s, economists were more confident about their ability to maintain output at its potential level using the appropriate monetary and fiscal policies. They believed they could compute the size of output gaps, and devise policies to eliminate these gaps. Many also believed they could easily predict the future path of the economy under alternate policy scenarios, and they were comfortable implementing frequent policy changes to ‘fine-tune’ the economy. Finally, many economists mistakenly thought policymakers could deliver a permanently higher level of output with just a bit more inflation.

The experience of the past few decades has made economists humbler, even about identifying an output gap. Some economists believe that we are at potential output when the unemployment rate is 4.5 per cent, while others believe the natural rate of unemployment is as high as 5.5 or even 6 per cent.

Consequently, whenever the actual unemployment rate lies between 4.5 and 6 per cent, some economists think they see a contractionary gap while others see an expansionary gap.

Because of these uncertainties, macroeconomic policymakers tend to proceed cautiously. The Reserve Bank, for example, avoids large changes in interest rates and rarely raises or lowers the target cash rate more than one-half of a percentage point (e.g. from 5% to 5.5%) at any one time. Indeed, the typical change in the interest rate is one-quarter of a percentage point. Similarly, policymakers are now less likely to try to 'fine-tune' the economy.

Is macroeconomic policymaking an art or a science, then? In practice it appears to be both. Scientific analyses, such as the development of detailed econometric models of the economy, have proved useful in making policy. But human judgement based on long experience—what has been called the 'art' of macroeconomic policy—plays a crucial role in successful policymaking and is likely to continue to do so.

▹▹ RECAP

Macroeconomic policymaking is a difficult and inexact science. Policymakers do not know the precise state of the economy, the future path of the economy if no policy changes are implemented, or the precise level of potential output. They also have imperfect control over policy instruments and imprecise knowledge of the effects of any policy changes. The existence of inside and outside lags makes policymaking even more difficult. Consequently, macroeconomic policymaking is an art as well as a science.

SUMMARY

- Changes in exogenous spending shift the aggregate demand curve. In response, fiscal and monetary policy can be applied to return output to potential and inflation to its long-run expected rate.
- Inflation shocks force the central bank to choose between maintaining inflation and stabilising output. If inflationary expectations are anchored, the return to potential output following an inflation shock will occur more rapidly.
- Anchored inflationary expectations will improve economic performance in the long run and also may reduce the volatility of output and inflation in the short run. Inflationary expectations are more likely to be anchored if the central bank's policies are viewed as credible and the public believes the central bank's promises to keep inflation low.
- A central bank's credibility may be enhanced if it is insulated from short-term political considerations and is allowed to take a long-term view of the economy. Credibility also may be enhanced if the central bank publicly announces a numerical inflation target and if it has a reputation as an 'inflation hawk'.
- A supply-side policy is a policy that affects potential output. Fiscal policies affect aggregate demand, but they also may be supply-side policies. Government expenditures on public capital increase aggregate expenditure but also may increase potential output. Government tax and transfer programs affect the

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incentives of households and firms. People may respond to reductions in their marginal tax rates by working more hours, investing more in education and taking more entrepreneurial risks, all of which contribute to greater potential output. The size of the effect of tax changes on labour supply remains somewhat controversial. Fiscal policymakers should take into account the effects of spending and tax decisions on aggregate supply as well as on aggregate demand.

- Economists now recognise that the analogy between driving a car and managing the economy is a poor one. Unlike driving a car, macroeconomic policymaking is an inexact science. Policymakers do not know the precise state of the economy, the future path of the economy if no policy changes are implemented, or the precise level of potential output. In addition, they have imperfect control over policy instruments and imprecise knowledge of the effects of any policy changes. During the past few decades, economic policymakers have become more humble about their ability to 'fine-tune' the economy.

KEY TERMS

accommodating policy 306

anchored inflationary expectations 307

central bank independence 308

credibility of monetary policy 308

inflation dove 311

inflation hawk 311

inside lag (of macroeconomic policy) 314

marginal tax rate 312

outside lag (of macroeconomic policy) 314

supply-side policy 312

REVIEW QUESTIONS

1. Suppose there is an increase in taxes. What is the short-run effect on output, inflation and the real interest rate, assuming any supply-side effects are minimal? What will be the effect in the long run if the Reserve Bank chooses to adjust its target real interest rate to the new long-run real interest rate at which saving equals investment? LO 12.1 **MEDIUM**
2. How does the adoption of a tighter monetary policy affect output, inflation and the real interest rate in the short run? In the long run? LO 12.1 **MEDIUM**
3. Suppose there is a sudden increase in oil prices. What will be the effect on output and inflation in the short run? What is the 'dilemma' faced by the Reserve Bank because of the adverse inflation shock? LO 12.1 **MEDIUM**
4. What are anchored inflationary expectations and how do they reduce the cost of an adverse inflation shock? LO 12.2 **MEDIUM**
5. What factors determine a central bank's independence? What are the benefits of having an independent central bank? LO 12.2 **EASY**
6. How does a reduction in the marginal tax rate affect both aggregate demand and aggregate supply? LO 12.3 **EASY**

PROBLEMS

1. Suppose the economy is initially in long-run equilibrium and the Reserve Bank adopts a looser monetary policy and raises its long-run target for the inflation rate.

a) Explain how this change in monetary policy will affect the aggregate demand (AD) curve.

b) Use your result for part (a) along with an aggregate demand–aggregate supply (AD–AS) diagram to illustrate and explain what will happen to output and inflation in both the short run and the long run. LO 12.1 **MEDIUM**

2. Suppose the economy is initially in long-run equilibrium and experiences a favourable inflation shock.

a) Explain how the SRAS line is affected in the short run.

b) Use your result for part (a) along with an AD–AS diagram to illustrate and explain what will happen to output and inflation in both the short run and the long run if the Reserve Bank accommodates the favourable inflation shock.

c) Use your result for part (a) along with an AD–AS diagram to illustrate and explain what will happen to output and inflation in both the short run and the long run if the Reserve Bank does not accommodate the favourable inflation shock. LO 12.1 **MEDIUM**

3. Suppose the economy is initially in long-run equilibrium. Due to a decline in house prices, suppose that consumers reduce their consumption spending. LO 12.1 **HARD**

a) Explain how the decline in consumer spending affects the AD curve.

b) If the Reserve Bank does not change its monetary policy rule, how will it react to the decline in consumer spending? Use an AD–AS diagram to illustrate and explain your answer.

c) Now, in addition to the decline in consumer spending, suppose that the economy experiences an adverse inflation shock. (i) Explain how the adverse inflation shock affects the SRAS line. (ii) Discuss, using AD–AS diagrams, what choices the Reserve Bank now must make regarding monetary policy. (*Hint*: Think about whether or not it should tighten monetary policy.)

4. Suppose there is a large increase in oil or food prices. LO 12.2 **MEDIUM**

a) If the core rate of inflation remains unchanged, what might the Reserve Bank infer about inflationary expectations? How might it respond?

b) If the core rate of inflation rises substantially, what might the Reserve Bank infer about inflationary expectations and the inflation shock? How might it respond?

5. Suppose the economy is initially in long-run equilibrium and the government reduces the marginal tax rate. LO 12.3 **MEDIUM**

a) Explain what will happen to output and inflation in both the short run and the long run if the effects of the tax cuts are stronger on aggregate demand than on aggregate supply.

b) How would your conclusions in part (a) be affected if the effects of the tax cuts are stronger on aggregate supply than on aggregate demand? Explain.

6. Using the theory presented in this chapter, explain why the adoption of a tighter, more anti-inflationary monetary policy might be politically unpopular. LO 12.4 **MEDIUM**

7. Explain how the recognition that macroeconomic policymaking is an inexact science affects your recommended policy response to the following situations: LO 12.4 **HARD**

a) Your estimate of the natural rate of unemployment is 5 per cent, and the actual unemployment rate is 5.5 per cent.

b) Your estimate of the natural rate of unemployment is 5 per cent, and the actual unemployment rate is 8 per cent.

REFERENCES

Blinder A 1998, *Central Banking in Theory and Practice*, MIT Press, Cambridge.

Chairman of the (US) Council of Economic Advisers, n.d., 'Economic report of the President', 1947–2018, https://fraser.stlouisfed.org/title/45, accessed 14 November 2018.

Reserve Bank of Australia (RBA) 2018, 'Statement on monetary policy', August, https://www.rba.gov.au/publications/smp/2018/aug/economic-outlook.html.

PART 3

LONG RUN MACROECONOMICS: THE ANALYSIS OF ECONOMIC GROWTH

WHEREAS THE analyses of the business cycle in Part 2 dealt with fluctuations of real output around its potential level, here in Part 3 we consider the evolution of potential output itself. This is the subject matter of growth economics, which requires an entirely different set of analytical tools from those we have been using thus far.

We begin by looking at some of the key fundamental aspects of economic growth, emphasising both historical experience and the role of some important structural factors that affect growth, such as average productivity and the proportion of the population who contribute to production.

Analytical frameworks are then developed that highlight the key ideas economists have had about economic growth. These are based on the concept of the production function, a simple representation of how factors of production are combined to yield output. Building on the production function, the concept of growth accounting is introduced, an empirical technique for reviewing countries' historical growth experiences and identifying the relative importance of various factors. The Solow–Swan model is then introduced, highlighting the fundamental nature of growth and making clear the conditions under which growth can be sustained in the long run.

GRADUATE SPOTLIGHT

Name: Emma Greenland
Degree studied: Bachelor of Economics (Hons)/Bachelor of Laws (Hons)
University: Australian National University
Current position: Economist
Employer: Reserve Bank of Australia

Early on, what interested you about a career in economics?

Growing up on a cattle farm in north-west New South Wales—where you hear a lot of talk about cattle prices—it is hard not to take an interest in supply and demand. When deciding what to study at university, I was torn between science and the humanities. I wanted variety in my career, something that was both theoretical and applied, both rigorous and flexible, but most importantly something that was relevant and useful to society. I saw all of that in economics.

What did you learn in your degree that has been most useful in your career?

My degree taught me to relate economic theory to the real world. Understanding the intuition behind economics is just as important as understanding the mathematical basis for the theory. Being able to think my way through an economic problem by relating it to how things work in the real world is a useful skill. It allowed me to quickly build a working knowledge of new economic issues as they arise.

What have you been up to since graduation?

Right after completing my degrees, I was offered a graduate position at the Reserve Bank of Australia. My first role at the Bank was in the area of payments policy, which allowed me to develop my microeconomic skills by analysing the efficiency of payment systems such as cash, and debit and credit cards. More recently I have worked in macroeconomic analysis. In my two years with the Bank, I have also managed to make time to travel to Japan, New Zealand and Europe.

What does your current job involve?

I am responsible for analysing price trends in the economy and putting together forecasts for inflation. This role is providing me with a thorough grounding in data analysis and modelling, as well as improving my writing and communication skills. These will be useful tools wherever my career in economics takes me.

What do you enjoy most about your job?

The variety and challenge. Economics involves a lot of problem-solving and it is always a great feeling to come up with an answer. Sure, there is routine work, but since economics is an imprecise science, there are always more questions to ask and more ways to improve our models and methods. Knowing that the work that I do is useful in setting monetary policy to benefit all Australians, is also very satisfying.

What advice would you share with students wanting to pursue a career in economics?

Always try to relate what you learn about economics to the real world. Economics is an applied social science, not just a theoretical pursuit.

What are your thoughts on the future of the macroeconomics industry?

The scope and availability of data is making economic analysis better and better over time. Data can tell us what is happening in the economy, but a good economist will be able to interpret what that means and why it is important.

INDUSTRY SPOTLIGHT

Name: David Rumbens
Current Position: Partner, Deloitte Access Economics
Employer: Deloitte Australia

Could you give us a brief summary of your career in economics so far?

I developed my foundation skills as an economist undertaking Economics (Honours) at Sydney University. The 'macroeconometric model building' course in my honours year cemented my career focus on trying to understand and explain big picture economic trends.

After a few years in the Commonwealth public service I moved across to a macro-modelling role in Access Economics (working with very similar models to those I had tinkered with in my honours year).

What does your current job involve?

The macroeconomics team at Deloitte Access Economics provide advice to hundreds of businesses and government agencies around Australia on the economic environment and likely trends going forward. This is critical for business planning and strategy, and allows us to play a part in many policy debates, such as around budget policy, superannuation, immigration and tax settings.

What advice would you share with prospective students who want to pursue a career in economics?

Communication is key—we are story tellers. Build your core economics skills, but understand that most economists spend much of their time relaying research and analysis in layman’s terms. So look to relate any economic argument or data as much as possible to real world events.

Also, be passionate about your work.

What current macroeconomic event are you watching with interest?

Many in the economics profession believed that the argument over free trade had been run and won some time ago.

However, in 2016 we saw a stark shift away from the global trend towards more open borders: the United Kingdom voted to leave the EU, and Americans voted in a president preaching strong protectionist rhetoric. In 2018, a significant US–China tariff war commenced.

Global trade is once again a significant issue for economists to advise government on appropriate policies; we saw that in 2018, when Australia was central in salvaging the Trans Pacific Partnership after the United States walked away.

Economists also have a key role in advising business on strategies. It takes time for global production to reorganise in response to new tariffs, but as tariffs remain in play for longer, we might see more and more businesses considering where they produce and how they organise their supply chains.

CHAPTER 13

The economy in the long run: An introduction to economic growth

After reading this chapter, you should be able to answer the following questions.

13.1 What are the main facts about the world's experience of economic growth?

a) When has growth occurred?

b) How has growth been distributed across the world's countries?

13.2 Which countries have grown?

13.3 Which countries have not grown?

13.4 What is the relationship between economic growth and potential output?

a) What role does aggregate demand play in explaining economic growth?

13.5 What is the significance of small differences in economic growth rates for countries' standards of living in the long run?

13.6 What economic factors are the main contributors to economic growth?

13.7 What are the costs and benefits of economic growth?

13.8 What policies do economists recommend to boost economic growth?

a) Are there limits to economic growth?

SETTING THE SCENE

In the aftermath of World War II, two international institutions were established to guide the world's economies into what was hoped would be an era of peace and prosperity. One, the International Monetary Fund, was to provide support to economies that experienced short-term economic stress. The other, the World Bank, was to assist the world's poorest countries in their quest to achieve economic development. We can see in these two institutions the two grand themes of macroeconomics: short-run disruptions to economic growth and long-run growth.

In this chapter, we begin the task of understanding Page 324

economic growth. As you will learn as you work through this chapter, there remain major discrepancies in the standard of living between the world’s richest and poorest countries. Yet, in recent years, there has been some cause for cautious optimism, albeit tempered with acknowledgement that much still needs to be done. Consider this recent announcement from the World Bank (2018).

Decline of global extreme poverty continues but has slowed: World Bank

Fewer people are living in extreme poverty around the world, but the decline in poverty rates has slowed, raising concerns about achieving the goal of ending poverty by 2030 and pointing to the need for increased pro-poor investments, the World Bank finds.

The percentage of people living in extreme poverty globally fell to a new low of 10 percent in 2015—the latest number available—down from 11 percent in 2013, reflecting steady but slowing progress, World Bank data show. The number of people living on less than $1.90 a day fell during this period by 68 million to 736 million.

“Over the last 25 years, more than a billion people have lifted themselves out of extreme poverty, and the global poverty rate is now lower than it has ever been in recorded history. This is one of

the greatest human achievements of our time," World Bank group president Jim Yong Kim said. "but if we are going to end poverty by 2030, we need much more investment, particularly in building human capital, to help promote the inclusive growth it will take to reach the remaining poor. For their sake, we cannot fail."

Despite the tremendous progress in reducing extreme poverty, rates remain stubbornly high in low-income countries and those affected by conflict and political upheaval …

Reference
World Bank 2018, 'Decline of global extreme poverty continues but has slowed: World Bank', Press release, 19 September, www.worldbank.org/en/news/press-release/2018/09/19/decline-of-global-extreme-poverty-continues-but-has-slowed-world-bank.

The fact that global poverty is at an all-time low is to be celebrated. Economists, through careful analysis of evidence and through the development of sophisticated models of economic growth, have shed light on factors that promote growth and lift people out of poverty. Understanding the material in this and the next two chapters will help you understand the task that lies ahead if global poverty is, for once and for all, to be eliminated.

13.1 INTRODUCTION TO ECONOMIC GROWTH

LO 13.1

Think of all the things that contribute to your material standard of living: clothing, food, healthcare, entertainment, consumer durables and so on. Now think of what your parents or grandparents would have included if they had been asked to construct a similar list at the same age at which you are now. Certainly, the same broad categories of items would have been there—clothing, food and so on—but the specific items would have been very different. Would your grandparents have had access to designer clothes, online music services or flat-screen televisions? Economic growth, the gradual long-run increase in nations' potential output, has delivered consumption opportunities in terms of the range of commodities that are available, their quantity and their quality, that far outweigh what even the relatively affluent were able to obtain just one or two generations ago.

To take another important example, think of the standard of healthcare now on offer and contrast that with what was available in the past. It is only in comparatively recent times that doctors have had effective weapons against tuberculosis, typhoid fever, diphtheria, influenza, pneumonia and other communicable diseases. These illnesses, now quite treatable, were major killers in the nineteenth century. Infants and children were particularly susceptible to deadly infectious diseases, especially whooping cough and measles. Even a well-to-do family often lost two or three children to these illnesses.

No doubt you can think of other enormous changes in the way average people live, even over the past few decades. For example, computer technologies and the internet have changed the ways people work, study and enjoy their leisure time in just a few years. Though these changes are due in large part to scientific advances, such discoveries by *themselves* usually have little effect on most people's lives. New scientific knowledge leads to widespread improvements in living standards only when it is commercially applied. Better understanding of the human immune system, for example, has little impact unless it leads to new therapies or drugs. And a new drug will do little to help unless it is affordable to those who need it.

A tragic illustration of this point is the AIDS epidemic in Africa. Although some new drugs will moderate the effects of the virus that causes AIDS, they are so expensive that they are of little practical value in poverty-stricken African nations grappling with the disease. But even if the drugs were affordable, they would have limited benefit without modern hospitals, trained health professionals, and adequate nutrition and sanitation. In short, most improvements in a nation's living standard are the result not just of scientific and technological advances but of an economic system that makes the benefits of those advances available to the average person.

Economists have long been interested in the factors that contribute to economic growth. Recently, this interest has been spurred on by two observations about the world. The first is the tremendous increase in material living standards enjoyed by those people in industrialised countries such as Australia and the United States. This growth has subsequently spread to countries in the East Asian region. The second reason for economists' interest in economic growth is sadly not as fortuitous as the first. Many countries, and a significantly large proportion of the world's population, have not enjoyed fully the fruits of this economic growth. Large areas of Sub-Saharan Africa remain relatively impoverished. Understanding why some countries have failed to grow is as important, if not even more important, as understanding why others have grown.

13.2 ECONOMIC GROWTH AND POTENTIAL OUTPUT

LO 13.1–13.4

There is an important conceptual question to answer before proceeding any further with our analysis of economic growth: How does economic growth relate to the material we discussed in Chapters 6 to 12 of this book—the economy's business cycle?

In the *short run*—remember that this is defined as the period in which prices do not adjust in response to either a contractionary or an expansionary output gap—output in the economy is determined by the state of planned aggregate demand (or spending). This is because firms are assumed to supply, in the short run, whatever is demanded. In this environment, fluctuations in aggregate demand are the key factor leading to output being either above or below its potential level. This is a fundamental prediction of the basic Keynesian model.

BACKGROUND BRIEFING 13.1

Some facts about economic growth

Economic growth is a relatively recent experience for human beings. Throughout most of humankind's history improvements in material living standards, to the extent that they occurred at all, evolved incredibly slowly. The expectation that many of us have—namely, that we will enjoy a better standard of living than our parents' generation and that our children will have a better standard of living than our generation—would have made little sense to someone living in, say, Europe during the tenth century. Back then, living standards remained largely static; change took centuries.

The industrial revolution, dating roughly from the eighteenth century in Europe, heralded a new era of economic growth. The increasing use of mechanical power in manufacturing meant a massive increase in labour productivity. New transport technologies, ultimately culminating in the steam train and steam-powered ocean-going vessels meant for the first time that commodities need not be manufactured close to the point of sale. Aggregate living standards rose significantly in the wake of the industrial revolution. (However, there exists a long-standing academic debate about whether the gains from the industrial revolution were spread equitably across the population of countries such as England and France; for example, Crafts 1985.) The trend towards increases in living standards in industrialised countries accelerated over the twentieth century. Since the end of World War II, many countries have experienced truly extraordinary improvements in living standards.

In Chapter 2 we introduced the concept of real gross domestic product (real GDP) as a basic measure of the level of economic activity in a country. Recall that real GDP measures the physical volume of goods and services produced within a country's borders during a specific period, such as a quarter or a year. Consequently, real GDP *per person* provides a measure of the quantity of goods and services available to the typical resident of a country at a particular time. Although real GDP per person is certainly not a perfect indicator of economic wellbeing, as we saw in Chapter 2, it is positively related to several pertinent variables, such as life expectancy, infant health and literacy. Lacking a better alternative, economists have focused on real GDP per person as a key measure of a country's living standard and stage of economic development.

Figure 13.1 shows real *per capita* GDP data for some selected countries. (The Penn World Table, from which these figures are taken, converts all countries' GDPs into units of a common currency [US$] and makes allowance for the different costs of living in each country. These data are widely used in empirical studies of economic growth.)

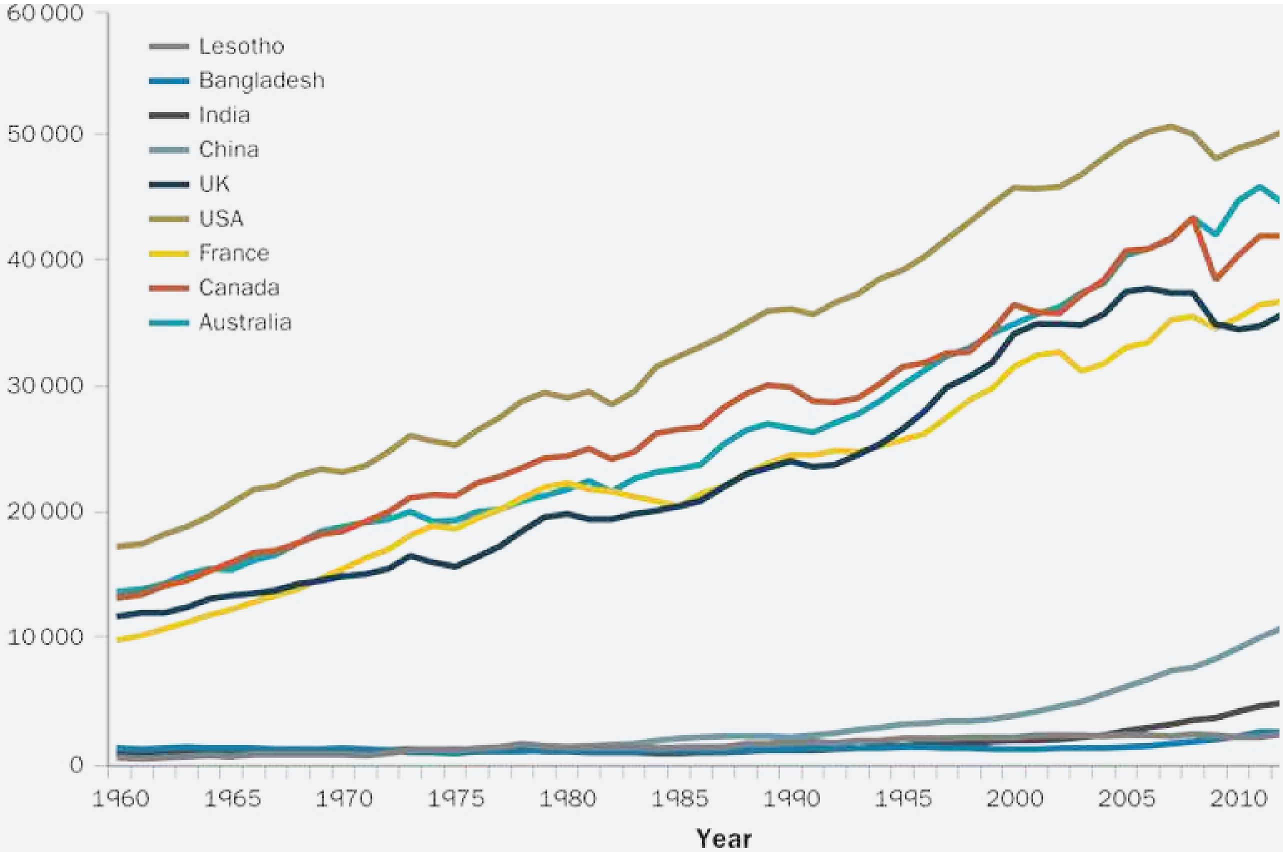

Figure 13.1 **Real per capita GDP**

Note: The amount of real GDP available to people has increased dramatically for many countries in the post-war era. However, not all countries have experienced rapid economic growth.

Source: Feenstra RC, Inklaar R and Timmer MP 2015, 'The next generation of the Penn World Table', *American Economic Review*, vol. 105, no. 10, pp. 3150–82, www.ggdc.net/pwt.

Figure 13.1 shows the flow of expenditure on real GDP for each country going back to 1960. The graph shows that for most of these countries the amount of real GDP available on average to each person was around three and a half times higher in 2014 than in 1960. China is a significant exception; the figure is closer to 11 times, a staggering rate of economic growth. Not all countries do as well: in Bangladesh the ratio is around 2, indicating economic growth has been at a comparatively slow rate compared to countries such as Australia and the United States.

Despite the impressive gains in living standards for the residents of many countries, the reality is that not all of the world's population has shared in this growth (as highlighted by the experience of countries such as Bangladesh and Lesotho shown in Figure 13.1). Figure 13.2 shows one measure of the distribution of world GDP—these data are for the year 2014. The figure is a histogram, where each bar represents the number of the world's countries in each real per capita GDP class. For example, the first bar shows that 38 countries had an average level of real per capita GDP between US$600 and US$3600, the second bar shows that 19 countries had an average per capita income between US$3600 and US$6000, and so on.

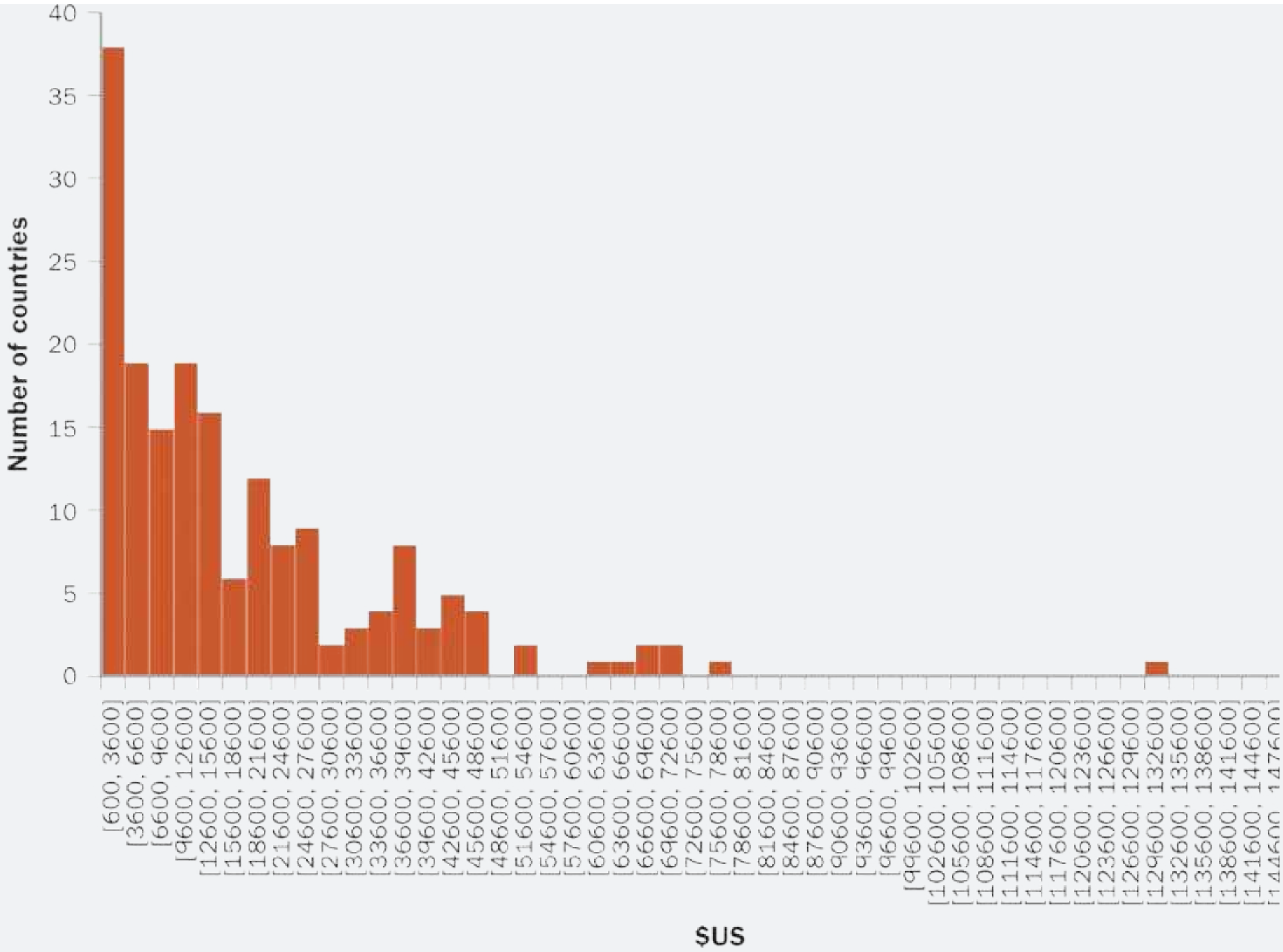

Figure 13.2 **Distribution of world real per capita GDP, 2014**

Note: The distribution of real per capita GDP is very uneven across the world. The relatively highest per capita GDP is earned in only a small number of countries.

Source: Feenstra RC, Inklaar R and Timmer MP 2015, 'The next generation of the Penn World Table', *American Economic Review*, vol. 105, no. 10, pp. 3150–82, www.ggdc.net/pwt.

Figure 13.2 highlights the inequality that exists in the distribution of per capita income across the world. The clear majority of countries earned well below the average real per capita GDP (which was US$19 170). The median level of real per capita GDP was US$12 622; this implies that half of the world's countries received a real per capita GDP that was around three and a half times smaller than the level earned by countries such as Australia and the United States.

Why some countries can grow rapidly and achieve relatively high per capita incomes and others languish far behind will be the subject of this and the next two chapters.

As discussed in Chapter 11, prices are unlikely to remain constant in response to a prolonged output gap. Over a time frame longer than that considered by the basic Keynesian model, we would expect that prices adjust in response to aggregate demand changes. To allow for these price changes, and to do so in a way that conforms closely to the actual behaviour of the economy, we extended the basic Keynesian model in Chapter 11 to incorporate the rate of inflation; we did this using the analytical framework of the aggregate demand—aggregate supply (AD–AS) model.

The longer time frame embedded in the AD–AS model allows the rate of inflation to have an impact on the economy's level of aggregate demand (recall that the Reserve Bank's response to inflation is an important reason for inflation affecting the level of planned spending in the economy). An economy with a contractionary output gap would experience a falling rate of inflation as firms try to boost their sales. In response, the Reserve Bank lowers the economy’s real interest rate, encouraging more spending in the economy, and this continues until potential output is regained. An inflationary output gap leads to an increase in the rate of inflation as firms allow prices to rise in response to the high level of planned aggregate spending. This leads, via the Reserve Bank’s policy reaction function, to an increase in the real interest rate and hence to a fall in planned aggregate spending. In either situation, a contractionary or an expansionary output gap, the economy ‘self-corrects’ and eventually finds its way back to potential GDP. Of course, should these automatic adjustments take a long time, or should the economy find itself with an entrenched high rate of inflation, there is scope for the government actively to manage the level of aggregate demand, with the aim of achieving potential output at a low rate of inflation.

When we extend the time frame even further, we enter a world in which the main influence on the economy is not the business cycle (which we have seen will either be self-correcting or will be moderated through carefully chosen fiscal and monetary policies); instead, the most fundamental influence on the economy becomes the level of potential output. Macroeconomic analysis of economic growth is essentially the study of the long-run forces that affect potential output.

There are some important changes to be made in the way we think about, and model, the economy once we start thinking about long-run economic growth; this is especially true for the role of aggregate demand. As we saw in Chapters 6 to 12, aggregate demand is one of the factors that plays a central role in driving the business cycle. In the long run, we know that the economy eventually returns to potential output. This self-correcting tendency of the economy has implications for the effect that aggregate demand has on the economy—aggregate demand changes are responsible for the short-run fluctuations of the economy *around* its potential GDP. Changes in aggregate demand do *not* affect potential GDP in the long run. This has a very important implication, namely, that the Keynesian model, either in its basic 45-degree diagram form or in its extended AD–AS form, offers little insight into the factors that drive economic growth in the long run (economic growth is taken to mean a sustained increase in the economy's potential output). As you will learn, a very different class of macroeconomic model must be used to analyse an economy's long-run growth performance.

The distinction between short-run Keynesian analysis and the theories that economists use to analyse long-run growth is illustrated in Figure 13.3. The figure shows two sets of AD–AS curves. The first set relates to an economy in the year 1960; potential output in 1960 was Y^*_{1960}. There is, of course, no reason to expect that the actual level of output would have corresponded to this potential level of output. That would have been the case only if the economy had been in long-run equilibrium in 1960; that is, with an aggregate demand curve given by AD^1_{1960} and a short-run aggregate supply curve given by *SRAS*. Had aggregate demand in that year been given by the curve AD^2_{1960} for example, the economy would have experienced a contractionary output gap given by $\frac{Y^1_{1960} - Y^*_{1960}}{Y^*_{1960}}$.

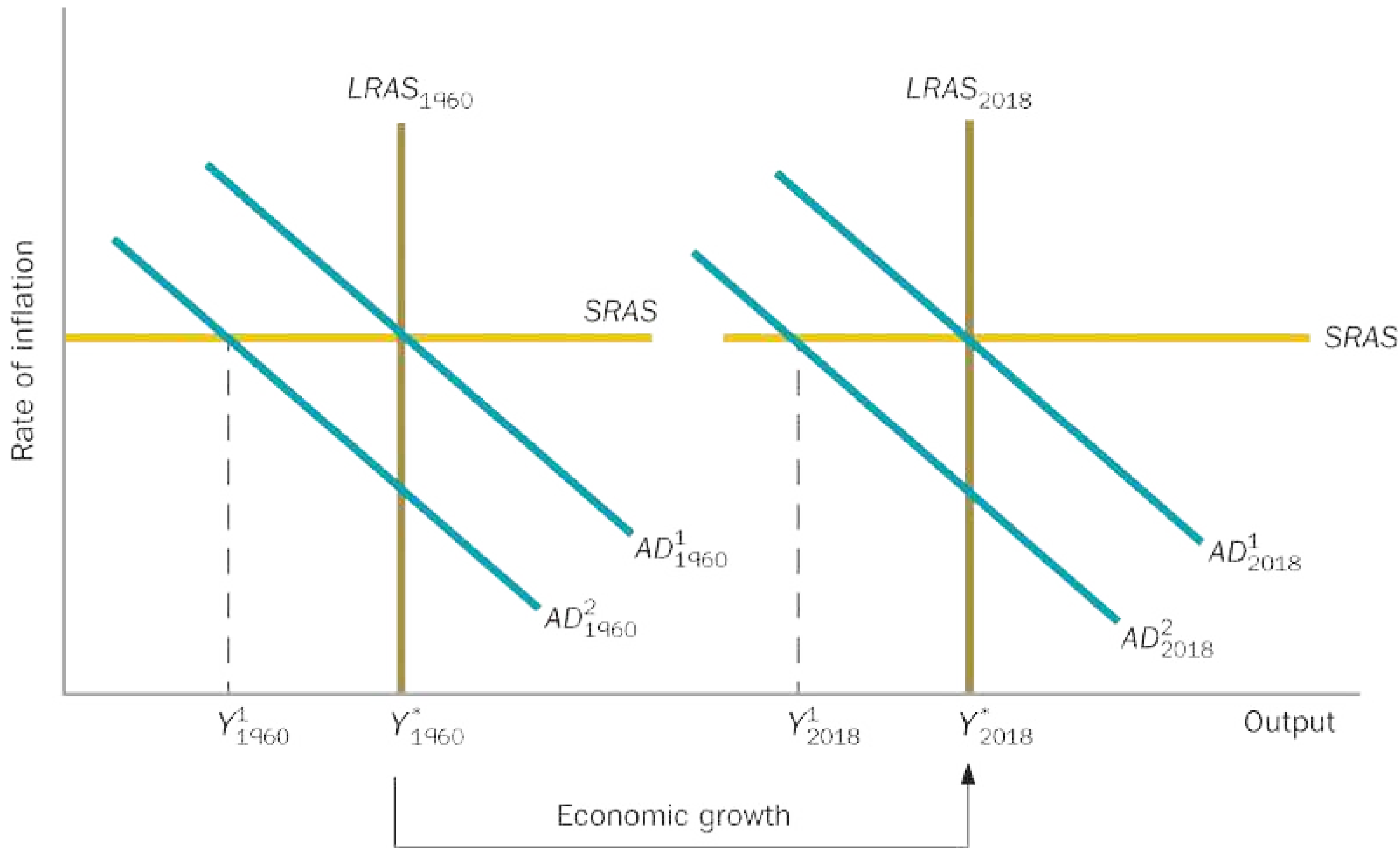

Figure 13.3 **Economic growth and the business cycle**

Note: Economic growth involves a rightward shift in the economy's potential output over time. The business cycle can be thought of as fluctuations of output around its long-run potential over the period in which there is no change in potential output.

Move the clock forward 58 years to 2018. In the intervening 58 years, economic growth has caused the economy's potential level of output to expand to Y^*_{2018} in terms of the AD–AS analysis. Whether the economy will be at its potential level of output in 2018 depends on the position of the AD curve. Given the short-run aggregate supply curve, *SRAS*, the potential level of output, Y^*_{2018}, will be achieved only if aggregate demand is given by the curve AD^1_{2018}. Should aggregate demand be, for example, AD^2_{2018}, the economy will have a contractionary output gap given by $\frac{Y^1_{2018} - Y^*_{2018}}{Y^*_{2018}}$. It is interesting to note that even in the depths of a contraction, the economy's output in 2018 still exceeds the level of potential output that was available in 1960; such is the effect of economic growth.

▹▹ RECAP

Economic growth over the past 300 years has delivered gains in people's standard of living at a rate that would once have been unimaginable. This growth has not been spread equally across all countries.

Economic growth refers to the long-run evolution of the economy's potential real GDP. The business cycle relates to short-run movements of actual GDP around potential GDP. Aggregate demand affects short-run fluctuations of output around its potential level. Aggregate demand has no influence on the long-run growth of potential GDP.

13.3 GROWTH RATES AND DIFFERENCES IN LIVING STANDARDS

LO 13.5

As we have seen in Background briefing 13.1 and in Section 13.2, economists think about economic growth in terms of what is happening to per capita real GDP over long periods of time. An important aspect of this long-run growth is how apparently small changes in growth rates can, over time, accumulate to give very different outcomes for per capita living standards. For example, Table 13.1 shows real GDP per person in nine major countries in selected years from 1870 to 2016; Figure 13.4 displays the same data graphically for five of the nine countries.

TABLE 13.1 Real GDP per person in selected countries, 187

	1870	1913	1950	1980	2010	2016
Australia	5947	9 369	13 466	26 184	45 684	48 845
United States	3 736	8 101	15 241	29 613	49 267	53 015
United Kingdom	5 716	7 973	10 846	20 211	34 722	37 334
Germany	2 362	5 587	7 840	28 512	41 576	44 689
Japan	1 160	2 182	3 023	21 130	34 990	37 465
China	754	881	637	1 539	9 555	12 569
Brazil	1 405	1 354	2 898	1 372	14 392	13 873
India	710	895	824	1 249	4 487	6 125
Ghana	689	1 226	1 762	1 817	2 944	3 878

Source: Bolt J, Inklaar R, de Jong H and Luiten van Zanden J 2018, 'Rebasing "Maddison": New income comparisons and the shape of long-run economic development', Maddison Project Working Paper 10. Maddison Project Database, version 2018.

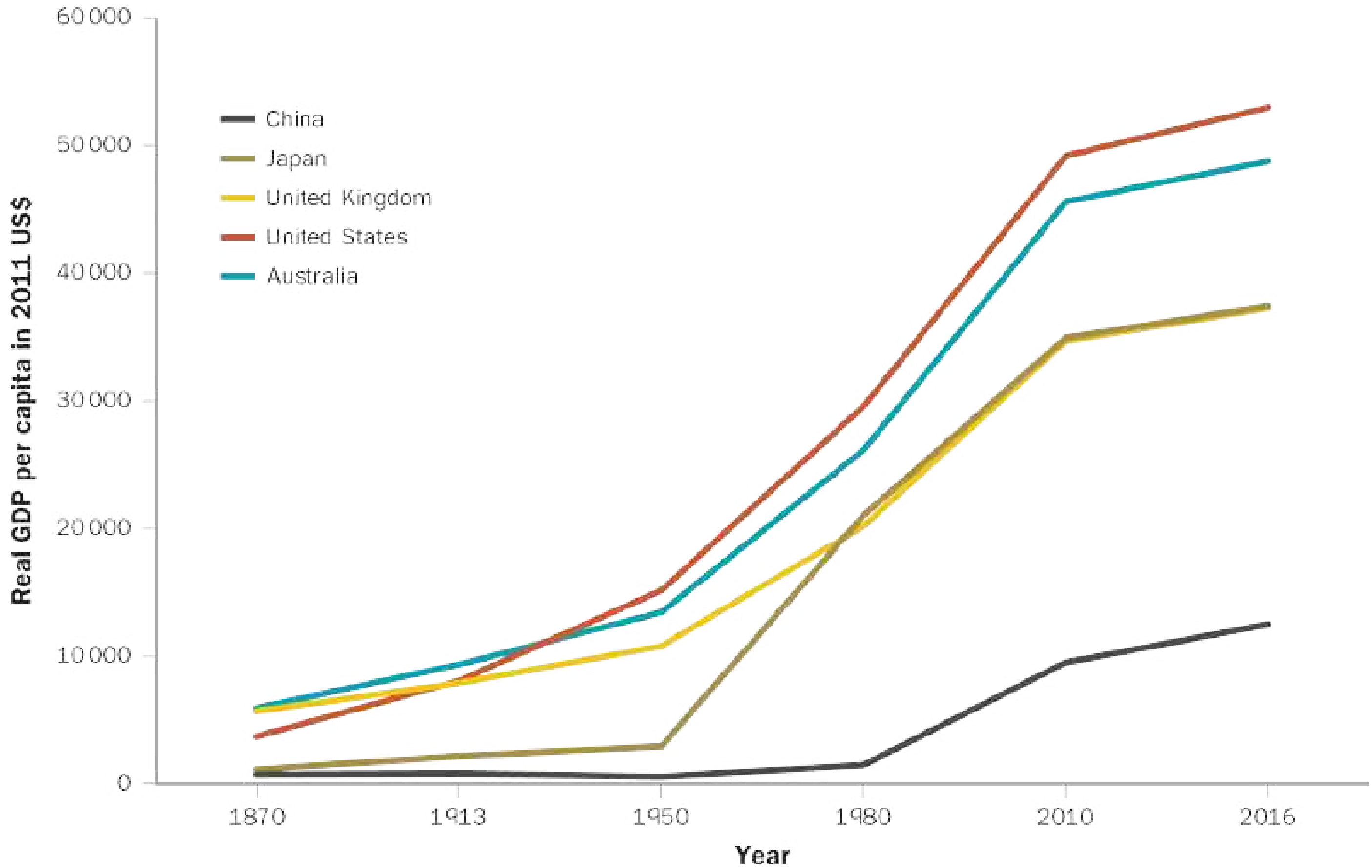

Figure 13.4 **Real GDP per person in five industrialised countries, 1870–2016**

Note: Economic growth has been especially rapid since the 1950s.

Source: Bolt J, Inklaar R, de Jong H and Luiten van Zanden J 2018, 'Rebasing "Maddison": New income comparisons and the shape of long-run economic development', Maddison Project Working paper 10, Maddison Project Database, version 2018.

The data in Table 13.1 and Figure 13.4 tell a dramatic story. For example, in the United States (which was already a relatively wealthy industrialised country in 1870), real GDP per person grew more than 13 times between 1870 and 2016. In Japan real GDP per person grew more than 31 times over the same period. Underlying these statistics is an amazingly rapid process of economic growth and transformation, through which in just a few generations relatively poor agrarian societies became highly industrialised economies—with average standards of living that could scarcely have been imagined in 1870. As Figure 13.4 shows, a significant part of this growth has occurred since 1950, particularly in Japan.

Before proceeding a note of caution is in order. The further back in time we go the less precise are historical estimates of real GDP. Most governments did not keep official GDP statistics until after World War II; production records from earlier periods are often incomplete or of questionable accuracy. Comparing economic output over a century or more is also problematic because many goods and services that are produced today were unavailable—indeed, inconceivable—in 1870. How many nineteenth-century horse-drawn wagons, for example, would be the economic equivalent of a BMW 328i car or a Boeing 787 Dreamliner jet? Despite the difficulty of making precise comparisons, however, we can say with certainty that the variety, quality and quantity of available goods and services increased enormously in industrialised countries during the nineteenth and twentieth centuries, a fact reflected in the data on real GDP per capita.

13.3.1 WHY 'SMALL' DIFFERENCES IN GROWTH RATES MATTER

The last two columns of Table 13.1 show the annual growth rates of real GDP per person, for both the entire 1870–2016 period and the more recent years, 1950–2016. At first glance, these growth rates do not seem to differ much from country to country. For example, for the period 1870–2016 the highest growth rate is 2.4 per cent (Japan) and the lowest is 1.19 per cent (Ghana). But consider the long-run effect of this seemingly 'small' difference in annual growth rates. In 1870, in terms of output per person, Australia was by far the richest of the nine countries listed in Table 13.1, with a real GDP per person two and a half times that of Germany. Yet by the 2000s Germany had largely caught up to Australia. This remarkable change in economic fortunes is the result of the apparently small differences in the countries' respective growth rates, maintained over 130 years.

The fact that what seem to be small differences in growth rates can have large long-run effects results from what is called the *power of compound interest*.

EXAMPLE 13.1 – COMPOUND INTEREST (1)

In 1800 your great-great-grandfather deposited $10.00 in a savings account at 4 per cent interest. Interest is compounded annually (so that interest paid at the end of each year receives interest itself in later years). Great-Great-Grandpa's Will specified that the account be turned over to his most direct descendant (you) in the year 2000. When you withdrew the funds in that year, how much was the account worth?

The account was worth $10.00 in 1800; $10.00 × 1.04 =

$10.40 in 1801; $10.00 × 1.04 × 1.04 = $10.00 × $(1.04)^2$ = $10.82 in 1802; and so on. Since 200 years elapsed between 1800, when the deposit was made, and the year 2000, when the account was closed, the value of the account in the year 2000 was $10.00 × $(1.04)^{200}$, or $10.00 × 1.04 to the 200th power. Using a calculator, you will find that $10.00 times 1.04 to the 200th power is $25 507.50—a good return for a $10.00 deposit!

Compound interest—an arrangement in which interest is paid not only on the original deposit but on all previously accumulated interest—is distinguished from *simple interest*, in which interest is paid only on the original deposit. If your great-great-grandfather's account had been deposited at 4 per cent simple interest it would have accumulated only 40 cents each year (4 per cent of the original $10.00 deposit), for a total value of $10.00 + 200 × $0.40 = $90.00 after 200 years. The tremendous growth in the value of his account came from the compounding of the interest—hence the phrase 'the power of compound interest'.

EXAMPLE 13.2 – COMPOUND INTEREST (2)

Refer to Example 13.1. What would your great-great-grandfather's $10.00 deposit have been worth after 200 years if the annual interest rate had been 2 per cent? 6 per cent?

At 2 per cent interest the account would be worth $10.00 in 1800; $10.00 × 1.02 = $10.20 in 1801; $10.00 × $(1.02)^2$ = $10.40 in 1802; and so on. In the year 2000 the value of the account would be $10.00 × $(1.02)^{200}$, or $524.85. If the interest rate were 6 per cent, after 200 years the account would be worth $10.00 × $(1.06)^{200}$, or $1 151 259.04. Let us summarise the results of Examples 13.1 and 13.2:

INTEREST RATE (%)	VALUE OF $10 AFTER 200 YEARS ($)
2	524.85
4	25507.50
6	1151259.04

The power of compound interest is that, even at relatively low rates of interest, a small sum, compounded over a long enough period, can greatly increase in value. A subtler point, illustrated by this example, is that small differences in interest rates matter a lot. The difference between a 2 per cent and a 4 per cent interest rate does not seem tremendous, but over a long period of time it implies large differences in the amount of interest accumulated on an account. Likewise, the effect of switching from a 4 per cent to a 6 per cent interest rate is enormous, as our calculations show.

Economic growth rates are like compound interest rates. Just as the value of a bank deposit grows each year at a rate equal to the interest rate, so the size of a nation's economy expands each year at the rate of economic growth. This analogy suggests that even a relatively modest rate of growth in output per person—say, 1 to 2 per cent per year—will produce tremendous increases in the average living standard over a long period. And relatively small *differences* in growth rates, as in the case of Australia versus Japan, will ultimately produce very different living standards. Over the long run, then, the rate of economic growth is an extremely important variable. Hence, government policy changes or other factors that affect the long-term growth rate even by a small amount will have a major economic impact.

CONCEPT CHECK 13.1

Suppose that real GDP per capita in Australia had grown at 2.41 per cent per year, as Japan's did, instead of the actual 1.45 per cent per year, from 1870 to 2016. How much larger would real GDP per person have been in Australia in 2016?

▹▹ RECAP

Countries can achieve very different standards of living if, over the long run, there are small differences in their respective growth rates. This is because of the effect of compounding growth rates over time.

13.4 WHY NATIONS BECOME RICH: THE CRUCIAL ROLE OF AVERAGE LABOUR PRODUCTIVITY

LO 13.6

FIND ONLINE

What determines a nation's economic growth rate? To get some insight into this vital question we will find it useful to express real GDP per person as the product of two terms: average labour productivity and the share of the population that is working.

To do this, let Y equal total real output (as measured by real GDP), N equal the number of employed workers and POP equal the total population. Then real GDP per person can be written as Y/POP; average labour productivity, or output per employed worker, equals Y/N; and the share of the population that is working is N/POP. The relationship between these three variables is:

$$\frac{Y}{POP} = \frac{Y}{N} \times \frac{N}{POP}$$

which, as you can see by cancelling out N on the right-hand side of the equation, always holds exactly. In words, this basic relationship is: real GDP per person = average labour productivity × share of population employed.

This expression for real GDP per person tells us something very basic and intuitive, that is, the quantity of goods and services that each person can consume depends on:

1. how much each worker can produce
2. how many people (as a fraction of the total population) are working.

Furthermore, because real GDP per person equals average labour productivity times the share of the population that is employed, real GDP per person can *grow* only to the extent that there is *growth* in worker productivity and/or the fraction of the population that is employed.

Figure 13.5 shows Australian data for the two key variables in the relationship above, average labour productivity and the proportion of the population in work.

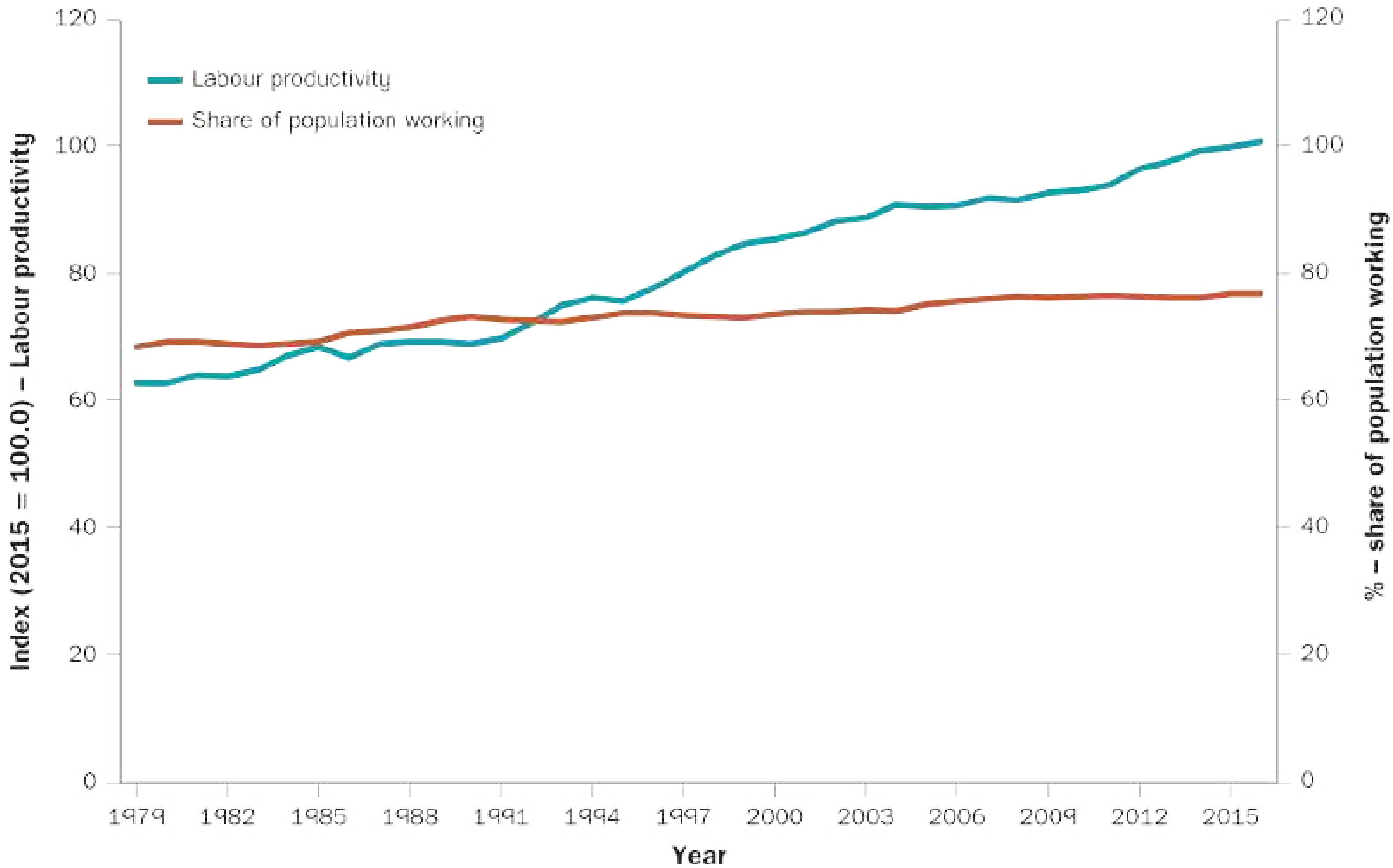

Figure 13.5 **Average labour productivity and the proportion of the population in work, Australia 1979–2015**

Note: While the proportion of the Australian population in work has changed little in Australia over the last 40 years, there has been significant growth in labour productivity.

Source: Based on data from Organization for Economic Co-operation and Development (OECD) n.d., 'Main economic indicators–complete database', http://dx.doi.org/10.1787/data-00052-en, accessed 15 November 2018.

Let us look a bit more closely at these two contributing factors, beginning with the share of the population that is employed. As Figure 13.5 shows, this has been relatively stable over the last 40 years. Therefore, we cannot look to more people working as being a significant contributor to rising living standards over this period. Indeed, economists expect that this proportion is likely to fall in coming years as the baby boom generation begins to retire. As more and more baby boomers retire, the fraction of the population that is employed will begin to drop, probably significantly. In the long run, then, further improvement in living standards brought about by the rising share of Australians with jobs will be unlikely.

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What about the other factor that determines output per person, average labour productivity? As Figure 13.5 shows, since 1979, average labour productivity in Australia increased significantly, so much so that it would appear to account for a sizeable share of the overall increase in GDP per person.

This quick look at recent data supports a more general conclusion: to understand why economies grow, we must understand the reasons for increased labour productivity.

13.4.1 THE DETERMINANTS OF AVERAGE LABOUR PRODUCTIVITY

FIND ONLINE

What determines the productivity of the average worker in a country at a particular time? Popular discussions of this issue often equate worker productivity with the willingness of workers of a given nationality to work hard. Everything else being equal, a culture that promotes hard work certainly tends to increase worker productivity. But intensity of effort alone cannot explain the huge differences in average labour productivity that we observe around the world. For example, average labour productivity in the United States is about 24 times what it is in Indonesia and 100 times what it is in Bangladesh, though there is little doubt that Indonesians and Bangladeshis work very hard.

In this section we examine six factors that appear to account for the major differences in average labour productivity, both between countries and between generations. Later in the chapter we discuss how economic policies can influence these factors to spur productivity and growth.

Human capital

To illustrate the factors that determine average labour productivity, we introduce in Example 13.3 two proto-typical assembly line workers, Kevin and Len.

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EXAMPLE 13.3 – KEVIN AND LEN ON THE ASSEMBLY LINE

Kevin and Len have jobs wrapping chocolates and placing them into boxes. Kevin, a novice wrapper, can wrap only 100 chocolates per hour. Len, who has had on-the-job training, can wrap 300 chocolates per hour. Kevin and Len each work 40 hours per week. Find average labour productivity, in terms of chocolates

wrapped per week and chocolates wrapped per hour, (a) for Kevin, (b) for Len and (c) for Kevin and Len as a team.

We have defined average labour productivity in general terms as output per worker. Note, though, that the measurement of average labour productivity depends on the period that is specified. In this example we are concerned with how much Kevin and Len can produce *per hour* of work or *per week* of work. Any one of these ways of measuring labour productivity is equally valid, if we are clear about the time unit we are using.

Kevin and Len’s hourly productivities are given in the problem: Kevin can wrap 100 chocolates per hour and Len can wrap 300. Kevin’s weekly productivity is (40 hours/week) × (100 chocolates wrapped/hour) = 4000 wrapped chocolates per week. Len’s weekly productivity is (40 hours/week) × (300 chocolates wrapped/hour), or 12 000 chocolates per week.

Together Kevin and Len can wrap 16 000 chocolates per week. As a team, their average weekly productivity is (16 000 chocolates wrapped)/(2 weeks of work), or 8000 chocolates per week. Their average hourly productivity as a team is (16 000 chocolates wrapped)/(80 hours of work) = 200 chocolates per hour. Notice that, taken as a team, the two workers' productivity lies midway between their individual productivities.

Len is more productive than Kevin because he has had on-the-job training, which has allowed him to develop his chocolate-wrapping skills to a higher level than Kevin's. Because of his training, Len can produce more than Kevin can in a given number of hours.

CONCEPT CHECK 13.2

Suppose Len attends additional classes in chocolate wrapping and learns how to wrap 500 chocolates per hour. Find the output per week and output per hour for Kevin and Len, both individually and as a team.

Economists would explain the difference in the two workers' performance by saying that Len has more *human capital* than Kevin. Human capital comprises the talents, education, training and skills of workers. Workers with a large stock of human capital are more productive than workers with less training. For example, an architect who knows how to use a computerised drafting program will be able to design more buildings than one who does not; a car mechanic who is familiar with computerised diagnostic equipment will be able to fix engine problems that less well-trained mechanics could not.

THINKING AS AN ECONOMIST 13.1

Why did West Germany and Japan recover so successfully from the devastation of World War II?

Germany and Japan sustained extensive destruction of their cities and industries during World War II and entered the post-war period impoverished. Yet, within 30 years, both countries had not only been rebuilt but had become worldwide industrial and economic leaders. What accounts for these ‘economic miracles’?

Many factors contributed to the economic recovery of West Germany and Japan from World War II, including the substantial aid provided by the United States to Europe under the Marshall Plan and to Japan during the post-war Allied occupation. Most economists agree, however, that high levels of *human capital* played a crucial role in both countries.

At the end of the war, Germany’s population was

exceptionally well educated, with a large number of highly qualified scientists and engineers. The country also had (and still has) an extensive apprentice system that provided on-the-job training to young workers. As a result, Germany had a skilled industrial workforce. In addition, the area that became West Germany benefited substantially from an influx of skilled workers from East Germany and the rest of Soviet-controlled Europe, including 20 000 trained engineers and technicians. Beginning as early as 1949, this concentration of human capital contributed to a major expansion of Germany's technologically sophisticated, highly productive manufacturing sector. By 1960 West Germany was a leading exporter of high-quality manufactured goods, and its citizens enjoyed one of the highest standards of living in Europe.

Japan, which probably sustained greater physical destruction in the war than Germany, also began the post-war period with a skilled and educated labour force. In addition, occupying Allied forces restructured the Japanese school system and encouraged all Japanese to obtain a good education. Even more so than the Germans, however, the Japanese emphasised on-the-job training. As part of a lifetime employment system, under which workers were expected to stay with the same company throughout their entire careers, Japanese firms invested extensively in worker training. The payoff to these investments in human capital was a steady increase in average labour productivity, particularly in manufacturing. By the 1980s Japanese manufactured goods were among the most advanced in the world and Japan's workers among the most skilled.

Although high levels of human capital were instrumental in the rapid economic growth of West Germany and Japan, human capital alone cannot create a high living standard. A case in point was Soviet-dominated East Germany, which had a level of human capital similar to West Germany's after World War II but did not enjoy the same economic growth. For reasons we will discuss later in the chapter (see Thinking as an economist 13.3) the communist system imposed by the Soviets utilised East Germany's human capital far less effectively than the economic systems of Japan and West Germany.

Human capital is analogous to physical capital (such as machines and factories) in that it is acquired primarily through the investment of time, energy and money. For example, to learn how to use a word-processing program a secretary might need to attend a technical school at night. The cost of going to school includes not only the tuition paid but also the *opportunity* cost of the secretary's time spent attending class and studying. The benefit of the schooling is the increase in wages the secretary will earn when the course has been completed. We know by the *cost–benefit principle* that the secretary should learn word-processing only if the benefits exceed the costs, including the opportunity costs. In general, then, we would expect to see people acquire additional education and skills when the difference in the wages paid to skilled and unskilled workers is significant.

Physical capital

Workers' productivity depends not only on their skills and effort but on the tools they have to work with. Even the most skilled surgeon cannot perform open-heart surgery without sophisticated equipment, and an expert computer programmer is of limited value without a computer. These examples illustrate the importance of *physical capital*, such as factories and machines. More and better capital allows workers to produce more efficiently, as Example 13.4 shows.

EXAMPLE 13.4 – KEVIN AND LEN BECOME AUTOMATED

Refer to Example 13.3. Kevin and Len's boss has acquired an electric chocolate-wrapping machine, which is designed to be operated by one worker. Using this machine, an untrained worker can wrap 500 chocolates per hour. What are Kevin and Len's hourly and weekly outputs now? Will the answer change if the boss gets a second machine? A third?

Suppose for the sake of simplicity that a chocolate-wrapping machine must be assigned to one worker only. (This assumption rules out sharing arrangements, in which one worker uses the machine on the day shift and another on the night shift.) If the boss buys just one machine they will assign it to Kevin. (Why? See Concept check 13.3.) Now Kevin will be able to wrap 500 chocolates per hour, while Len can wrap only 300 per hour. Kevin’s weekly output will be 20 000 wrapped chocolates (40 hours × 500 chocolates wrapped per hour). Len’s weekly output is still 12 000 wrapped chocolates (40 hours × 300 chocolates wrapped per hour). Together they can now wrap 32 000 chocolates per week, or an average of 16 000 chocolates per week each. On an hourly basis, average labour productivity for the two workers taken together is 32 000 chocolates wrapped per 80 hours of work, or 400 chocolates wrapped per hour—twice their average labour productivity before the boss bought the machine.

With two chocolate-wrapping machines available, both Kevin and Len could use a machine. Each could wrap 500 chocolates per hour, for a total of 40 000 wrapped chocolates per week. Average labour productivity for both workers taken together would be 20 000 wrapped chocolates per week, or 500 wrapped chocolates per hour.

What would happen if the boss purchased a third machine? With only two workers available, a third machine would be useless: it would add nothing to either total output or average labour productivity.

CONCEPT CHECK 13.3

Using the assumptions made in Examples 13.3 and 13.4, explain why the boss should give the single available chocolate-wrapping machine to Kevin rather than Len.

The chocolate-wrapping machine is an example of a *capital good*, which is a long-lived good, itself produced and used to produce other goods and services. Capital goods include machines and equipment (such as computers, earthmovers or assembly lines) as well as buildings (such as factories or office buildings).

Capital goods like the chocolate-wrapping machine enhance workers' productivity. Table 13.2 summarises the results from Examples 13.3 and 13.4. For each number of machines the boss might acquire (column 1), Table 13.2 gives the total weekly output of Kevin and Len taken together (column 2), the total number of hours worked by the two workers (column 3) and average output per hour (column 4), equal to total weekly output divided by total weekly hours.

TABLE 13.2 Capital, output and productivity in the chocolate-wrapping factory

NUMBER OF MACHINES (CAPITAL)	TOTAL NUMBER OF CHOCOLATES WRAPPED EACH WEEK (OUTPUT)	TOTAL HOURS WORKED PER WEEK	CHOCOLATES WRAPPED PER HOUR WORKED (PRODUCTIVITY)
0	16 000	80	200
1	32 000	80	400
2	40 000	80	500
3	40 000	80	500

Table 13.2 demonstrates two important points about the effect of additional capital on output. First, for a given number of workers, adding more capital generally increases both total output and average labour productivity. For example, adding the first chocolate-wrapping machine increases weekly output (column 2) by 16 000 chocolates and average labour productivity (column 4) by 200 chocolates wrapped per hour.

The second point illustrated by Table 13.2 is that the more capital is already in place, the smaller the benefits of adding extra capital. Notice that the first machine adds 16 000 chocolates to total output, but the second machine adds only 8000. The third machine, which cannot be used since there are only two workers, does not increase output or productivity at all. This result illustrates a general principle of economics, called **diminishing returns to capital**. According to the principle, if the amount of labour and other inputs employed is held constant, then the greater the amount of capital already in use, the less an additional unit of capital adds to production. In the case of the chocolate-wrapping factory, diminishing returns to capital implies that the first chocolate-wrapping machine acquired adds more output than the second, which in turn adds more output than the third.

Diminishing returns to capital are a natural consequence of firms' incentive to use each piece of capital as productively as possible. To maximise output, managers will assign the first machine that a firm acquires to the most productive use available, the next machine to the next most productive use and so on—an illustration of the *principle of increasing opportunity cost*. When many machines are available, all the highly productive ways of using them have already been exploited. Thus, adding yet another machine will not raise output or productivity by very much. If Kevin and Len are already operating two chocolate-wrapping machines there is little point to buying a third machine, except perhaps as a replacement or spare.

The implications of Table 13.2 can be applied to the question of how to stimulate economic growth. First, increasing the amount of capital available to the workforce will tend to increase output and average labour productivity. The more adequately equipped workers are, the more productive they will be. Second, the degree to which productivity can be increased by an expanding stock of capital is limited. Because of diminishing returns to capital, an economy in which the quantity of capital available to each worker is already very high will not benefit much from further expansion of the capital stock.

Land and other natural resources

Besides capital goods, other inputs to production help to make workers more productive, among them land, energy and raw materials. Fertile land is essential to agriculture, and modern manufacturing processes make intensive use of energy and raw materials.

In general, an abundance of natural resources increases the productivity of the workers who use them. For example, a farmer can produce a much larger crop in a land-rich country like Australia or the United States than in a country where the soil is poor or arable land is limited in supply. With the aid of modern farm machinery and great expanses of land, today's Australian farmers are so productive that even though they constitute a tiny proportion of the world's population, they provide enough food not only to feed the country but to export to the rest of the world.

Although there are limits to a country's supply of arable land, many other natural resources, such as petrol and metals, can be obtained through international markets. Because resources can be obtained through trade, countries need not possess large quantities of natural resources within their own borders to achieve economic growth. Indeed, a number of countries and regions have become rich without substantial natural resources of their own, including Japan, Hong Kong, Singapore and Switzerland. Just as important as possessing natural resources is the ability to use them productively—for example, by means of advanced technologies.

Technology

Besides human capital, physical capital and natural resources, a country's ability to develop and apply new, more productive technologies will help to determine its productivity. Consider just one industry: transport. Two centuries ago, the horse and cart were the primary means of transport—a slow and costly method indeed. But in the nineteenth century, technological advances such as the steam engine supported the expansion of river-borne transport and the development of a national rail networks. In the twentieth century, the invention of the internal combustion engine and the development of aviation, supported by the construction of extensive infrastructure of roads and airports, have produced increasingly rapid, cheap and reliable transport. Technological change has clearly been a driving force in the transport revolution.

New technologies can improve productivity in industries other than the one in which they are introduced. Once farmers could sell their produce only in their local communities, for example. Now the availability of rapid shipping and refrigerated transport allows farmers to sell their products virtually anywhere in the world. With a broader market in which to sell, farmers can specialise in those products best suited to local land and weather conditions. Similarly, factories can obtain their raw materials wherever they are cheapest and most abundant, produce the goods they are most efficient at manufacturing, and sell their products wherever they will fetch the best price. Both these examples illustrate *the principle of comparative advantage*; that overall productivity increases when producers concentrate on those activities at which they are relatively most efficient. We will return to this concept in Chapter 16.

Numerous other technological developments have led to increased productivity, including advances in communication and medicine and the introduction of computer technology. All indications are that the internet will have a major impact on the economy, not just in retailing but also in many other sectors. In fact, *most economists would probably agree that new technologies are the single most important source of productivity improvement*, and hence of economic growth in general.

However, economic growth does not automatically follow from breakthroughs in basic science. To make the best use of new knowledge, an economy needs entrepreneurs who can exploit scientific advances commercially, as well as a legal and political environment that encourages the practical application of new knowledge.

BACKGROUND BRIEFING 13.2

Technological innovation and economic growth in Japan and China

Economists have long promoted the benefits of investing in new technology as a means of boosting average productivity and promoting economic growth. In Chapter 15, you will learn there are important theoretical arguments suggesting it is only through technological progress that per capita income can continue to grow in the long run. Consequently, many countries have developed policies that facilitate technological change in the belief that this will improve their prospects for economic growth.

A case in point is Japan. Japan's economic recovery and subsequent rapid growth after World War II has been justifiably called 'miraculous'. Until around the late 1980s, Japan was indisputably the nation most likely to take over from the United States as the world's leading economy. A variety of factors contributed to Japan's growth miracle. What is clear, however, is that technological innovation, particularly in the export sector, was a significant factor underlying Japanese economic growth. Indeed, it is difficult to imagine how Japan could have fared so well without its highly developed culture of 'incremental innovation of industrial processes', essentially guaranteeing continuous technological improvements (Posen 2002). However, Japan has now undergone almost 20 years of relatively disappointing economic performance and was especially hard hit by the Global Financial Crisis. This is despite technological innovation continuing pretty much as before (Posen 2002, pp. 75–6). Clearly, growth does not occur from a single factor alone.

China has now assumed the mantle of the nation most likely to overtake the United States. Economic growth in China has been spectacular since the economic reforms introduced by Deng Xiaoping in the late 1970s. These reforms were centred on the gradual introduction of a more market-oriented economy with an export orientation. However, the role of innovation, in terms of both technology and managerial practices, never seemed to be as important as was the case in Japan's post-war growth. Perhaps this is now changing. A recent book looks at 'Chinnovation', the growing trend towards China becoming much more oriented towards risk-taking in terms of new technologies and managerial practices (Tan 2011). The author, Yinglan Tan, argues that 'China will soon become the world's innovator, moving beyond being the world's factory and ultimately becoming the world's leader' (p. xiii). As you will learn, for economists it is no surprise that innovation is seen as necessary to sustain long-run growth.

CONCEPT CHECK 13.4

A new kind of wrapping paper has been invented that makes chocolate wrapping quicker and easier. The use of this paper increases the number of chocolates a person can wrap by hand by 200 per hour, and the number of chocolates a person can wrap by machine by 300 per hour. Using the data from Examples 13.3 and 13.4, construct a table like Table 13.2 that shows how this technological advance affects average labour productivity. Do diminishing returns to capital still hold?

Entrepreneurship and management

The productivity of workers depends in part on the people who help to decide what to produce and how to produce it: entrepreneurs and managers. **Entrepreneurs** are people who create new economic enterprises. Because of the new products, services, technological processes and production methods they introduce, entrepreneurs are critical to a dynamic, healthy economy. In the late nineteenth and early twentieth centuries individuals like Henry Ford and Alfred Sloan (cars), Andrew Carnegie (steel), John D Rockefeller (oil) and JP Morgan (finance) played central roles in the development of American industry—and, not incidentally, amassed huge personal fortunes in the process. Their ideas quickly spread to other countries. These people and others like them (including contemporary entrepreneurs like Bill Gates) have been criticised for some of their business practices, in some cases with justification. Clearly, though, they and dozens of other prominent business leaders of the past century have contributed significantly to the process of economic growth. Henry Ford, for example, developed the idea of mass production, which lowered costs sufficiently to bring cars within reach of the average family. Ford began his business in his garage, a tradition that has been maintained by thousands of innovators ever since.

Entrepreneurship, like any form of creativity, is difficult to teach, although some of the supporting skills like financial analysis and marketing can be learned at university or business/TAFE college. How, then, does a society encourage entrepreneurship? History suggests that the entrepreneurial spirit will always exist; the challenge to society is to channel entrepreneurial energies in economically productive ways. For example, economic policymakers need to ensure that taxation is not so heavy, and regulation not so inflexible, that small businesses—some of which will eventually become big businesses—cannot get off the ground. Sociological factors may play a role as well. Societies in which business and commerce are considered to be beneath the dignity of refined, educated people are less likely to produce successful entrepreneurs (see Thinking as an economist 13.2). In Australia, for the most part, business has been viewed as a respectable activity. Overall, a social and economic milieu that allows entrepreneurship to flourish appears to promote economic growth and rising productivity, perhaps especially so in high-technology eras like our own.

EXAMPLE 13.5 – KEVIN AND LEN ARE

‘DISCOVERED’

A television producer ‘discovers’ Kevin and Len working on the production line at the chocolate factory and makes them stars of their own television series. The show is a huge success and is seen by millions. How does the producer’s discovery of Kevin and Len affect their average labour productivity?

Because Kevin and Len are so popular, and because television advertising fees are based on the number of people who watch a show, Kevin and Len are likely to increase the television network’s revenues by many millions of dollars. This increase in revenues is a measure of Kevin and Len’s contribution to GDP. Their average labour productivity (in per-hour terms) is their contribution to GDP divided by the number of hours they work on the show. Clearly, Kevin and Len’s average labour productivity as television stars will be many times what it was when they were chocolate wrappers.

This example illustrates the importance of creative entrepreneurship: if not for the television producer’s entrepreneurial skills, Kevin and Len would still be working on the assembly line, where their average labour productivity would be much lower.

THINKING AS AN ECONOMIST 13.2

Why did medieval China stagnate economically?

The Sung period in China (AD 960–1270) was one of considerable technological sophistication; its inventions included paper, waterwheels, water clocks, gunpowder and possibly the compass. Yet no significant industrialisation occurred, and in subsequent centuries Europe saw more economic growth and technological innovation than China. Why did medieval China stagnate economically?

According to research by economist William Baumol (1990), the main impediment to industrialisation during the Sung period was a social system that inhibited entrepreneurship. Commerce and industry were considered low-status activities, not fit for an educated person. In addition, the emperor had the right to seize his subjects' property and to take control of their business enterprises—a right that greatly reduced his subjects' incentives to undertake business ventures. The most direct path to status and riches in medieval China was to go through a system of demanding civil service examinations given by the government every three years. The highest scorers on these national examinations were granted lifetime positions in the imperial bureaucracy, where they wielded much power and often became wealthy, in part through corruption. Not surprisingly, medieval China did not develop a dynamic entrepreneurial class and consequently its scientific and technological advantages did not translate into sustained economic growth. China's experience shows why scientific advances alone cannot guarantee economic growth; to have economic benefits, scientific knowledge must be commercially applied through new products and new, more efficient means of producing goods and services.

Although entrepreneurship may be more glamorous, managers—the people who run businesses on a daily basis—also play an important role in determining average labour productivity. Managerial jobs span a wide range of positions, from the supervisor of the loading dock to the CEO (chief executive officer) at the helm of a large company. Managers work to satisfy customers, deal with suppliers, organise production, obtain financing, assign workers to jobs and motivate them to work hard and effectively. Such activities enhance labour productivity. For example, in the 1970s and 1980s Japanese managers introduced new production methods that greatly increased the efficiency of Japanese manufacturing plants. Among them was the *just-in-time* inventory system, in which suppliers deliver production components to the factory just when they are needed, eliminating the need for factories to stockpile components. Japanese managers also pioneered the idea of organising workers into semi-independent production teams, which allowed workers more flexibility and responsibility than the traditional assembly line. Managers in Australia and other countries studied the

Japanese managerial techniques closely and adopted many of them.

The political and legal environment

So far, we have emphasised the role of the private sector in increasing average labour productivity. But government too has a role to play in fostering improved productivity. One of the key contributions government can make is to provide a *political and legal environment* that encourages people to behave in economically productive ways—to work hard, save and invest wisely, acquire useful information and skills and provide the goods and services that the public demands.

One specific function of government that appears to be crucial to economic success is the establishment of *well-defined property rights*. Property rights are well defined when the law provides clear rules for determining who owns what resources (e.g. through a system of deeds and titles) and how those resources can be used. Imagine living in a society in which a dictator, backed by the military and the police, could take whatever they wanted, and regularly does so. In such a country, what incentive would you have to raise a large crop or to produce other valuable goods or services? Very little, since much of what you produced would be likely to be taken away from you. In many countries of the world today this situation is far from hypothetical.

Political and legal conditions affect the growth of productivity in other ways as well. Political scientists and economists have documented the fact that *political instability* can be detrimental to economic growth. This finding is reasonable, since entrepreneurs and savers are unlikely to invest their resources in a country whose government is unstable, particularly if the struggle for power involves civil unrest, terrorism or guerrilla warfare. On the other hand, a political system that promotes the *free and open exchange of ideas* will speed up the development of new technologies and products. For example, some economic historians have suggested that the decline of Spain as an economic power was due in part to the advent of the Spanish Inquisition, which permitted no dissent from religious orthodoxy. Because of the Inquisition's persecution of those whose theories about the natural world contradicted Church doctrine, Spanish science and technology languished, and Spain fell behind more tolerant nations like the Netherlands.

CONCEPT CHECK 13.5

A Bangladeshi worker who emigrates to Australia is likely to find that their average labour productivity is much higher in Australia than it was at home. The worker is, of course, the same person they were when they lived in Bangladesh. How can the simple act of moving to Australia increase the worker's productivity? What does your answer say about the incentive to emigrate?

THINKING AS AN ECONOMIST 13.3

Why did communism fail?

For more than 70 years, from the Russian Revolution in 1917 until the collapse of the Soviet Union in 1991, communism was believed by many to pose a major challenge to market-based economic systems. Yet by the time of the Soviet Union's break-up the poor economic record of communism had become apparent. Indeed, low living standards in communist countries, compared to those achieved in the West, were a major reason for the popular discontent that brought down the communist system in Europe. Economically speaking, why did communism fail?

The poor growth records of the Soviet Union and other communist countries did not reflect a lack of resources or economic potential. The Soviet Union had a highly educated workforce, a large capital stock, a vast quantity of natural resources including land and energy, and access to sophisticated technologies. Yet at the time of its collapse, output per person in the Soviet Union was probably less than one-seventh what it was in the United States.

Most observers would agree that the political and legal environment that established the structure of the communist economic system was a major cause of its ultimate failure. The economic system of the Soviet Union and other communist countries had two main elements. First, the capital stock and other resources were owned by the government rather than by individuals or private corporations. Second, most decisions regarding production and distribution were made and implemented by a government planning agency rather than by individuals and firms interacting through markets. This system performed poorly, we now understand, for several reasons.

One major problem was *the absence of private property rights*. With no ability to acquire a significant amount of private property, Soviet citizens had little incentive to behave in economically productive ways. The owner of an Australian or Japanese firm is strongly motivated to cut costs and to produce goods that are highly valued by the public, because the owner's income is determined by the firm's profitability. In contrast, the performance of a Soviet firm manager was judged on whether the manager produced the quantities of goods specified by the government's plan—irrespective of the quality of the goods produced or whether consumers wanted them. Soviet managers had little incentive to reduce costs or produce better, more highly valued products as any extra profits would accrue to the government and not to the manager; nor was there any scope for entrepreneurs to start new businesses. Likewise, workers had little reason to work hard or effectively under the communist system as pay rates were determined by the government planning agency rather than by the economic value of what the workers produced.

A second major weakness of the communist system was the *absence of free markets*. In centrally planned economies markets are replaced by detailed government plans that specify what should be produced and how. However, the coordination of even relatively basic economic activities can be extremely complex and require a great deal of information, much of which is dispersed among many people. In a market system, changes in prices both convey information about the goods and services people want and provide suppliers the incentives to bring these goods and services to market. Indeed, as we know from the *equilibrium principle*, a market in equilibrium leaves individuals with no unexploited opportunities. Central planners in communist countries proved far less able to deal with this complexity than decentralised markets. As a result, under communism, consumers suffered constant shortages and poorly made goods.

After the collapse of communism, many formerly communist countries began the difficult transition to a market-oriented economic system. Changing an entire economic system (the most extreme example of a structural policy) is a slow and difficult task, and many countries saw economic conditions worsen at first rather than improve. *Political instability* and the absence of a modern *legal* *framework*, particularly laws applying to commercial transactions, have often hampered the progress of reforms. However, a number of formerly communist countries, including Poland, the Czech Republic and the former East Germany, have succeeded in implementing Western-style market systems and have begun to achieve significant economic growth.

▹▹ RECAP

Output per person equals average labour productivity times the share of the population that is employed. Since 1960 the share of the Australian population with jobs has risen significantly, but this variable is likely to decline in coming decades. In the long run, increases in output per person and hence living standards arise primarily from increases in average labour productivity.

Key factors determining average labour productivity in a country include:

1. the skills and training of workers, called *human capital*
2. the quantity and quality of *physical capital*—machines, equipment and buildings
3. the availability of land and other *natural resources*
4. technology, entrepreneurship and management skills.

13.5 THE COSTS OF ECONOMIC GROWTH

LO 13.7

This chapter has emphasised the positive effects of economic growth on the average person's living standard. But should societies always strive for the highest possible rate of economic growth? The answer is no. Even if we accept for the moment the idea that increased output per person is always desirable, attaining a higher rate of economic growth does impose costs on society.

What are some of the costs of increasing economic growth? The most straightforward is the cost of creating new capital. We know that by expanding the capital stock we can increase future productivity and output. But to increase the capital stock we must divert resources that could otherwise be used to increase the supply of consumer goods. For example, to add more robot-operated assembly lines a society must employ more of its skilled technicians in building industrial robots and fewer in designing computer games. To build new factories more carpenters and timber must be assigned to factory construction and less to renovating family rooms. In short, high rates of investment in new capital require people to tighten their belts, consume less and save more—a real economic cost.

Should a country undertake a high rate of investment in capital goods at the sacrifice of consumer goods? The answer depends on the extent that people are willing and able to sacrifice consumption today to have a bigger economic pie tomorrow. In a country that is very poor or is experiencing an economic crisis, people may prefer to keep consumption relatively high and savings and investment relatively low. The middle of a thunderstorm is not the time to be putting something aside for a rainy day! But in a society that is relatively well-off, people may be more willing to make sacrifices to achieve higher economic growth in the future.

Consumption sacrificed to capital formation is not the only cost of achieving higher growth. In industrialised countries in the nineteenth and early twentieth centuries, periods of rapid economic growth were often times in which many people worked extremely long hours at dangerous and unpleasant jobs. While those workers helped to build the economies that many of us enjoy today, the costs were great in terms of reduced leisure time and, in some cases, workers' health and safety.

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Other costs of growth include the cost of the research and development that is required to improve technology and the costs of acquiring training and skill (human capital). The fact that a higher living standard tomorrow must be purchased at the cost of current sacrifices is an example of the *scarcity principle*: that having more of one good thing usually means having less of another. Because achieving higher economic growth imposes real economic costs, we know from the *cost–benefit principle* that higher growth should be pursued only if the benefits outweigh the costs.

Another cost of economic growth is the potential for environmental degradation that may accompany growth, particularly in its early phases. We discuss a particular example of this in Thinking as an economist 13.5.

▹▹ RECAP

Economic growth confers benefits but also imposes costs. One important cost, especially for relatively poor countries, is the cost of capital required to promote growth. Obtaining this capital means postponing current consumption. For poor countries this may mean a trade-off between a dramatic short-run fall in living standards and long-term economic prosperity. Environmental damage is another potential cost.

13.6 PROMOTING ECONOMIC GROWTH

LO 13.6

If a society decides to try to raise its rate of economic growth, what are some of the measures that policymakers might take to achieve this objective? Here is a short list of suggestions, based on our discussion of the factors that contribute to growth in average labour productivity and hence output per person.

13.6.1 POLICIES TO INCREASE HUMAN CAPITAL

Because skilled and well-educated workers are more productive than unskilled labour, governments in most countries try to increase the human capital of their citizens by supporting education and training programs. In Australia the government provides public education through primary and high schools and provides support to tertiary institutions, including TAFE colleges and universities. To a lesser degree than some other countries, the Australian Government also funds job training for unskilled youths and retraining for workers whose skills have become obsolete.

13.6.2 POLICIES THAT PROMOTE SAVING AND INVESTMENT

Average labour productivity increases when workers can utilise a sizeable and modern capital stock. To support the creation of new capital, government can encourage high rates of saving and investment in the private sector. Australia's system of compulsory superannuation contributions is a notable example, boosting the nation's saving through the requirement that funds be set aside until retirement.

Government can contribute directly to capital formation through *public investment*, or the creation of government-owned capital. Public investment includes the building of roads, bridges, airports, dams and, in some countries, including Australia, energy and communications networks. The construction of interstate road networks is often cited as an example of successful public investment. The interstate system substantially reduces transport costs, improving productivity throughout the economy. Today, the internet is having a similar effect. This project received crucial US government funding in its early stages. Many research studies have confirmed that government investment in *infrastructure*, the public capital that supports private sector economic activities, can be a significant source of growth.

13.6.3 POLICIES THAT SUPPORT RESEARCH AND DEVELOPMENT

Productivity is enhanced by technological progress, which in turn requires investment in research and development (R&D). In many industries private firms have adequate incentive to conduct research and development activities. There is no need, for example, for the government to finance research for developing a better underarm deodorant. But some types of knowledge, particularly basic scientific knowledge, may have widespread economic benefits that cannot be captured by a single private firm. The developers of the silicon computer chip, for example, were instrumental in creating huge new industries, yet they received only a small portion of the profits flowing from their inventions. Because society in general, rather than the individual inventors, may receive much of the benefit from basic research, government may need to support basic research, as it does through agencies such as the Australian Research Council.

THINKING AS AN ECONOMIST 13.4

Why do almost all countries provide free public education?

All industrial countries provide their citizens with the opportunity for free public education up to the end of high school, and most subsidise to some extent universities and other post-secondary institutions. Why?

We are so used to the idea of free public education that this question may seem odd. But why should the government provide free education when it does not provide even more essential goods and services, such as food or medical care, for free, except to the most needy? Furthermore, educational services can be, and indeed commonly are, supplied and demanded on the private market without the aid of the government (though note that in Australia even private school education is partly subsidised by the government).

An important argument for free or at least subsidised education is that the private demand curve for educational services does not include all the social benefits of education. For example, the democratic political system relies on an educated citizenry to operate effectively—a factor that an individual demander of educational services has little reason to consider. From a narrower economic perspective, we might argue that individuals do not capture the full economic returns from their schooling. For example, people with high human capital, and thus high earnings, pay more taxes—funds that can be used to finance government services and aid the less fortunate. Because of income taxation the private benefit to acquiring human capital is less than the social benefit, and the demand for education on the private market may be less than optimal from society's viewpoint. Similarly, educated people are more likely than others to contribute to technological development, and hence to general productivity growth, which may benefit many other people beside themselves. Finally, another argument for public support of education is that poor people who would like to invest in human capital may not be able to do so because of insufficient income.

The Nobel laureate Milton Friedman, among many economists, suggested that these arguments may justify government grants, in the form of educational vouchers, to help citizens purchase educational services in the private sector, but they do not justify the government providing education directly, as through the public school system. Defenders of public education, on the other hand, argue that the government should have some direct control over education in order to set standards and monitor quality. What do you think?

13.6.4 THE LEGAL AND POLITICAL FRAMEWORK

Although economic growth comes primarily from activities in the private sector, the government plays an essential role in providing the framework within which the private sector can operate productively. We have discussed the importance of secure property rights and a well-functioning legal system, of an economic environment that encourages entrepreneurship and of political stability and the free and open exchange of ideas. Government policymakers should also consider the potential effects of tax and regulatory policies on activities that increase productivity, such as investment, innovation and risk taking. Policies that affect the legal and political framework are examples of *structural macroeconomic policies*.

13.6.5 THE POOREST COUNTRIES: A SPECIAL CASE?

Radical disparities in living standards exist between the richest and poorest countries of the world (see Background briefing 13.1). Achieving economic growth in the poorest countries is thus particularly urgent. Are the policy prescriptions of this section relevant to those countries, or are very different types of measures necessary to spur growth in the poorest nations?

To a significant extent the same factors and policies that promote growth in richer countries apply to the poorest countries as well. Increasing human capital by supporting education and training, increasing rates of saving and investment, investing in public capital and infrastructure, supporting research and development and encouraging entrepreneurship are all measures that will enhance economic growth in poor countries.

However, to a much greater degree than in richer countries, most poor countries need to improve the legal and political environment that underpins their economies. For example, many developing countries have poorly developed or corrupt legal systems, which discourage entrepreneurship and investment by creating uncertainty about property rights. Taxation and regulation in developing countries are often heavy handed and administered by inefficient bureaucracies, to the extent that it may take months or years to obtain the approvals needed to start a small business or expand a factory. Regulation is also used to suppress market forces in poor countries; for example, the government, rather than the market, may determine the allocation of bank credit or the prices for agricultural products. Structural policies that aim to ameliorate these problems are important preconditions for generating growth in the poorest countries. But, probably most important —and most difficult, for some countries—is establishing political stability and the rule of law. Without political stability domestic and foreign savers will be reluctant to invest in the country, and economic growth will be difficult if not impossible to achieve.

Can rich countries help poor countries to develop? Historically, richer nations have tried to help by providing financial aid through loans or grants from individual countries (foreign aid) or by loans made by international agencies, such as the World Bank. Experience has shown, however, that financial aid to countries that do not undertake structural reforms, such as reducing excessive regulation or improving the legal system, is of limited value. To make their foreign aid most effective rich countries should help poor countries achieve political stability and undertake the necessary reforms to the structure of their economies.

▹▹ RECAP

A variety of policies exist that may help to promote economic growth. These policies are linked in the sense that they attempt to raise the level of average labour productivity. Some policies, such as publicly provided education, try to raise the level of human capital. Others, such as policies designed to promote savings, are designed to free up resources that can be used for physical capital accumulation.

One significant factor that has impinged on economic growth in many of the world's poorest countries is the inefficiency of their legal and political environments, in particular the existence of corruption and nepotism. Establishing political stability and the rule of law would seem a necessary precondition for these countries to grow.

13.7 ARE THERE LIMITS TO GROWTH?

LO 13.8

Earlier in this chapter we saw that even relatively low rates of economic growth, if sustained for a long period, will produce huge increases in the size of the economy. This fact raises the question of whether economic growth can continue indefinitely without depleting natural resources and causing massive damage to the global environment. Does the basic truth that we live in a finite world of finite resources imply that, ultimately, economic growth must come to an end?

The concern that economic growth may not be sustainable is not a new one. In 1972 an influential book, *The Limits to Growth* (Meadows et al. 1972), reported the results of computer simulations that suggested that unless population growth and economic expansion were halted the world would soon be running out of natural resources, drinkable water and breathable air. This book, and later works in the same vein, raises some fundamental questions that cannot be done full justice here. However, in some ways its conclusions are misleading.

One problem with the 'limits to growth' thesis lies in its underlying concept of economic growth. Those who emphasise the environmental limits on growth assume implicitly that economic growth will always take the form of more of what we have now—more smoky factories, more polluting cars, more fast-food restaurants. If that were indeed the case then surely there would be limits to the growth the planet can sustain. But growth in real GDP does not necessarily take such a form. Increases in real GDP can also arise from new or higher-quality products. For example, not too long ago tennis racquets were relatively simple items made primarily of wood. Today they are made of newly invented synthetic materials and designed for optimum performance using sophisticated computer simulations. Because these new high-tech tennis racquets are more valued by consumers than the old wooden ones, they increase the real GDP. Likewise, the introduction of new pharmaceuticals has contributed to economic growth, as have the expanded number of television channels, digital sound and online retailing. Thus, economic growth need not take the form of more and more of the same old stuff; it can mean newer, better and perhaps cleaner and more efficient goods and services.

A second problem with the 'limits to growth' conclusion is that it overlooks the fact that increased wealth and productivity expand society's capacity to take measures to safeguard the environment. In fact, the most polluted countries in the world are not the richest but those that are in a relatively early stage of industrialisation (see Thinking as an economist 13.5). At this stage, countries must devote the bulk of their resources to basic needs—food, shelter, healthcare—and continued industrial expansion. In these countries, clean air and water may be viewed as a luxury rather than a basic need. In more economically developed countries, where the most basic needs are more easily met, extra resources are available to keep the environment clean. Thus, continuing economic growth may lead to less, not more, pollution.

A third problem with the pessimistic view of economic growth is that it ignores the power of the market and other social mechanisms to deal with scarcity. During the oil-supply disruptions of the 1970s, newspapers were filled with headlines about the energy crisis and the imminent depletion of world oil supplies. Yet 30 years later, the world's known oil reserves are actually *greater* than they were in the 1970s.

Today's energy situation is so much better than was expected 30 years ago because the market went to work. Reduced oil supplies led to an increase in prices that changed the behaviour of both demanders and suppliers. Consumers insulated their homes, purchased more energy-efficient cars and appliances and switched to alternative sources of energy. Suppliers engaged in a massive hunt for new reserves, opening up major new sources in Latin America, China and the North Sea. In short, market forces solved the energy crisis.

In general, shortages in any resource will trigger price changes that induce suppliers and demanders to deal with the problem. Simply extrapolating current economic trends into the future ignores the power of the market system to recognise shortages and make the necessary corrections. Government actions spurred by political pressures, such as the allocation of public funds to preserve open space or reduce air pollution, can be expected to supplement market adjustments.

Despite the shortcomings of the ‘limits to growth’ perspective, most economists would agree that not all the problems created by economic growth can be dealt with effectively through the market or the political process. Probably the most important are global environmental problems such as the possibility of global warming or the ongoing destruction of rainforests—a challenge for existing economic and political institutions. Environmental quality is not bought and sold in markets and thus will not automatically reach its optimal level through market processes. Nor can local or national governments effectively address problems that are global in scope. Unless international mechanisms are established for dealing with global environmental problems, these problems may become worse as economic growth continues.

THINKING AS AN ECONOMIST 13.5

Why is the air quality so poor in Mexico City?

Developing countries like Mexico, which are neither fully industrialised nor desperately poor, often have severe environmental problems. Why?

One concern about economic growth is that it will cause ever-increasing levels of environmental pollution. Empirical studies show, however, that the relationship between pollution and real GDP per person is more like an inverted U (see Figure 13.6). In other words, as countries move from very low levels of real GDP per person to ‘middle-income’ levels, most measures of pollution tend to worsen, but environmental quality improves as real GDP per person rises even further. One study of the relationship between air quality and real GDP per person found that the level of real GDP per person at which air quality is the worst—indicated by point A in Figure 13.6—is roughly equal to the average income level in Mexico (Grossman & Krueger 1993; see also Grossman & Krueger 1995 and World Bank 1992). And indeed, the air quality in Mexico City is exceptionally poor, as any visitor to that sprawling metropolis can attest. Pollution problems are also present in many Asian capital cities. However, there is emerging in Asia some evidence of the inverted-U relation between income and pollution. For example, China has had extraordinarily rapid economic growth over the past 10 years and there is now evidence that Beijing appears to have lower levels of particulate atmospheric pollution than was the case in 1990 (see O’Connor 2004).

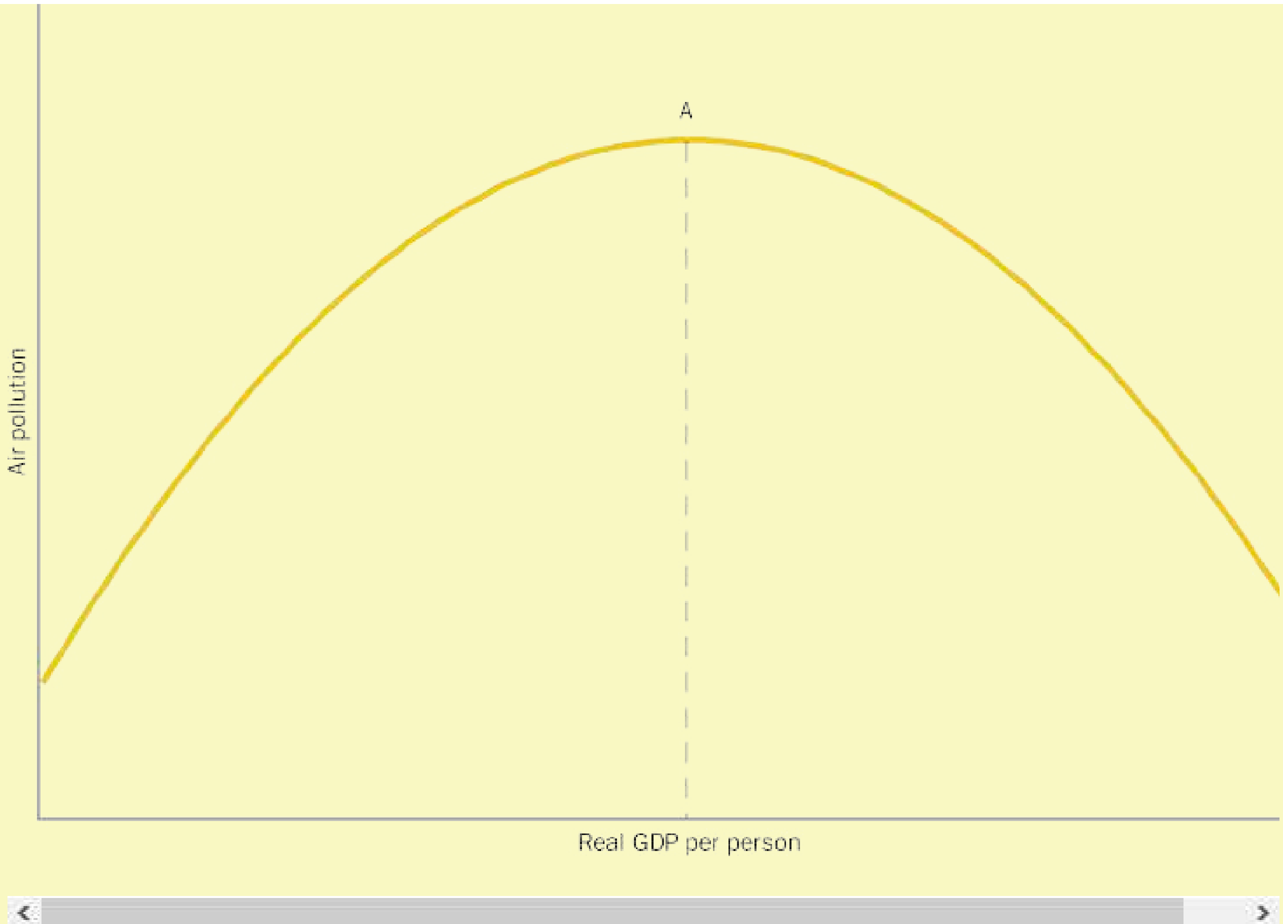

Figure 13.6 **The relationship between air pollution and real GDP per person**

Note: Empirically, air pollution increases with real GDP per person up to a point and then begins to decline. Maximum air pollution (point A) occurs at a level of real GDP per person roughly equal to that of Mexico.

Source: Based on information from Grossman GM and Krueger AB 1993, 'Environmental impacts of a North American free trade agreement', in Garber PM (ed.), *The Mexico–US Free Trade Agreement*, MIT Press, Cambridge, MA. Used with permission of MIT Press, Cambridge, MA.

That pollution may worsen as a country industrialises is understandable, but why does environmental quality improve when real GDP per person climbs to very high levels? There is a variety of explanations for this phenomenon. Compared to middle-income economies, the richer economies are relatively more concentrated in ‘clean’, high-value services like finance and software production, as opposed to pollution-intensive industries like heavy manufacturing. Rich economies are also more likely to have the expertise to develop sophisticated and cost-effective anti-pollution technologies. But the main reason why the richer economies tend to be cleaner is the same reason that the homes of rich people are generally cleaner and in better condition than the homes of the poor. As income rises above the level necessary to fulfil basic needs, more resources remain to dedicate to ‘luxuries’ like a clean environment (the *scarcity principle*). For the rich family the extra resources will pay for a cleaning service; for the rich country they will pay for pollution control devices in factories and on cars. Indeed, anti-pollution laws are generally tougher and more strictly enforced in rich countries than in middle-income and poor countries.

▹▹ RECAP

The finite supply of natural resources has led many to conclude that there must be a limit on the extent of economic growth. However, economic growth can occur through the more efficient use of existing resources and through the development of new technologies. In addition, the price system will continue to allocate resources efficiently in a growing economy and will allow necessary adjustments to be made in the way that scarce resources are used.

SUMMARY

- Over the past two centuries industrialised nations have seen enormous improvements in living standards, as reflected in large increases in real GDP per person. Because of the power of *compound interest*, relatively small differences in growth rates, if continued over long periods, can produce large differences in real GDP per person and average living standards. Thus, the rate of long-term economic growth is an economic variable of critical importance.
- Real GDP per person is the product of average labour productivity (real GDP per employed worker) and the share of the population that is employed. Growth in real GDP per person can occur only through growth in average labour productivity, in the share of the population that is working or both. In the past four decades, as in most periods, the main source of the increase in real GDP per person was rising average labour productivity.
- Among the factors that determine labour productivity are: the talents, education, training and skills of workers, or human capital; the quantity and quality of the physical capital that workers use; the availability of land and other natural resources; the application of technology to the production and distribution of goods and services; the effectiveness of entrepreneurs and managers; and the broad social and legal environment. Because of *diminishing returns to capital*, beyond a certain point, expansion of the capital stock is

not the most effective way to increase average labour productivity. Economists generally agree that new technologies are the most important single source of improvements in productivity.

- Economic growth has costs as well as benefits. Prominent among them is the need to sacrifice current consumption to achieve a high rate of investment in new capital goods; other costs of growing more quickly include extra work effort and the costs of research and development. Thus, more economic growth is not necessarily better; whether increased economic growth is desirable depends on whether the benefits of growth outweigh the costs.
- Among the ways in which government can stimulate economic growth is the adoption of policies that encourage the creation of human capital; that promote saving and investment, including public investment in infrastructure; that support research and development, particularly in the basic sciences; and that provide a legal and political framework that supports private sector activities. The poorest countries, with poorly developed legal, tax and regulatory systems, are often in the greatest need of an improved legal and political framework and increased political stability.
- Are there limits to growth? Arguments that economic growth must be constrained by environmental problems and the limits of natural resources ignore the fact that economic growth can take the form of increasing quality as well as increasing quantity. Indeed, increases in output can provide additional resources for cleaning up the environment. Finally, the market system, together with political processes, can solve many of the problems associated with

economic growth. On the other hand, global environmental problems, which can be handled neither by the market nor by individual national governments, have the potential to constrain economic growth.

KEY TERMS

compound interest 331

diminishing returns to capital 336

entrepreneurs 339

REVIEW QUESTIONS

1. What has happened to real GDP per person in the industrialised countries over the past century? What implications does this have for the average person? LO 13.1 **EASY**
2. Why do economists consider growth in average labour productivity to be the key factor in determining long-run living standards? LO 13.6 **EASY**
3. What is *human capital?* Why is it economically important? How is new human capital created? LO 13.6 **EASY**
4. You have employed five workers of varying physical strength to dig a ditch. Workers without shovels have zero productivity in ditch digging. How should you assign shovels to workers if you do not have enough shovels to go around? How should you assign any additional shovels that you obtain? Using this example, discuss: LO 13.6 **MEDIUM**
   - **a)** the relationship between the availability of physical capital and average labour productivity
   - **b)** the concept of diminishing returns to capital.
5. Discuss how talented entrepreneurs and effective managers can enhance average labour productivity. LO 13.6 **MEDIUM**
6. What major contributions can the government make to the goal of increasing average labour productivity? LO 13.6 **MEDIUM**

7. Discuss the following statement: ‘Because the environment is fragile and natural resources are finite, ultimately economic growth must come to an end.’ LO 13.8 **HARD**

PROBLEMS

1. Richland's real GDP per person is $20 000 and Poorland's real GDP per person is $10 000. However, Richland's real GDP per person is growing at 2 per cent per year and Poorland's is growing at 4 per cent per year. Compare real GDP per person in the two countries after 10 years and after 20 years. Approximately how many years will it take Poorland to catch up to Richland? LO 13.5
MEDIUM

2. The 'greying of the population' will substantially increase the fraction of the population that is retired in the decades to come. To illustrate the implications for living standards, suppose that over the 49 years following 2009 the share of the population that is working returns to its 1960 level, while average labour productivity increases by as much as it did during 1960–2009. Under this scenario, what would be the net change in real GDP per person between 2009 and 2058? LO 13.5 **HARD**

   The following data will be useful:

YEAR	AVERAGE LABOUR PRODUCTIVITY	SHARE OF POPULATION EMPLOYED
1960	$45 438	37.8%
2009	$99 763	46.0%

3. Here are data for Germany and Japan on the ratio of employment to population in 1979 and 2008:

	1979	2008
Germany	0.33	0.49
Japan	0.48	0.51

Data on the real GDPs (in US$, 2010 prices) is:

	1979	2008
Germany	25756	42365
Japan	25344	45166

Find average labour productivity for each country in 1979 and in 2008. How much of the increase in output per person in each country over the 1979–2008 period is due to increased labour productivity? To increased employment relative to population?
LO 13.5 **HARD**

4. Joanne has just completed high school and is trying to determine whether to go to university for two years or go directly to work. Her objective is to maximise the savings she will have in the bank five years from now. If she goes directly to work she will earn $19 500 per year for each of the next five years. If she goes to university, for each of the next two years she will earn nothing—indeed, she will

have to borrow $6000 each year to cover her fees and books. This loan must be repaid in full three years after graduation. If she graduates from university, in each of the subsequent three years her wages will be $37 500 per year. Joanne's total living expenses and taxes, excluding fees and books, equal $15 000 per year.
LO 13.5 **MEDIUM**

a) Suppose for simplicity that Joanne can borrow and lend at 0 per cent interest. On purely economic grounds, should she go to university or work?

b) Does your answer to part (a) change if she can earn $25 000 per year with only a high school certificate?

c) Does your answer to part (a) change if Joanne's fees and books cost $8000 per year?

d) Suppose that the interest rate at which Joanne can borrow and lend is 10 per cent per year, but other data are as in part (a). Savings are deposited at the end of the year they are earned and receive (compound) interest at the end of each subsequent year. Similarly, the loans are taken out at the end of the year in which they are needed, and interest does not accrue until the end of the subsequent year. Now that the interest rate has risen, should Joanne go to university or go to work?

5. The Good'n'Fresh Grocery Store has two checkout lanes and four employees. Employees are equally skilled, and all are able either to operate a register (cashiers) or bag groceries (baggers). The store owner assigns one cashier and one bagger to each lane. A lane with a cashier and a bagger can serve 40 customers per hour. A lane with a cashier only can serve 25 customers per hour. LO 13.6 **MEDIUM**

a) In terms of customers served per hour, what is total output and average labour productivity for the Good'n'Fresh Grocery Store?

b) The owner adds a third checkout lane and register. Assuming that no employees are added, what is the best way to reallocate the workers to tasks? What is total output and average labour productivity (in terms of customers served per hour) now?

c) Repeat part (b) for the addition of a fourth checkout lane, and a fifth. Do you observe diminishing returns to capital in this example?

6. Harrison, Carla and Fred are housepainters. Harrison and Carla can paint 100 square metres per hour using a standard paintbrush, and Fred can paint 80 square metres per hour. Any of the three can paint 200 square metres per hour using a roller. LO 13.6 **MEDIUM**

a) Assume Harrison, Carla and Fred have only paintbrushes at their disposal. What is the average labour productivity, in terms of square metre per painter-hour, for the three painters taken as a team? Assume that the three painters always work the same number of hours.

b) Repeat part (a) for the cases in which the team has one, two, three or four rollers available. Are there diminishing returns to capital?

c) An improvement in paint quality increases the area that can be covered per hour (by either brushes or rollers) by 20 per cent. How does this technological improvement affect your answers to part (b)? Are there diminishing returns to capital? Does the technological improvement increase or reduce the economic value of an additional roller?

7. Hester's Hatchery raises fish. At the end of the current season she has 2 400 fish in the hatchery. She can harvest any number of fish that she wishes, selling them to restaurants for $10 apiece. Because big fish make little fish, for every fish that she leaves in the hatchery this year she will have two fish at the end of next year. The price of fish is expected to be $10 each next year as well. Hester relies entirely on income from current fish sales to support herself. LO 13.8 **HARD**

   a) How many fish should Hester harvest if she wants to maximise the growth of her stock of fish from this season to next season?

   b) Do you think maximising the growth of her fish stock is an economically sound strategy for Hester? Why or why not? Relate to the text discussion on the costs of economic growth.

   c) How many fish should Hester harvest if she wants to maximise her current income? Do you think this is a good strategy?

   d) Explain why Hester is unlikely to harvest either all or none of her fish, but instead will harvest some and leave the rest to reproduce.

8. True or False: For advances in basic science to translate into

improvements in standards of living, they must be supported by favourable economic conditions. Discuss, using concrete examples where possible to illustrate your arguments. LO 13.6 **MEDIUM**

REFERENCES

Baumol W 1990, ‘Entrepreneurship: Productive, unproductive, and destructive’, *Journal of Political Economy*, October, pp. 893–921.

Bolt J, Inklaar R, de Jong H and Luiten van Zanden J 2018, ‘Rebasing “Maddison”: New income comparisons and the shape of long-run economic development’, Maddison Project Working Paper 10, Maddison Project Database, version 2018.

Crafts NFR 1985, *British Economic Growth during the Industrial Revolution*, Oxford University Press, Oxford.

Feenstra RC, Inklaar R and Timmer MP 2015, ‘The next generation of the Penn World Table’, *American Economic Review*, vol. 105, no. 10, pp. 3150–82, www.ggdc.net/pwt.

Grossman GM and Krueger AB 1993, ‘Environmental impacts of a North American free trade agreement’, in Garber PM (ed.), *The Mexico–US Free Trade Agreement*, MIT Press, Cambridge, MA.

Grossman GM and Krueger AB 1995, ‘Economic growth and the environment’, *Quarterly Journal of Economics*, May, pp. 353–78.

Meadows DH, Meadows DL, Randers R and Behrens III W 1972, *The Limits to Growth*, New American Library, New York.

O’Connor D 2004, ‘OECD country economic and environmental policies: What implications for East Asia?’, Paper prepared for experts’ seminar ‘The impact and coherence of OECD country policies on Asian developing economies’, Organization for Economic Co-operation and Development, Paris, 10–11 June, www.oecd.org/dataoecd/11/33/31970833.pdf.

Organization for Economic Co-operation and Development (OECD) n.d., ‘Main economic indicators: Complete database’, http://dx.doi.org/10.1787/data-00052-en, accessed 15 November 2018.

Posen AS 2002, ‘Japan’, in Steil B, Victor DG and Nelson RR (eds), *Technological Innovation and Economic Performance*, Princeton University Press.

Tan Y 2011, *Chinnovation: How Chinese Innovators Are Changing the World*, John Wiley and Sons.

World Bank (1992), *World Development Report: Development and the Environment*, World Bank.

World Bank 2018, ‘Decline of global extreme poverty continues but has slowed: World Bank’, Press release, 19 September, www.worldbank.org/en/news/press-release/2018/09/19/decline-of-global-extreme-poverty-continues-but-has-slowed-world-bank.

CHAPTER 14

The production function approach to understanding growth

After reading this chapter, you should be able to answer the following questions.

14.1 What is a production function?

a) According to the production function, what factors determine output?

14.2 What determines a firm's demand for primary factors of production?

a) Under what circumstances would the demand for primary factors change?

14.3 How can a production table be used to illustrate a production function?

a) What other ways are there to display a production function?

14.4 What is the functional form of the Cobb–Douglas production function?

a) How can equations for the marginal product of capital and marginal product of labour be derived from the Cobb–Douglas production function?

b) How does the Cobb–Douglas production function relate to the concept of constant returns to scale?

14.5 What is the purpose of growth accounting?

a) How is the growth accounting equation derived from a Cobb–Douglas production function?

SETTING THE SCENE

World Bank economist William Easterly has written extensively about economic growth. In his book *The Elusive Quest for Growth*, mischievously subtitled *Economists' Adventures and Misadventures in the Tropics*, he writes very movingly about the problems that beset the world's underdeveloped countries (Easterly 2001). He points out that diseases that are almost unknown in the developed world—tuberculosis, polio, measles, tetanus, sleeping sickness and leprosy, among others—are endemic in many of the poorer countries. Every year two million children die from the dehydration associated with

diarrhoea in these countries. Another two million children die each year from pertussis, polio, diphtheria, tetanus and measles. The contrast with wealthy nations is staggering. In the richest fifth of countries the rate of infant mortality is four out of 1 000 births; in the poorest fifth of countries it is 200 out of 1 000 births.

These figures are only one aspect of the poverty that afflicts the world's poorest countries. Added to this are countless other calamities: short life spans, substandard housing, inferior nutrition, lack of educational opportunities, repetitive and often dangerous jobs and so on.

The World Bank defines poverty as subsisting on less than US$1.90 a day. Figure 14.1 aggregates World Bank data on poverty according to whether a country is classified as high income or low income. In high income countries, extreme poverty is experienced by a tiny proportion of the population. From the chart, you can see this is clearly not the case in the world's poorest countries. Encouragingly, the proportion of the population in poor countries living on less than US$1.90 a day has decreased in recent years. However, it is beyond doubt that a significant proportion of the world's population still lives in abject poverty.

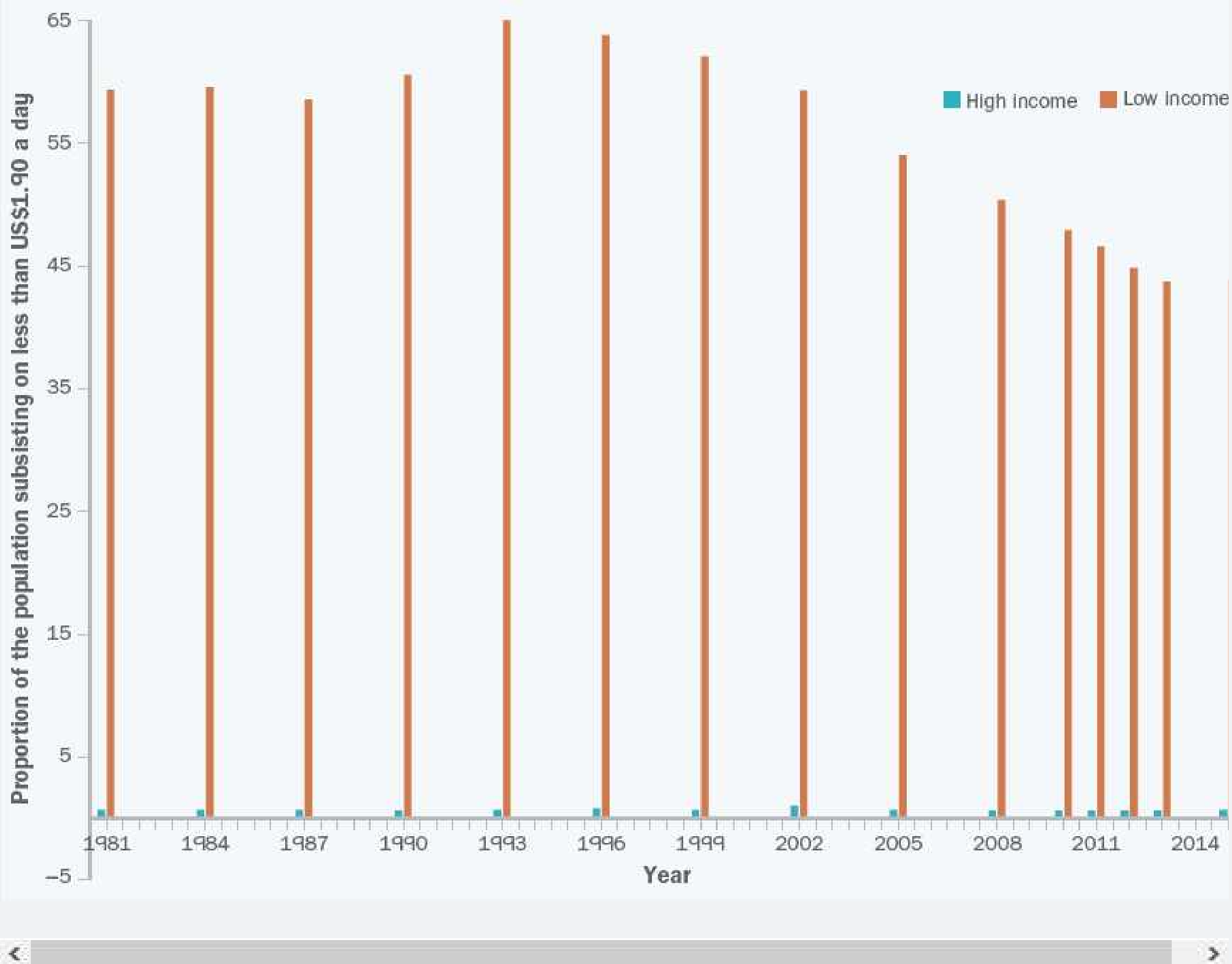

Figure 14.1 **The share of the population living in extreme poverty**

Source: The World Bank n.d., 'World development indicators', http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators&.

Given the scale of human misery often associated with extreme poverty, economists do not really need much justification for studying economic growth. It is the most important topic on the research agenda.

14.1 ECONOMISTS AND ECONOMIC GROWTH

How do economists think about economic growth? The answer, which by this stage in the book should come as no surprise, is to apply the tools of economic analysis to identify, in a systematic way, the fundamental factors that influence a country's growth performance. The starting point for economists' analysis of growth is to build an analytical framework that enables predictions to be made about what factors influence economic growth and what sort of growth those factors give rise to. Those frameworks then become the basis for empirical work designed to see just how well economists' ideas hold up against what happens in the real world. Because of that empirical work, economic ideas are modified, with new models formulated and tested. We are a long way short of fully understanding the factors that make some countries grow rapidly and others languish far behind. But we know more than we used to, and we are constantly learning. All of this makes the study of economic growth one of the most fascinating of all areas in macroeconomics. And it goes almost without saying that any insights provided by economists that enable policies to be designed that could assist the world's poorest countries to grow would be among our discipline's greatest achievements.

In this chapter we begin to outline what has become the standard economic approach to the study of growth: the neo-classical growth model or, as it is sometimes known, the Solow–Swan model (after its original developers).

Although this is not the only model of economic growth, it is widely used and still forms the basis of more advanced models that have been developed recently (we will touch on these more advanced models towards the end of the next chapter). This chapter focuses on a key component of the neo-classical growth model, the production function.

14.2 THE PRODUCTION FUNCTION

LO 14.1–14.3

In Chapter 13 we saw how the economy's real gross domestic product (GDP) could be divided into two components: one that reflects the average productivity of labour and the second relating to the proportion of the population in the labour force. In Chapter 13 we also identified, at an informal level, a series of factors that could affect average labour productivity. We now formalise these ideas using an important theoretical concept in economics, the **production function**. As you will see in this chapter and in Chapter 15, the production function provides a unifying framework for economists' ideas concerning economic growth.

Figure 14.2 is a diagrammatic representation of the factors that determine firms' ability to produce output. Labour and capital are the firms' *primary* factors of production. In Chapter 13 we saw that it is firms' average level of labour productivity that determines the economy's ability to grow. Average productivity, which is a measure of labour's ability to produce output, depends in a fundamental way on the available capital stock, the plant and equipment that workers use to produce output. All else being equal, the more output that a given supply of labour can produce, the larger is the capital stock.

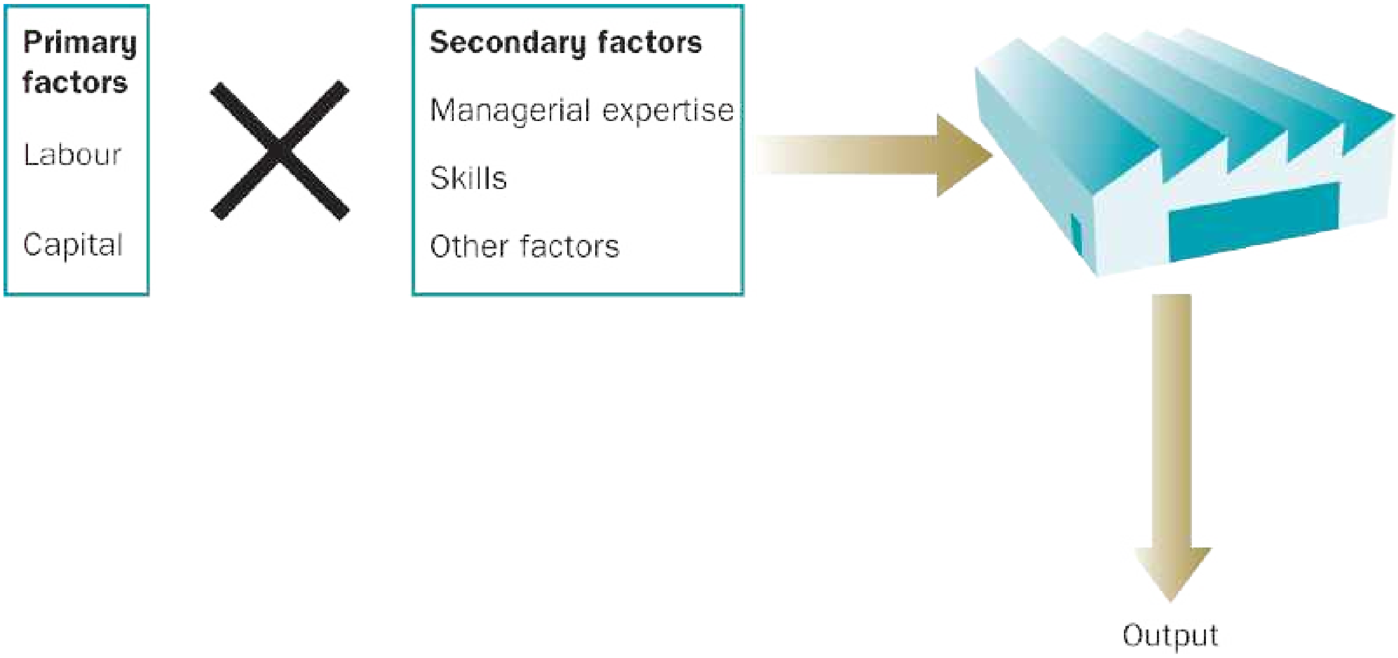

Figure 14.2 **The production process**

Note: Firms bring in combinations of primary factors, labour and capital, to produce output. How much output can be produced from given combinations of labour and capital depends on the interaction of those primary factors with the state of technology, managerial expertise, the skills of the workforce and various other factors.

How well firms do this—how much output can be produced from a given set of capital and labour inputs—depends on what we will call firms' *secondary* factors of production. These are factors such as the level of technological advancement in the economy, firms' managerial expertise and the skills possessed by the workforce. Other factors such as firms' access to infrastructure—roads and rail networks, for example—and even intangibles, such as the government's ability to ensure a climate of political stability, could also be important.

The production function is based on the schematic representation of the production process in Figure 14.2. Essentially, the production function is a simple, abstract representation of something that we know in the real world is incredibly complex, namely, the process by which firms combine capital and labour to yield output of goods and services. Because capital and labour are so integral to an economy's growth we will now look at each in some detail. We begin with capital.

BACKGROUND BRIEFING 14.1

Economic growth and population growth

Although the existence of widespread poverty in the world means that no one should take economic growth for granted, those who today live in industrialised countries probably view economic growth as very much normal. Yet in recorded human history economic growth is a relatively recent occurrence. Economic historians believe, for example, that until around the year 1500 there had been next to no growth in output per worker for 1000 years. One consequence of this was that population growth throughout the world prior to 1500 was, as one economist has put it, 'glacial' (DeLong 2001).

Even when economic growth began to take off, and especially in the nineteenth century when the industrial revolution made possible previously unprecedented increases in production, there were many pessimists who argued that growth could only ever be a temporary phenomenon and that the world would soon revert to its historically normal non-growth existence. These views were put most forcibly by Thomas Malthus (1766–1834) in his famous essay on the principle of population (1798). Malthus was an early expert at ‘thinking as an economist’. He believed that the new prosperity that economic growth was bringing did not guarantee a means of solving what he saw as a looming and chronic scarcity problem. Malthus was concerned about the interaction between the dynamics of population growth and economic growth. The latter would lead to rising income levels, which Malthus saw as both encouraging families to have more children and lowering infant mortality rates. Consequently, economic growth meant that the population would begin to increase geometrically. Malthus saw this leading to an eventual crisis because even with the technological advances of the industrial revolution, food production could only increase linearly, that is, at a fixed rate per year. Malthus’s prediction was that there would be insufficient resources to support the growing population, which would lead eventually to dramatic falls in per capita income and in per capita levels of food intake. Famine and disease, Malthus predicted, would be the results of economic growth.

Malthus's ideas were very influential at the time and were widely debated, and not just by economists. Charles Darwin, for example, once famously wrote:

In October 1838, that is, fifteen months after I had begun my systematic inquiry, I happened to read for amusement Malthus on Population, and being well prepared to appreciate the struggle for existence which everywhere goes on from long-continued observation of the habits of animals and plants, it at once struck me that under these circumstances favourable variations would tend to be preserved, and unfavourable ones to be destroyed. The results of this would be the formation of a new species. Here, then I had at last got a theory by which to work (Darwin 1876).

Yet Malthus's theories have proven, at least so far, to be quite wrong. Figure 14.3 shows estimates of the world's population from 1950 onwards. The Malthusian scenario of economic growth being incapable of supporting rapid population growth is not supported by the data.

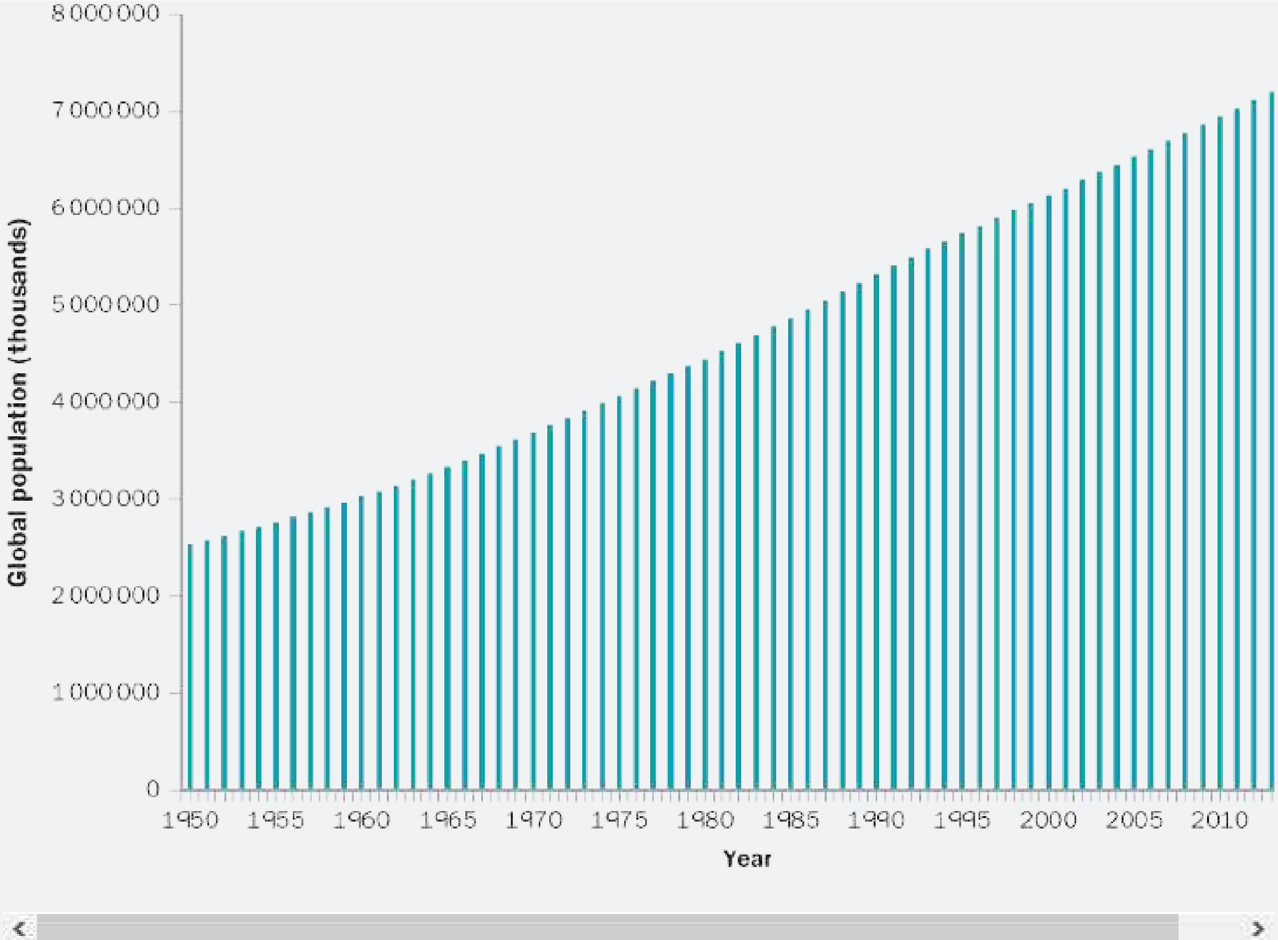

Figure 14.3 **The world's population**

Note: The world's population has nearly tripled since 1950.

Source: Based on data from United Nations 2017, 'World population prospects: The 2017 revision', Department of Economic and Social Affairs, Population Division, https://www.compassion.com/multimedia/world-population-prospects.pdf.

The question is, why not? What has allowed the world to support such a large increase in its population? The answer, not surprisingly, is technology. Food production has kept up with the increase in population and this has been made possible by the remarkable increases we have seen in the productivity of labour. In fact, many countries with large populations, such as the United States, have harnessed technology in a way that means they produce a surplus of food, more than is needed to feed their own populations, and can export that surplus to other countries. For Malthus, this would have been something that was simply unthinkable.

Does this mean that Malthus has nothing to teach us today? The answer is, clearly, no. Population pressures are important constraints on living standards in many developing countries. And the scarcity problem is still there; the world's resources are finite and at some point, it may be that technological advances are no longer able to provide for an ever-growing population. Fortunately, something else has happened, also unforeseen by Malthus: as economic growth has progressed the population growth rate has begun to decline, especially in the industrialised world (as we all know, family sizes are today much smaller than a generation or two ago). This can be seen in the data in Figure 14.4. Malthus saw disaster in economic growth, as it encouraged unsustainable increases in population. The reality, in the twenty-first century, is that the world's population, although clearly very large in number, is not increasing at the rate it once was.

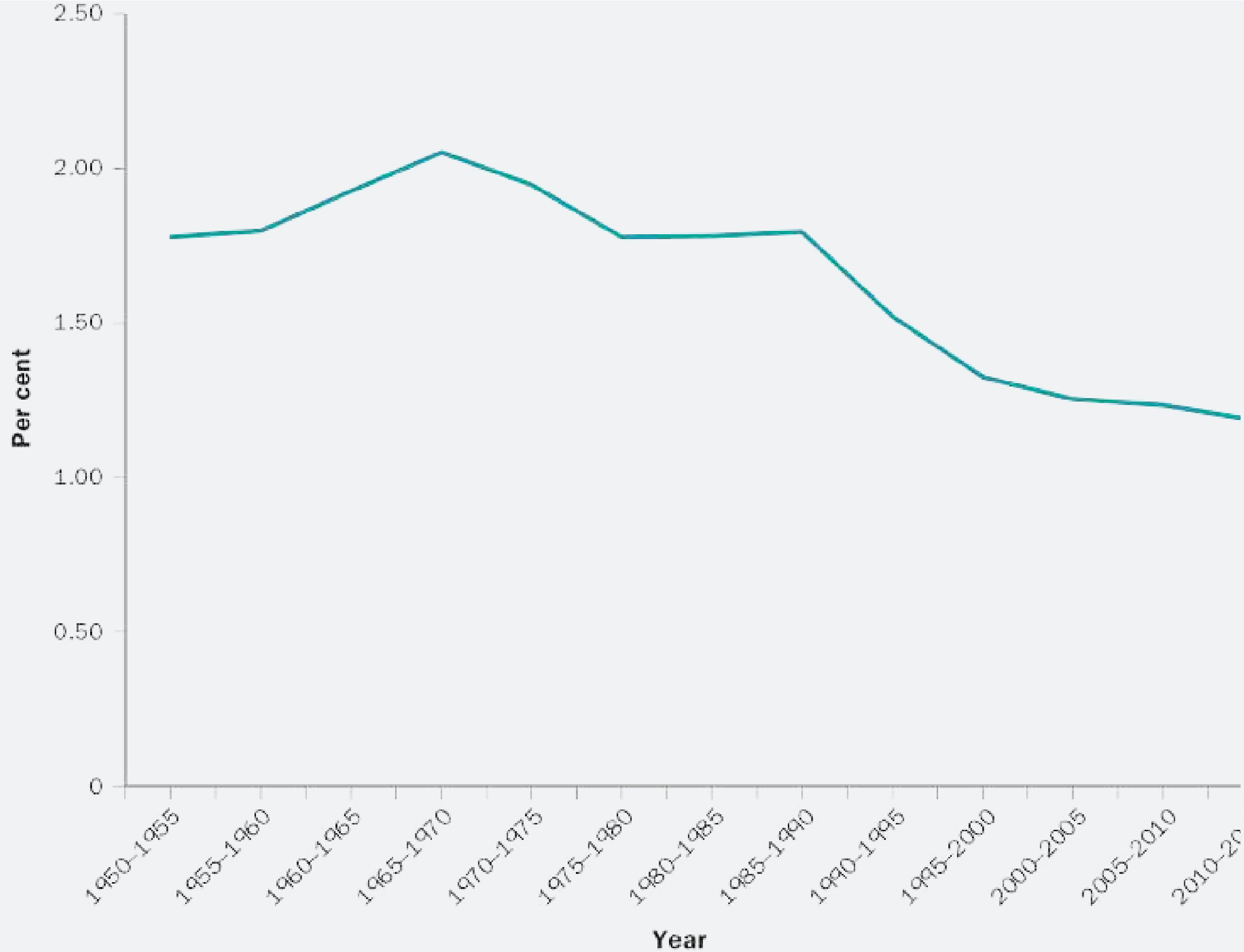

Figure 14.4 **Average annual rate of population growth (%)**

Note: The annual growth rate of the world's population has declined.

Source: Based on data from United Nations 2017, 'World population prospects: The 2017 revision', Department of Economic and Social Affairs, Population Division, custom data acquired via website.

References

Darwin C 1876, *The Autobiography of Charles Darwin*, quoted in 'Thomas Malthus (1766–1834)', www.ucmp.berkeley.edu/history/malthus.html.

Malthus T 1798, 'An essay on the principle of population'.

14.2.1 CAPITAL

What determines how much capital a firm will use? Recall from Chapter 4 that the economy's real rate of interest represents an opportunity cost to firms when employing capital. At first it may be difficult to see why the real rate of interest relates to the cost of capital equipment. To see the link, think for a moment about the nature of firms' use of capital equipment. Firms face a fundamental problem when acquiring capital equipment and that problem is *time*. Given enough time, a piece of capital equipment will produce output, which can then be sold, and return some revenue to the firm. But this does not happen instantaneously. It takes time to produce the output, to transport that output to market, to advertise that output, to sell that output and then to return that revenue to the firm. This could take weeks, even months (for some luxury items, much longer). The problem for the firm is that it must pay for the capital equipment upfront even though the economic return from that equipment will not be forthcoming until sometime in the future. This means that the firm must finance the purchase of the capital equipment without having access to the future stream of revenue that will be forthcoming when the output produced by that equipment is sold—the firm, in other words, has a 'cash flow' problem. The answer for firms is to borrow the money needed to purchase the capital equipment. This will enable firms to acquire the capital equipment, install it, use it and sell the output that is eventually produced. The revenue obtained from the use of the capital equipment can then be used to repay the loan. For the firm, an important component of the opportunity cost of capital is the real interest rate on the loan—this represents the real cost of funds expended to acquire the capital equipment. Note that there is another sense in which the real interest rate represents the opportunity cost of capital. Suppose the firm does not have to borrow money to purchase the capital equipment (the firm may have set aside some funds from previous sales of output for just this purpose). If it wanted to, the firm could give up the opportunity to purchase the capital equipment and instead deposit an amount equal to the purchase price at a bank. This would enable the firm to earn the going real interest rate. By choosing not to do this, and instead buying the capital equipment, the firm is giving up the opportunity of earning the real interest rate.

How much capital equipment should the firm acquire? To answer this question, we introduce the concept of the marginal product of capital (which we will denote as MP_K). The **marginal product of capital (MP_K)** is the amount of extra output that is obtained if the capital stock is increased by one unit. If we take the marginal product of capital and multiply it by the price at which the product produced by that capital is sold, $P \times MP_K$, we have what is known as the **marginal revenue product of capital (MRP_K)**, a measure of the extra revenue received by the firm if it increases its capital stock by one unit.

Should the firm increase its capital stock? Not surprisingly the answer to this question hinges on an application of the cost–benefit principle. If the benefits to the firm from adding to its capital stock outweigh the costs of doing so then the firm should increase the size of its capital stock.

We now return to the concept of the **diminishing marginal productivity** of capital. This characteristic of capital plays a crucial part in economists' models of economic growth (we will see this in the next chapter). The diminishing marginal productivity of capital refers to the observation that while additions to the capital stock give rise to extra output, the amount of extra output that is obtained diminishes as the size of the capital stock increases. In symbols, the diminishing marginal productivity of capital can be represented as:

$$K \uparrow \Rightarrow MP_K \downarrow$$

This is another application of the *low-hanging-fruit principle*. According to this principle, the first piece of capital equipment that is employed by a firm is assigned to the area in which it will be most productive, the second piece will be assigned to the next most productive area, the third piece to the next most productive area and so on. The low-hanging-fruit principle is one explanation for the diminishing marginal productivity of capital. A second reason relates to an assumption that the size of the labour force employed by the firm remains constant, while we allow the size of the capital stock to increase. Think of an extreme example in which there is only one worker employed by the firm. The acquisition of one machine will greatly enhance that worker's ability to produce output; hence that first machine has a very high marginal productivity. Suppose the firm, encouraged by this tremendous burst of productivity, buys a second machine, *but keeps the workforce at one individual*. Our worker now faces the unenviable task of trying to keep two machines going simultaneously (you could picture this worker running from one machine to the other). The likely result will be more output, but not as much extra output as was produced by the first machine alone. A third machine would make things even harder for our worker, who now has to keep three machines going. Again, there is likely to be more output at the end of the day than if just two machines were used, but probably not that much more. Figure 14.5 illustrates the diminishing marginal productivity of capital.

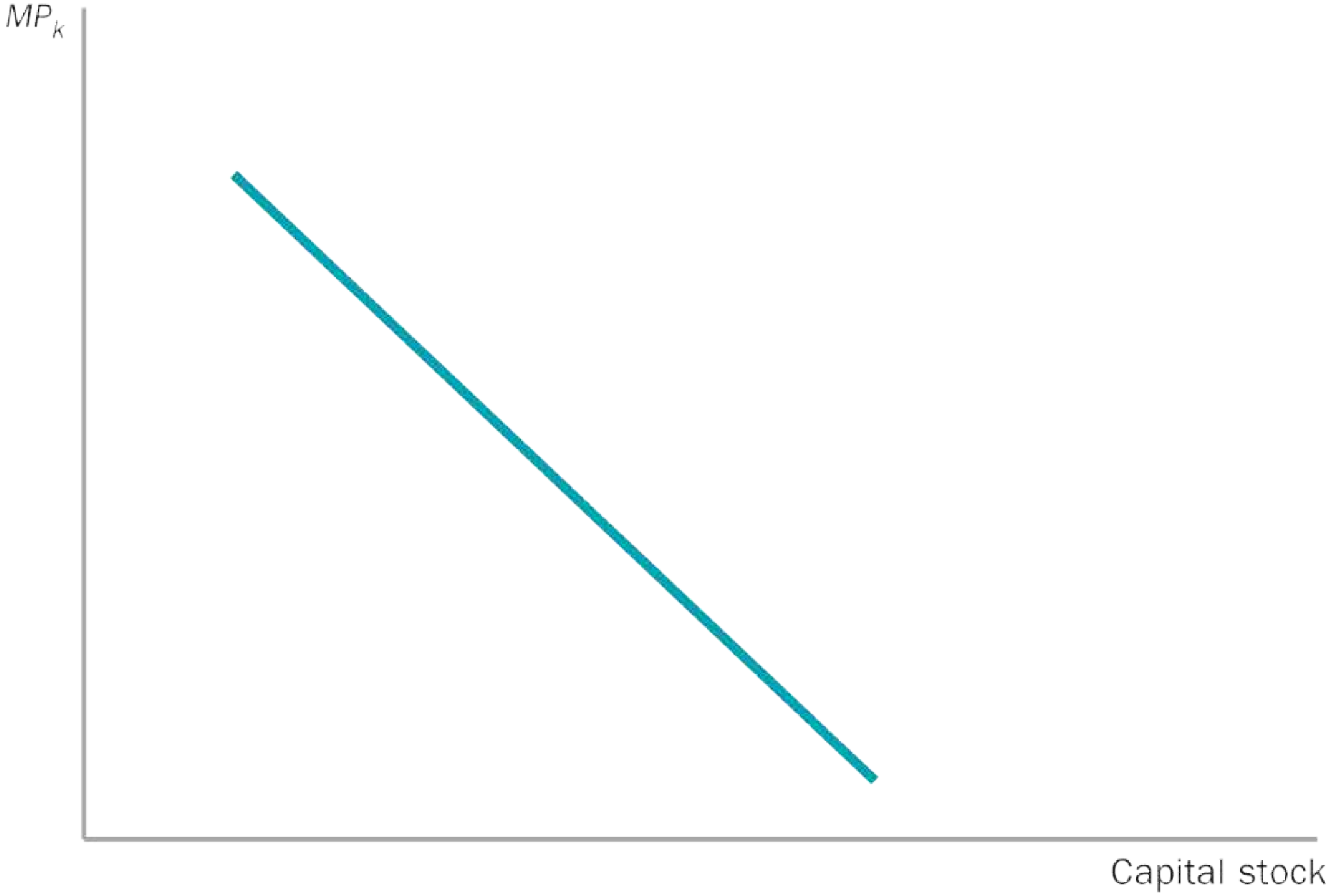

Figure 14.5 **The diminishing marginal productivity of capital**

Note: As the capital stock increases, the marginal productivity of capital declines.

How does the concept of the diminishing marginal productivity of capital relate to the question of how much capital firms acquire? We will assume that the firms we are looking at are *perfectly competitive*. This means that each firm is unable to affect the price it receives for its product through its own actions. In making decisions about the size of their capital stock, firms can assume that the price they receive for their products is constant. We will use the notation $\bar{P}$ to represent this price (the bar over P is there to remind us that the price is being held fixed throughout this analysis). Firms' marginal revenue product of capital will therefore be given by:

$$MRP_K = \overline{P} \times MP_K$$

Equation 14.1

Note an important implication of Equation 14.1. Given that the marginal product of capital declines as the size of the capital stock increases, and given that the marginal revenue product of capital is just the marginal product of capital multiplied by a constant, $\overline{P}$, it must be the case that the marginal revenue product of capital also declines as the size of the capital stock increases.

Think of the marginal revenue product of capital as the extra benefit a firm receives when it adds to its stock of capital. Equation 14.1 then implies that this extra benefit declines as the size of the capital stock increases, holding all else constant. If we now remind ourselves of the cost–benefit principle, namely that in deciding how much extra capital to install a firm will compare the extra cost with the extra benefit, it follows that at some point adding to the capital stock will no longer make economic sense as the declining benefit will not outweigh the extra cost. The point at which the benefits and costs exactly balance, and where any further increase in the capital stock would push the benefit below cost, is known as the **optimal capital stock**.

What are these costs? We have already discussed how the real interest rate can be viewed as a cost of capital equipment. Should the real interest rate be relatively high, the optimal capital stock is likely to be relatively low as the diminishing marginal productivity of capital would quickly push the benefits below the (high) cost. Using the same logic, you should be able to convince yourself that a relatively low real interest rate, holding all else constant, will mean most likely that the optimal capital stock is relatively large. There are other costs that firms would consider as well. For example, the purchase price of capital equipment will often be an important consideration, as will the amount of resources needed to be put aside to finance depreciation (i.e. the replacement of worn-out capital equipment). The same principles will apply: considering all the elements of cost, there exists an optimal capital stock beyond which diminishing marginal productivity will push the benefits of adding to the capital stock below the cost.

The cost–benefit principle makes it clear under what circumstances the firm would change its optimal capital stock. If there is a change in (1) the opportunity cost of capital, the real interest rate, or (2) some other element of the cost of acquiring capital equipment or (3) the marginal revenue product of capital, the firm's optimal capital stock will change. Suppose, for example, the price received by the firm for its product increases. Then, assuming everything else remains the same, the firm's marginal revenue product will increase; this will lead to an increase in the firm's optimal capital stock. Concept check 14.1 asks you to work through other cases in which the firm's choice of optimal capital stock might change.

CONCEPT CHECK 14.1

Using the cost–benefit principle, explain what happens to a firm's optimal capital stock if:

a) the real interest rate rises

b) a technological advance makes capital more productive.

14.2.2 LABOUR

When using the production function economists usually measure labour, L, as the total number of hours or work supplied. How many hours of work will an individual be willing to *supply*? As we discussed in Chapter 5, this depends on a comparison of the costs and benefits to that individual of allocating time to paid employment. The benefit is the real wage that is received. The individual will weigh up this benefit against the cost; this will be the subjective value to the worker of the time spent at work. Should the benefit of work, in terms of the wage received, more than compensate the individual for giving up their time, the individual will supply more work. Should the costs outweigh the benefits, the individual will cut back on the hours of work they supply.

Concept check 14.2 asks you to predict what would happen to the number of hours of work an individual would be prepared to supply under various scenarios.

CONCEPT CHECK 14.2

Predict what would happen to the hours of work supplied by an individual if:

a) the individual, a keen golfer, is told that they must practise constantly to improve their game
b) the price of petrol increases, making it more expensive to drive to work
c) the local council introduces free entry to the neighbourhood swimming pool.

The factors that affect a firm's *demand* for labour are similar to the factors that affect the firm's choice of capital stock, namely, a comparison of the benefits, in terms of the extra revenue received from employing additional labour, against the opportunity costs. The benefits to the firm from employing an additional unit of labour are measured by the **marginal revenue product of labour (*MRP_L*)**. This is the extra revenue the firm receives from selling the product produced by an additional hour of labour. Mathematically, the marginal revenue product of labour can be expressed as:

Equation 14.2

$$MRP_L = \overline{P} \times MP_L$$

where $\overline{P}$ is the product price received by the firm and MP_L is the marginal product of labour, the extra output that the firm can produce from employing an additional unit of labour.

As with capital, labour is also subject to diminishing returns—that is, as the quantity of labour increases, the marginal product of labour declines. This is because, with a fixed capital stock, the employment of extra labour yields more output, but the amount of additional output declines as the amount of labour increases. Again, we can appeal to the low-hanging-fruit principle—labour is first allocated to tasks in which workers will be highly productive—

or to the pragmatic problems of ever-increasing numbers of workers trying to use the same quantity of machinery. The diminishing marginal product of labour will cause the marginal revenue product also to be diminishing as the quantity of labour increases.

The cost that firms bear when employing labour is the nominal wage, denoted by W. Firms' demand for labour will be based on a comparison of the nominal wage with the marginal revenue product of labour. Should the marginal revenue product of labour be larger than the nominal wage, the firm will increase its demand for labour since the benefits of employing an additional unit of labour outweigh the costs. If, on the other hand, the marginal revenue product of labour falls short of the nominal wage, the firm will shed some of its labour since the cost savings from doing so outweigh the lost marginal revenue product. Therefore, firms will adjust their demand for labour until the nominal wage matches the marginal revenue product of labour. Mathematically, we write this as:

$$MRP_L = \overline{P} \times MP_L = W$$

Equation 14.3

Dividing the marginal revenue product and the nominal wage by the price level, we can rewrite Equation 14.3 as:

$$MP_L = \frac{W}{\overline{P}}$$

Equation 14.4

Equation 14.4 implies that firms will hire labour up to the point at which the marginal product equals the real wage as measured by the nominal wage divided by the price. This formulation is slightly different from the one we used in Chapter 5 where we related a firm's demand for labour to the relative price of the firm's output. Here, we are implicitly assuming that all firms receive the same price for their product—this is for simplicity.

Concept check 14.3 looks at reasons why the demand for labour might change (you might wish to review the material in Chapter 5, Section 5.2 before attempting these exercises).

CONCEPT CHECK 14.3

Explain what happens to a firm's demand for labour if:

a) education standards improve so that new workers are more skilled than was previously the case
b) firms receive lower prices for their products.

14.2.3 BRINGING LABOUR AND CAPITAL TOGETHER: THE

PRODUCTION FUNCTION

Having seen what economic factors determine the amount of labour and capital that are available to firms, we can now begin to analyse how firms combine these primary factors of production to produce output. To do this we are going to assume the following about the production process:

- Holding the amount of capital constant, if firms increase the amount of labour used, output increases but at a diminishing rate (diminishing marginal productivity of labour).
- Holding the amount of labour constant, if firms increase the amount of capital used, output increases but at a diminishing rate (diminishing marginal productivity of capital).
- We will assume that all secondary factors of production, such as managerial expertise and the skill base of the labour supply, remain constant. We will relax this assumption later in the chapter.

Recall from earlier in this chapter that the production function summarises firms' bringing together of primary and secondary factors in order to produce output. Through a series of examples we will outline the various forms in which the production function can be displayed.

EXAMPLE 14.1 – THE FIRM'S PRODUCTION FUNCTION USING A PRODUCTION TABLE

Figure 14.6 **shows an example of a production table. Each cell in the table shows the amount of output produced by a firm using different combinations of labour and capital. We could find out the values in a production table for an actual firm by observing how its output changes over time as it varies the amounts of labour and capital it uses. For example, with four units of labour and nine units of capital, this firm has been observed to produce 12 units of output. Adding an additional unit of capital, while holding labour constant, yields 12.65 units of output.**

		Labour										
		0	1	2	3	4	5	6	7	8	9	10
Capital	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1	0.00	2.00	2.83	3.46	4.00	4.47	4.90	5.29	5.66	6.00	6.32
	2	0.00	2.83	4.00	4.90	5.66	6.32	6.93	7.48	8.00	8.49	8.94
	3	0.00	3.46	4.90	6.00	6.93	7.75	8.49	9.17	9.80	10.39	10.95
	4	0.00	4.00	5.66	6.93	8.00	8.94	9.80	10.58	11.31	12.00	12.65
	5	0.00	4.47	6.32	7.75	8.94	10.00	10.95	11.83	12.65	13.42	14.14
	6	0.00	4.90	6.93	8.49	9.80	10.95	12.00	12.96	13.86	14.70	15.49
	7	0.00	5.29	7.48	9.17	10.58	11.83	12.96	14.00	14.97	15.87	16.73
	8	0.00	5.66	8.00	9.80	11.31	12.65	13.86	14.97	16.00	16.97	17.89
	9	0.00	6.00	8.49	10.39	12.00	13.42	14.70	15.87	16.97	18.00	18.97
	10	0.00	6.32	8.94	10.95	12.65	14.14	15.49	16.73	17.89	18.97	20.00

		Labour	
		3	MP_k
Capital	0	0.00	
	1	3.46	3.46
	2	4.90	1.43
	3	6.00	1.10
	4	6.93	0.93
	5	7.75	0.82
	6	8.49	0.74
	7	9.17	0.68
	8	9.80	0.63
	9	10.39	0.59
	10	10.95	0.56

Panel A

Capital	Labour										
	0	1	2	3	4	5	6	7	8	9	10
4	0.00	4.00	5.66	6.93	8.00	8.94	9.80	10.58	11.31	12.00	12.65
MP_L		4.00	1.66	1.27	1.07	0.94	0.86	0.78	0.73	0.69	0.65

Panel B

Figure 14.6 **A hypothetical production table**

Note: A production table is a way of displaying a firm’s production function. It shows the amount of output that can be produced from different combinations of capital and labour, holding the secondary factors of production constant.

There are three important things to note about production tables. First, consistent with our list of assumptions above, we assume when constructing a production table that the secondary factors of production are held constant. Therefore, any change in output must be the result of changes in either capital or labour or perhaps both. Second, should either factor of production be zero, we can see that no output will be produced regardless of the amount of the other factor of production that is available. This reflects the fact that the factors of production must be used in combination. Labour without capital cannot produce output. Likewise, capital without the labour to operate it also produces no output. Third, the data in the table are consistent with our assumptions regarding the diminishing marginal productivity of labour and capital. This can be seen in Figure 14.6, which focuses on two situations, one where labour is fixed at three units and we increase the amount of capital, and another where we fix the amount of capital at four units and vary the amount of labour. When we fix the quantity of labour and vary the amount of capital one unit at a time, the change in output is a measure of the marginal product of capital. The column of panel A headed MP_k shows the change in output as capital is varied by one unit. As you can see, the increment in output declines the higher is the capital stock—this is the diminishing marginal product of capital. Panel B shows the marginal product of labour as capital is held fixed at four units and the amount of labour can vary. Once again, you can see from the data that labour also features diminishing marginal productivity.

EXAMPLE 14.2 – THE FIRM’S PRODUCTION FUNCTION USING A SURFACE PLOT

It is possible to graph the data from a production table using a three-dimensional surface plot. To construct a surface plot, the data for labour and capital are arranged on the *x*-axis and *y*-axis and the output that results from various combinations of labour and capital is plotted on the vertical *z*-axis. Figure 14.7 **shows how this can be done for the data from** Figure 14.6 **.**

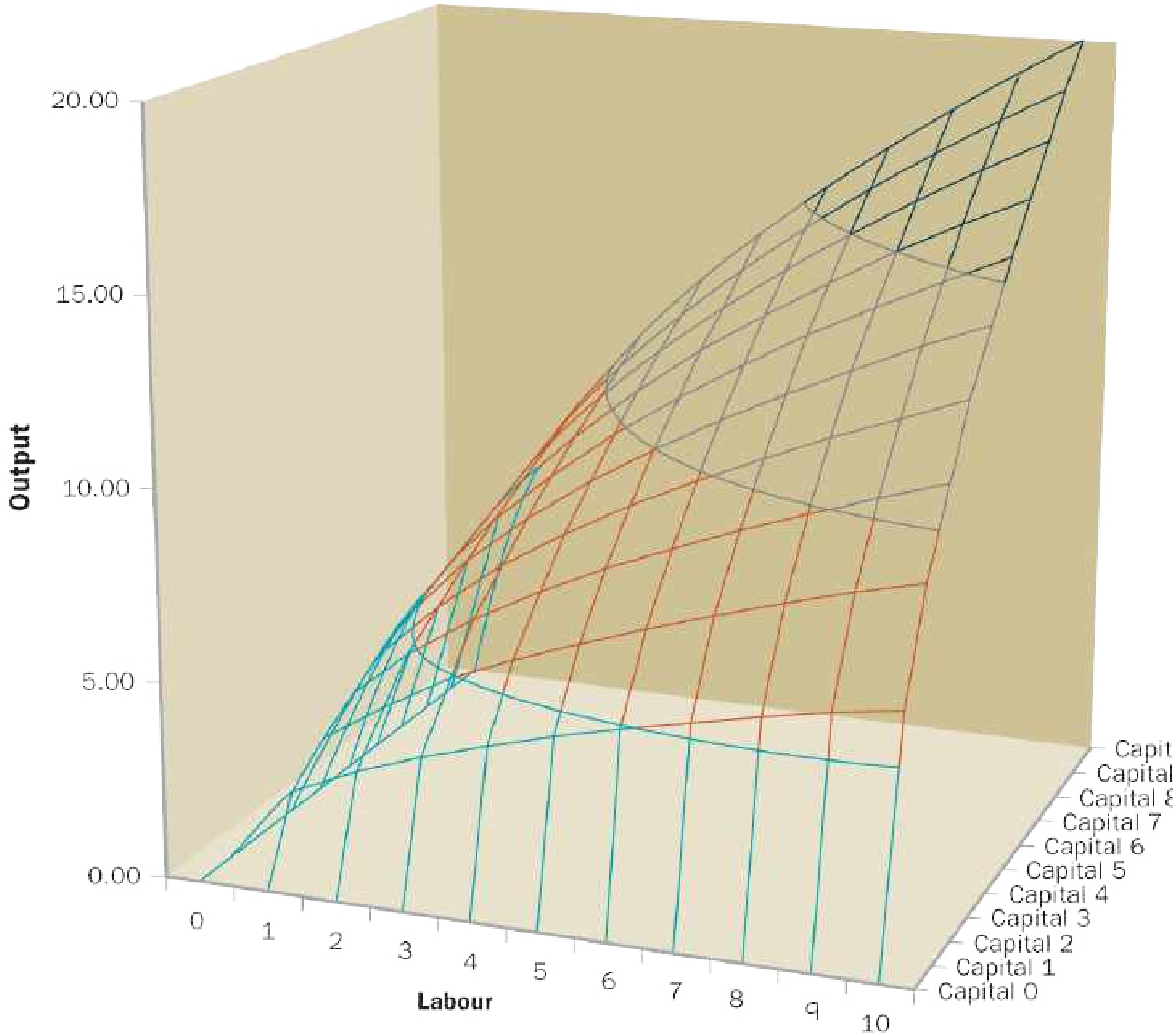

Figure 14.7 **The production function as a three-dimensional surface plot**

Note: A three-dimensional surface plot allows a graphical representation of the data in a production table.

The use of a three-dimensional surface plot reminds us that it is *combinations* of labour and capital that yield output.

Remember also that this graph has been drawn using data that assume fixed secondary factors of production. Suppose a secondary factor changed, for example the government might improve the transportation network. We would expect in this case that any given combination of capital and labour would then yield more output. This would raise the height of the surface plot (e.g. 10 units of capital and 10 units of labour might now give 25 units of output instead of 20 units of output).

EXAMPLE 14.3 – THE FIRM’S SINGLE-VARIABLE FACTOR PRODUCTION FUNCTION

Economists are often interested in what happens to production if only one factor of production changes, usually capital or labour, while holding everything else constant. Suppose, for example, we are going to examine the effect on production of varying only the capital stock. In terms of the three-dimensional surface plot shown in Figure 14.7**, this can be done by taking a cross-section through the diagram at a level of labour (such as three units of labour) and then plotting a two-dimensional graph showing how output varies as the size of the capital stock varies. Organising the data as**

in Panel A of Figure 14.6 and then drawing a graph having output on the vertical axis and capital on the horizontal axis can achieve this. Such a two-dimensional production function, based on the data in Panel A of Figure 14.6, is drawn in Figure 14.8.

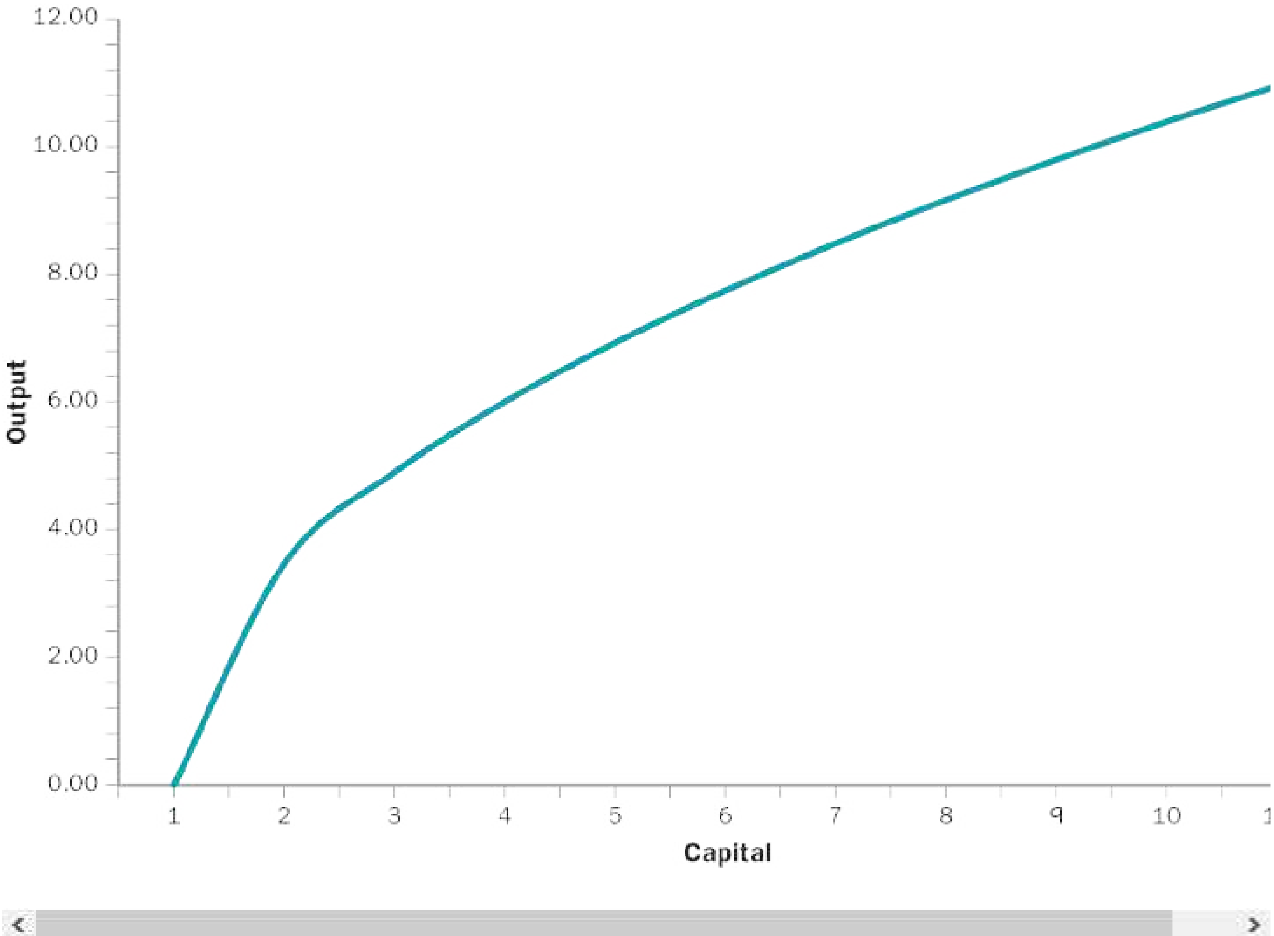

Figure 14.8 **A two-dimensional production function**

Note: A two-dimensional production function shows how output varies, holding all but one of the primary factors of production constant. In this case capital is the factor that is allowed to vary.

Two-dimensional production functions, such as the one plotted in Figure 14.8, typically have a curved shape that reflects the diminishing marginal productivity of the factor that is being allowed to vary (in the case of Figure 14.8 this is capital)—note that the slope of the production function becomes smaller as we move along the horizontal axis. Remembering that the slope reflects the amount by which the *y*-axis variable changes for a small movement along the *x*-axis, then it is clear why diminishing marginal productivity would imply that the production function in Figure 14.8 will have a steadily declining slope as the size of the capital grows larger.

EXAMPLE 14.4 – MATHEMATICAL REPRESENTATION OF THE PRODUCTION FUNCTION

Our final example of a production function is a general mathematical formulation of the relationship between primary and secondary factors of production and the amount of output that a firm can produce. In many ways the mathematical specification of the production function is the most satisfactory way of displaying the relationship between factors of production and output,

since all factors—primary and secondary—can be allowed to change. Only the mathematical formulation of the production function gives this degree of generality.

Using mathematical notation, the production function can be written as:

$$Y_t = A_t \times f(K_t, L_t)$$

Equation 14.5

where Y_t is the amount of real output produced in period t, A_t is an index of secondary factors of production available to the firm in period t, $f(\ )$ means 'a function of', K_t is the capital stock in period t and L_t is the amount of labour used by the firm in period t. Equation 14.5 says that the amount of output produced by the firm is a function of the primary factors of production, capital and labour, and depends also on the various secondary factors of production. Although Equation 14.5 looks deceptively simple, it gives the most complete picture of the production process of any of the ways of displaying the production function that we have considered.

One important drawback of Equation 14.5, however, is that we do not know exactly what type of function is best suited to capturing the relationship between factors of production and output. In Section 14.3 we turn to a function, the *Cobb–Douglas production function*, which has proven to be extremely successful in capturing a number of features of the way production is actually organised. Economists often use the Cobb–Douglas production function in their analyses of economic growth. The next section demonstrates why.

▻▻ RECAP

The production function is a simplified representation of the way in which firms combine the primary factors of production, labour and capital, to produce output. The amount of output that can be produced from given amounts of labour and capital depends on secondary factors of production.

The optimal capital stock is found when the opportunity cost of capital, the real interest rate, is matched with the benefits from adding to the capital stock, the marginal product of capital.

The amount of labour used by firms is determined by equilibrium in the labour market. Labour supply involves a comparison of the real wage on offer with the subjective value of the time spent at work. Labour demand depends on a comparison of the cost to the firm of additional labour, the real wage, and the benefit to the firm, the marginal product of labour.

There are four different ways in which a production function can be displayed:

1. a production table
2. a three-dimensional surface plot
3. a one-variable production function
4. mathematically.

14.3 THE COBB–DOUGLAS PRODUCTION FUNCTION

LO 14.4

The **Cobb–Douglas production function** is perhaps the most widely used empirical relationship in economics. It is named after the scholars who first developed the idea, Paul Douglas and Charles Cobb. (A fascinating account of the formulation of the Cobb–Douglas production function can be found in Douglas 1976.) Douglas, a US economist, had collected data on US manufacturing output, and calculated indices representing the amount of labour and capital available to US manufacturers. He did this work in 1927. But he was unsure how to best analyse these data. Charles Cobb, a friend of Douglas's and, helpfully, a skilled mathematician, looked at the data Douglas had collected and suggested that the following functional form would be a good representation of the data:

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha}$$

Equation 14.6

The Greek letter α (alpha) is a number that is restricted to a value between 0 and 1. The other variables in the function have the interpretation given in Example 14.4.

Early empirical work, especially a series of papers authored by Paul Douglas himself, found that Equation 14.6 gave a very accurate representation of actual data for American manufacturing. In later work Douglas also used state-level data from Australia for the 1920s and 1930s and found that, once again, Equation 14.6 performed well. To this day the Cobb–Douglas production function does a good job at modelling a variety of production outcomes and is widely used by economists.

Why does the Cobb–Douglas production function do so well? What is it about that particular functional form that means it can represent quite accurately the way production takes place in the real world? One important reason for its success is that the Cobb–Douglas production function embeds a number of theoretical concepts that economists believe are reasonable ideas in the context of firms' production decisions. Take the diminishing marginal productivity of the primary factors of production. Although it might not be immediately apparent from looking at Equation 14.6, the Cobb–Douglas production function does display diminishing returns. To show this formally requires the use of some elementary calculus.

The marginal product of capital, that is, the change in output forthcoming as a result of a small change in capital, can be found by differentiating the Cobb–Douglas production function with respect to $K: MP_K = \frac{\partial Y}{\partial K} = \alpha K_t^{\alpha-1} L_t^{1-\alpha}$. This can be simplified as $MP_K = \frac{\partial Y}{\partial K} = \frac{\alpha K_t^{\alpha} L_t^{1-\alpha}}{K_t}$. Note that the numerator of this expression is the Cobb–Douglas production function itself, $Y_t = K_t^{\alpha} L_t^{1-\alpha}$, multiplied by the number represented by α. Therefore, we can write the marginal product of capital as $MP_K = \frac{\partial Y}{\partial K} = \alpha \frac{Y_t}{K_t}$. Similarly, for the marginal product of labour, we can derive the following:

$$MP_L = \frac{\partial Y_t}{\partial K_t} = (1-\alpha)A_t K_t^{\alpha} L_t^{1-\alpha-1} = \frac{(1-\alpha)A_t K_t^{\alpha} L_t^{1-\alpha}}{L_t} = (1-\alpha)\,\frac{Y_t}{L_t}$$

What this calculus shows is that the marginal products of capital and labour derived from the Cobb–Douglas production function have very simple specifications. These are reproduced below:

$$\begin{gathered}\text{Marginal product of capital}\\ MP_K = \alpha\,\frac{Y_t}{K_t}\\ \text{Marginal product of labour}\\ MP_L = (1-\alpha)\,\frac{Y_t}{L_t}\end{gathered}$$

(You can check that the Cobb–Douglas production function reflects the diminishing marginal productivity of the primary factors by taking the second derivative of the production function with respect to capital and with respect to labour and checking that these second derivatives are negative—the negativity of the respective second derivatives indicates that the marginal products of both capital and labour are diminishing, as argued above.)

CONCEPT CHECK 14.4

Using the following Cobb–Douglas production function, $Y_t = 5K_t^{0.2}L_t^{0.8}$, calculate:

a) output

b) the marginal product of capital if the labour supply is fixed at a value of 1 and the capital stock increases from 1 to 2 to 3 to 4 to 5 units.

As well as being informative about the way productive inputs are turned into output, the Cobb–Douglas production function also has implications for the way in which income in the economy is distributed between the owners of capital and the owners of labour. Recall from above that firms' willingness to pay for labour is related to labour's marginal product. Should the marginal product of labour increase, for example, firms will be willing to pay a higher real wage for each possible quantity of labour. But their willingness to do so is tempered by the fact that adding to the amount of labour reduces labour's marginal productivity. Given the Cobb–Douglas production function, we know that the marginal product of labour is given by the expression $MP_L = (1-\alpha)\frac{Y_t}{L_t}$. No firm would be willing to pay more for an extra unit of labour than this amount for to do so would drive the marginal benefit below the marginal cost; and no firm would risk paying less than this amount, for fear that they would be outbid by a rival firm willing to pay an amount up to the marginal product of labour. Hence, the marginal product of labour will correspond exactly to the wage paid to a single supplier of labour. To calculate the *total value* of payments to labour in the economy we need to multiply this marginal product by L (i.e. Total wage payments = Wage × Total supply of labour). Multiplying the marginal product of labour by the total supply of labour gives the following expression:

$$MP_L \times L_t = (1-\alpha)\frac{Y_t}{L_t} \times L_t = (1-\alpha)Y_t \qquad \textbf{Equation 14.7}$$

Recall that α is a number lying somewhere between 0 and 1. Let us suppose it is 0.25. Then what Equation 14.7 tells us is that the total payments made to labour in this economy are equivalent to 75 per cent of the economy's total income. This leaves 25 per cent of the nation's income to be paid to the owners of capital equipment. In fact, this break-up of GDP is roughly what the owners of capital and labour in Australia are paid (see Dornbusch *et al*. 2002).

The Cobb–Douglas production function also embodies a particular assumption regarding what happens to output should there be an equal proportionate increase in both primary factors of production. This assumption is known as **constant returns to scale**. Formally, a production function is said to exhibit constant returns to scale if scaling up each of the primary factors of production by some factor λ results in λ times the output. For example, should λ = 2, a doubling of both labour and capital would result in twice as much output. For many situations this seems like a perfectly reasonable assumption. After all, if an identical factory was built and placed next to an existing factory, we would expect the combined total of the two factories' outputs to be twice what the first factory produced. To show that constant returns to scale is a characteristic of the Cobb–Douglas production function, simply multiply both primary factors of production by the scale factor λ:

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$$A_t(\lambda K_t)^{\alpha}(\lambda L_t)^{1-\alpha} = \lambda^{\alpha+1-\alpha}A_tK_t^{\alpha}L_t^{1-\alpha} = \lambda A_tK_t^{\alpha}L_t^{1-\alpha} = \lambda Y_t$$

Therefore, scaling up both primary factors of production by λ results in λ times the output. Constant returns to scale seems reasonable property to have for a production function.

CONCEPT CHECK 14.5

Using the same production function as in Exercise 14.4, show what happens to output when labour and capital each increase by a factor of three. Does this production function exhibit constant returns to scale?

▻▻ RECAP

The Cobb–Douglas production function can be written mathematically as $Y_t = A_t K_t^{\alpha} L_t^{1-\alpha}$, where the coefficient α can take any value between 0 and 1. The Cobb–Douglas production function is characterised by diminishing marginal productivity of capital and labour and also by constant returns to scale.

14.4 GROWTH ACCOUNTING

LO 14.5

We are now able to use the concept of the production function to shed some light on the dynamics of economic growth. Specifically, for the remainder of this chapter we are interested in the following question: To what extent is an economy's economic growth the result of growth in the primary or the secondary factors of production?

This is an important question for macroeconomists to investigate. We know from Chapter 13 that a country's growth depends on average labour productivity and on the proportion of the population that is working. These, however, are very broad concepts and may not be all that useful when trying to design policies to encourage economic growth in poor countries. This is particularly so for the concept of average labour productivity. Since it is so fundamentally important for a country's economic growth, developing countries are very interested in the question of how to improve their average labour productivity. Looking at the experiences of countries that have experienced rapid economic growth might provide clues for countries that are seeking to achieve similar growth outcomes. We know, for example, that in theory one way of raising average labour productivity is to increase the capital stock. Is this how countries that have experienced economic growth brought about the necessary boost to their average labour productivity? Or has growth in the secondary factors of production been more important, namely, using the existing primary factors of production more efficiently (getting more output, in other words, from the existing primary inputs)? The Cobb–Douglas production function provides a ready framework for answering these questions. This involves using a concept known as **growth accounting**, a method of dividing a country's historical growth experience between growth in the primary and growth in secondary factors of production.

14.4.1 ECONOMIC GROWTH AND THE FACTORS OF PRODUCTION

We begin with a standard Cobb–Douglas production function:

Equation 14.8

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha}$$

Let us focus for the moment on capital. Suppose there was a 1 per cent increase in the size of the capital stock between this period and the previous period. The percentage increase in a variable is simply the value by which the variable has changed divided by the initial value of the variable. So, in the case of capital, a 1 per cent increase in the size of the capital stock can be represented by the following mathematical expression:

$$\frac{K_t - K_{t-1}}{K_{t-1}} = 0.01$$ **Equation 14.9**

Equation 14.9 states that the difference between this and the previous period's capital stock relative to the size of the capital stock in the previous period is equal to 0.01 (multiplying this decimal by 100 gives the 1% increase). There is a convention in economics that the change in a variable can be denoted by the Greek letter Δ (capital 'delta'), so that $(K_t - K_{t-1}) = \Delta K_t$. We can therefore write Equation 14.9 as:

$$\frac{\Delta K_t}{K_{t-1}} = 0.01$$ **Equation 14.10**

We can now ask the following question: given a 1 per cent increase in the capital stock, by how much will output increase? To work this out we have to use a simple mathematical rule: suppose we have two variables, X and Z, that are related as follows: $Z = X^{\alpha}$. Then the percentage change in Z is α times the percentage change in X. Using this mathematical rule and the functional form of the Cobb–Douglas production function, and assuming, for the moment, that capital is the only factor of production that is changing, it must be the case that:

$$\frac{\Delta Y_t}{Y_{t-1}} = \alpha \frac{\Delta K_t}{K_{t-1}}$$

Equation 14.11

The left-hand side of Equation 14.11 is the economy's rate of economic growth (recall from Chapter 2 that the economy's growth rate is the percentage change in real GDP). Equation 14.11 can therefore be used to determine what happens to the economy's growth rate should there be a particular percentage change in the size of the capital stock. For example, suppose that α = 0.25 (remember that in the Cobb–Douglas production function α represents the share of total income in the economy that is paid to the owners of capital). Using Equation 14.11, you can see that in this case a 1 per cent increase in the capital stock would cause output to increase by 0.25 of 1 per cent.

Exactly the same type of thinking goes into calculating what happens to the economy's growth rate should it be labour and not the capital stock that is changing. To work out the implications for growth from a change in the economy's labour supply we use the following equation (note that at this stage everything other than the labour supply that could affect economic growth is held constant):

Equation 14.12

$$\frac{\Delta Y_t}{Y_{t-1}} = (1-\alpha)\frac{\Delta L_t}{L_{t-1}}$$

Suppose that the labour supply increases by 1 per cent and, as before, α is equal to 0.25 (which means that labour, in aggregate, is paid an amount equivalent to 75% of the economy's total income). Then Equation 14.12 tells us that the economy will grow by 0.75 per cent.

Finally, what is the effect of a change in the secondary factors of production, the term *A* in the Cobb–Douglas production function? Before covering this we take this opportunity to introduce a slightly different terminology. Secondary factors of production are factors that impact on the ability of firms to transform the primary factors of production, capital and labour, into output. Secondary factors of production, in other words, reflect firms' *productivity*. Because of this, these secondary factors are often known collectively as **total factor productivity (TFP)**. Over time, total factor productivity in the economy can change, and in doing so, contribute to the economy's rate of growth. We can calculate the contribution that *TFP* makes to economic growth using the following equation:

$$\frac{\Delta Y_t}{Y_{t-1}} = \frac{\Delta A_t}{A_{t-1}}$$ **Equation 14.13**

Equation 14.13 implies that there is a 'one-for-one' relationship between the growth in TFP and the economy's growth rate; if, for example, TFP increases by 1 per cent we would expect the rate of economic growth to be also 1 per cent, holding all else constant.

14.4.2 THE SOURCES OF ECONOMIC GROWTH

Equations 14.11, 14.12 and 14.13 describe all the possible reasons the economy might grow; either the capital stock has grown (Equation 14.11), or the labour supply has grown (Equation 14.12), or there has been an improvement in the economy's ability to use capital and labour—an increase in total factor productivity (Equation 14.13). The reality, of course, is that all three factors simultaneously might be responsible for economic growth, and the interesting question then is which factor has been most important?

Growth accounting provides a framework for answering this question. Let us put together what we have learnt from Equations 14.11 to 14.13:

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$$\frac{\Delta Y_t}{Y_{t-1}} = \alpha \frac{\Delta K_t}{K_{t-1}} + (1-\alpha)\frac{\Delta L_t}{L_{t-1}} + \frac{\Delta A_t}{A_{t-1}}$$

Equation 14.14

Equation 14.14 divides a country's rate of economic growth between three possible sources of growth—capital, labour and TFP. If, in the context of Equation 14.14, we knew all the variables on the right-hand side—the percentage changes in capital, labour and TFP—and if we also knew the value of the parameter α, then we could easily calculate: (1) the economy's rate of growth; and (2) the relative contributions of capital, labour and TFP to that rate of growth. For example, if capital were growing at 4 per cent per year, labour at 1 per cent per year and TFP at 1 per cent per year, and if α was 0.25, the economy's growth rate would be 2.75 per cent per year. Of this growth rate, growth in the capital stock and in TFP would have each contributed 1 per cent, while growth in the labour supply would have contributed 0.75 per cent.

Real-world applications of Equation 14.14, however, are not as straightforward as this. This is because we do not know all the variables on the right-hand side of the equation, nor do we necessarily know the value of the parameter α. In terms of the variables, while information on the labour supply is readily available from agencies such as the Australian Bureau of Statistics, information on the capital stock is much harder to find. This is because the capital stock cannot be valued simply by using the prices that firms originally paid for their plant and equipment. This problem arises because capital depreciates over time; that is, because capital equipment wears out with use, its worth to firms becomes smaller over time. (Think why you would probably pay less for a used car than for a new car.) As a result, the historical purchase price overestimates the current value of capital equipment. To arrive at an accurate current valuation of the capital stock we would need to know the age of each piece of capital equipment and the rate at which its value depreciates over time. This, needless to say, is a daunting task for statisticians. Nevertheless, the statistics bureaus in most countries do try to provide estimates of the current value of the capital stock, although, relative to the labour force statistics, these data are probably not as accurate.

Suppose, therefore, that we know the percentage changes in K_t and in L_t. This still leaves *TFP* and the parameter α. Let us deal with α first. In Section 14.3, where we introduced the Cobb–Douglas production function, we showed that α is equal to the proportion of total income paid to the owners of capital. Fortunately, the national accounts usually gives this information (or at the very least the proportion of income paid to labour from which α can be readily calculated). For Australia, α, on average, seems to be around 0.25.

Total factor productivity, however, is a potential problem. Because this encompasses so many possible factors—after all, anything that affects productivity other than labour or capital belongs in TFP—there are no official data on total factor productivity. Perhaps, surprisingly, this is not such a problem after all. Look again at Equation 14.14. From that equation, the percentage change in TFP can be calculated if we know (1) the economy's rate of growth, (2) the percentage change in the labour supply, (3) the percentage change in the stock of capital, and (4) the value of the parameter α. These are all things that we know. Therefore, rearranging Equation 14.14 enables us to calculate the implied change in *TFP* using the following equation:

Equation 14.15

$$\frac{\Delta A_t}{A_{t-1}} = \frac{\Delta Y_t}{Y_{t-1}} - \alpha \frac{\Delta K_t}{K_{t-1}} - (1-\alpha) \frac{\Delta L_t}{L_{t-1}}$$

The left-hand side of Equation 14.15, the percentage change in TFP, is a residual term. This means that it reflects that part of the economy's overall growth that cannot be explained by growth in either the capital stock or the labour supply. In honour of one of the pioneers of growth theory, the American economist Robert Solow, the left-hand side of Equation 14.15 is often referred to as the Solow residual. The Solow residual will change if any of the secondary factors of production changes. For example, the Solow residual would change if there was a change in the level of technological achievement. A partial list of other factors that could change the Solow residual might include managerial expertise, education standards, the standard of workers' healthcare and so on. The list in all probability is endless.

THINKING AS AN ECONOMIST 14.1

What have been the sources of Australia's

economic growth?

Since 1980 Australia has enjoyed an average rate of real GDP growth of around 3.2 per cent a year. What factors have been responsible for this growth? Growth accounting provides a means of answering this question. We need data on real GDP growth, growth in the total labour supply and the capital stock and an estimate of the share of total income paid to labour and capital. Note that the measure of labour supply we use is total hours worked. The data are for the period 1980 to 2013. As noted above, a figure of 0.25 for the share of income paid to capital seems reasonable for Australia.

Figure 14.9 shows the results of the growth accounting exercise for Australia and highlights the importance of total factor productivity and labour for Australia’s growth. While the contribution of capital has been far from insignificant, it has been the greater efficiency with which the primary factors of production have been used and the growth in labour that has made the biggest contribution to Australia’s recent economic growth.

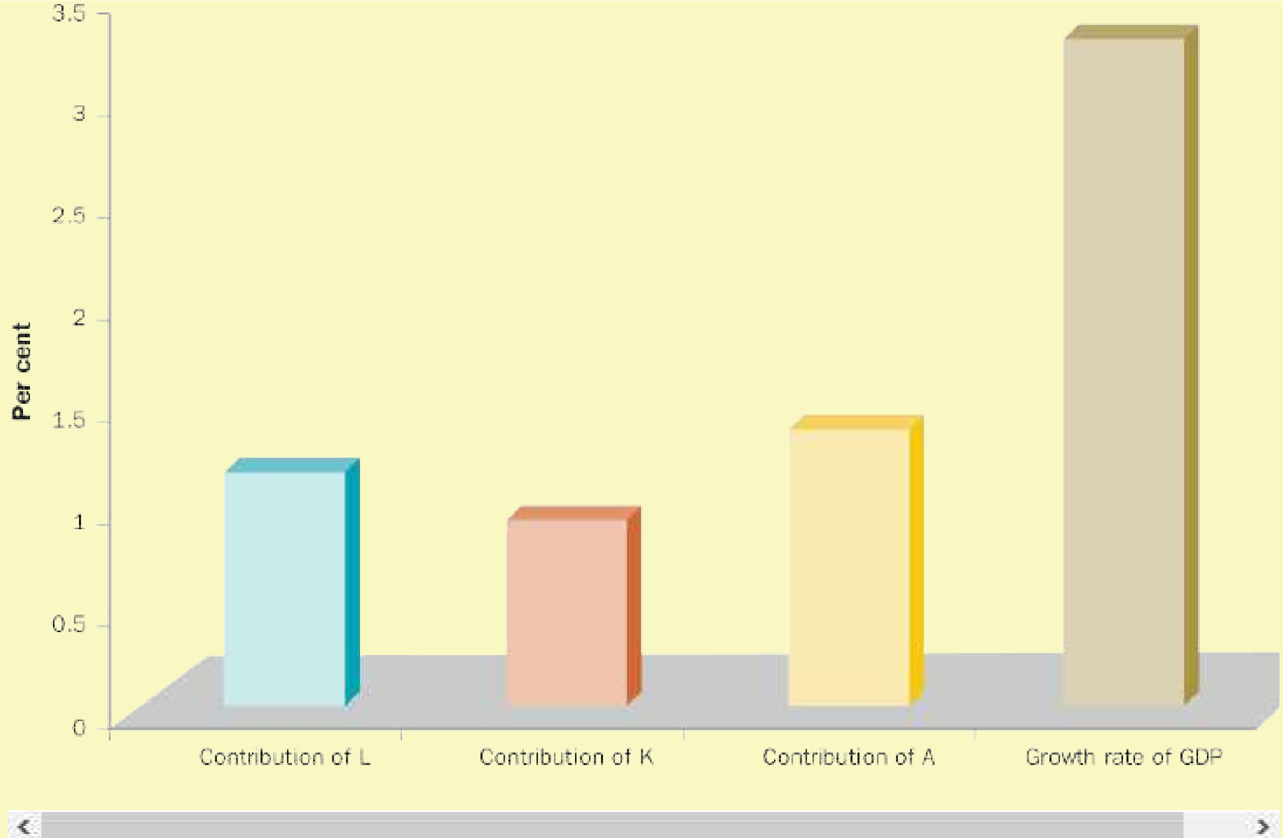

Figure 14.9 **Growth accounting, Australia, 1980–2013**

Note: For Australia, total factor productivity and labour have been the most significant factors driving economic growth.

Source: Authors' calculations. Labour is measured by total hours worked in a year calculated by multiplying average annual hours worked per worker (University of Groningen and University of California, Davis n.d. 'Average annual hours worked by persons engaged for Australia', retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/AVHWPEAUA065NRUG) by total employed workers (OECD n.d., 'Active population: Aged 15–64: All persons for Australia', retrieved from FRED, https://fred.stlouisfed.org/series/LFAC64TTAUM647S); capital stock is from University of Groningen and University of California, Davis n.d., 'Capital stock at constant national prices for Australia', retrieved from FRED, https://fred.stlouisfed.org/series/RKNANPAUA666NRUG; GDP is from OECD n.d., 'Gross domestic product by expenditure in constant prices: Total gross domestic product for Australia', retrieved from FRED, https://fred.stlouisfed.org/series/NAEXKP01AUA189S.

THINKING AS AN ECONOMIST 14.2

What factors have contributed to long-run growth in other countries?

What factors have driven long-run growth in Japan, the United Kingdom, Germany and the United States? How does this compare with economic growth in south-east Asian economies? Table 14.1 shows the results of a growth accounting exercise for Japan, the United Kingdom, Germany and the United States. The data have been divided into three distinct historical periods, the first covering the years from 1913 to 1950, the second covering the period from 1950 to 1973 and the third covering the period from 1973 to 1992.

TABLE 14.1 **Growth accounting, Japan, the United Kingdom, West Germany and the United States**

	1913–50	1950–73	1973–92
Japan			

Capital	1.2	3.1	2.0
Labour	0.3	2.5	0.8
Total factor productivity	0.7	3.6	1.0
Output growth	2.2	9.2	3.8
United Kingdom			
Capital	0.8	1.6	0.9
Labour	0.1	0.2	0.0
Total factor productivity	0.4	1.2	0.7
Output growth	1.3	3.0	1.6
United States			
Capital	0.9	1.0	0.9
Labour	0.6	1.3	1.3
Total factor productivity	1.3	1.6	0.2
Output growth	2.8	3.9	2.4
West Germany			
Capital	0.6	2.2	0.9

Labour	0.4	0.5	−0.1
Total factor productivity	0.3	3.3	1.5
Output growth	1.3	6.0	2.3

Note: The factors responsible for growth can differ across countries and across historical periods.

Source: Adapted from Crafts N 2000, 'Globalization and growth in the twentieth century', IMF Working Paper 00/44, March, Table 1.8, p. 22, https://www.imf.org/external/pubs/ft/wp/2000/wp0044.pdf.

Table 14.1 highlights an important fact about the dynamics of economic growth, namely, that the factors driving growth need not be the same across countries and, indeed, can even vary across different time periods in the same country. For example, from Table 14.1, capital accumulation in Japan appears to have been a relatively more important factor driving economic growth than in the United States, particularly in the post-World War II era. Growth in the labour supply has also been relatively more important in both Japan and the United States than in the United Kingdom. Interestingly, labour barely made any contribution to economic growth in the United Kingdom over the twentieth century. Finally, note the diminished importance of total factor productivity in the period 1973–92, especially for the United States. This is consistent with what became known as the productivity slowdown, a characteristic of the US economy that caused a great deal of concern at the time.

In Table 14.2, we show a growth accounting exercise for some of the south-east Asian economies (we have also included the Philippines for comparison).

TABLE 14.2 **Growth accounting, some of the south-east Asian economies and the Philippines, 1960–94**

	1960–94
Hong Kong	
Capital	2.8
Labour	2.1
Total factor productivity	2.4
Output growth	7.3
Korea	
Capital	4.3
Labour	2.5

Total factor productivity	1.5
Output growth	8.3
Philippines	
Capital	2.1
Labour	2.1
Total factor productivity	−0.4
Output growth	3.8
Singapore	
Capital	4.4
Labour	2.2
Total factor productivity	1.5
Output growth	8.1

Note: Capital accumulation has been the source of economic success in Hong Kong, Korea and Singapore.

Source: Adapted from Crafts N 2000, 'Globalization and growth in the twentieth century', IMF Working Paper 00/44, March, Table 1.8, p. 22, https://www.imf.org/external/pubs/ft/wp/2000/wp0044.pdf.

If you compare Tables 14.1 and 14.2, you can Page 374

see that these economies (Hong Kong, Republic of Korea and Singapore) have achieved their phenomenal economic growth rates largely on the back of their primary factors of production. Relative to the United States and Australia, these countries' economic growth rates have not been driven by improved total factor productivity. In Chapter 15 you will see that there is a very plausible explanation for why countries in the beginning phases of their economic growth rely on capital formation while countries that have already developed are more likely to grow because of improved TFP.

Finally, note the experience of the Philippines, which is an interesting contrast to the success of Hong Kong and Singapore. You can see that the Philippines' growth rate is far lower than for other countries in the region. Growth accounting tells us that one reason for this has been the negative contribution from total factor productivity. In the Philippines poor economic management under the Marcos regime would seem to have actively hindered growth during this period.

▹▹ RECAP

Growth accounting is designed to identify the contributions made by growth in labour, capital and total factor productivity to a country's rate of economic growth.

Growth accounting reveals that total factor productivity and labour growth have been the most important factors underlying Australia's economic growth. For the south-east Asian economies, capital accumulation has been more important.

SUMMARY

- The production function is a simplified representation of the process by which firms combine the primary factors of production, capital and labour to produce output. The amount of output that can be produced from given quantities of capital and labour depends on secondary factors of production. These include factors such as the level of technological advancement in the economy, firms' managerial expertise and the skills possessed by the workforce.
- The amount of capital that will be used by firms depends on a comparison of the benefits and costs associated with adding to the capital stock. The benefit is the extra revenue that the firm is able to obtain from selling the output produced by the additional capital equipment. The costs are the purchase price and the interest rate. The latter is a cost of capital since either (1) firms borrow the money needed to acquire the capital equipment or (2) the alternative to buying the capital equipment is to use those funds to buy an interest-bearing asset such as a government bond.
- The amount of labour that is available for production is determined by equilibrium in the labour market. How much labour is supplied is based on a comparison of the benefits, as captured by the real wage on offer, and the costs, the subjective value placed on the time devoted to work. The costs and benefits to firms of labour demand are, respectively, the wage that must be paid to attract labour and

the additional revenue obtained when the output produced by the labour is sold.

- Production functions can be displayed in a variety of ways. A production table shows, for a given level of secondary factors of productions, the different levels of output associated with different levels of labour and capital. A surface plot, which is a three-dimensional graph showing how output varies as labour and capital varies, holding secondary factors of production constant, provides similar information. A single-variable production function holds both secondary factors of production and one primary factor constant and looks at how output varies in response to changes in the other primary factor of production. The most general way of displaying a production function is mathematically; this allows output to change in response to changes in both primary factors of production and all secondary factors.
- The Cobb–Douglas production function is a widely used example of a production function. It has some important and very useful properties; it displays diminishing marginal productivity for both labour and capital and it features constant returns to scale.

- Growth accounting is the name given to the empirical analysis of the relative contributions made by capital, labour and total factor productivity to a country's rate of economic growth. The growth accounting equation is derived from the Cobb–Douglas production function and can be applied to real-world data to derive estimates of the contributions made to growth by capital, labour and total factor productivity.

KEY TERMS

Cobb–Douglas production function 366

constant returns to scale 367

diminishing marginal productivity 359

growth accounting 368

marginal product of capital (MP_k) 359

marginal revenue product of capital (MRP_k) 359

marginal revenue product of labour (MRP_l) 361

optimal capital stock 360

production function 355

total factor productivity (TFP) 369

REVIEW QUESTIONS

1. What is a production function? LO 14.1 **EASY**
2. How are primary and secondary factors of production distinguished? LO 14.1 **EASY**
3. What factors influence a firm's demand for capital equipment? LO 14.2 **EASY**
4. What factors influence a firm's demand for labour? LO 14.2 **EASY**
5. Distinguish between the: LO 14.1 **EASY**
   - **a)** production table
   - **b)** surface plot
   - **c)** single-variable
   - **d)** mathematical representations of the production function.
6. What is the Cobb–Douglas production function? LO 14.4 **EASY**

   What predictions does the Cobb–Douglas production function make about:
   - **a)** the marginal product of capital
   - **b)** the marginal product of labour
   - **c)** returns to scale?
7. Using a Cobb–Douglas production function, derive the growth accounting equation. What is this equation used for? LO 14.5 **MEDIUM**

PROBLEMS

1. What would happen to the marginal product of capital in the wake of a natural disaster that wipes out three-quarters of a country's capital stock? What would happen to the marginal product of capital if a plague wiped out three-quarters of the workforce? LO 14.2 **MEDIUM**
2. Consider the production function $Y = AK^{0.2}L^{0.8}$. What would be the effect on the marginal products of capital and labour of a 2 per cent increase in total factor productivity? Does this mean that labour and capital do not have diminishing marginal productivity? Explain. LO 14.4 **HARD**
3. Construct a production table as in Figure 14.7 for the production function $Y = AK^{0.4}L^{0.6}$ (this is best done in a spreadsheet program). Confirm the existence of the diminishing marginal productivity of capital and labour and constant returns to scale. LO 14.3 **MEDIUM**
4. Repeat Problem 2, this time for the production function $Y =$ $AK^{0.4}L^{0.7}$. Do you still observe diminishing marginal productivity of labour and capital and constant returns to scale? LO 14.4 **MEDIUM**
5. How would you respond to the argument that: 'Since labour is characterised by diminishing marginal productivity and since real wages are related to the marginal productivity of labour, people are always worse off if they work more'? LO 14.2 **HARD**

6. Suppose an economy's production function is $Y = AK^{\alpha}L^{1-\alpha}$. If the annual rate of economic growth is 3.5 per cent and labour and capital are both growing by 2 per cent annually, what contribution to growth is made by total factor productivity? You can assume that labour receives 75 per cent of the total income generated in this economy. LO 14.5 **MEDIUM**
7. The Republic of Ostralya has experienced a 5 per cent increase in output this year, a 2 per cent rise in its capital stock and a 3 per cent increase in total hours worked. Assuming a Cobb–Douglas production function where capital income accounts for 30 per cent of GDP, calculate how much output growth is explained by capital accumulation, labour and total factor productivity. LO 14.5 **MEDIUM**
8. How would you respond to the following argument: 'Economic theory makes no sense. For example, poor countries have very little capital. But capital has diminishing marginal productivity. So in poor countries the marginal productivity of capital must be high. But then if capital is so productive in those countries, why is everyone there not rich?' LO 14.5 **HARD**
9. According to a growth accounting exercise, labour in a country has contributed 1.5 percentage points to an economic growth rate of 4 per cent—in other words 37.5 per cent (= 1.5/4) of the increase in output can be attributed to labour. Does this mean that labour will receive 37.5 per cent of the increased output as payment? Explain. LO 14.5 **HARD**

REFERENCES

Crafts N 2000, ‘Globalization and growth in the twentieth century’, IMF Working Paper 00/44, March, Table 1.8, p. 22, https://www.imf.org/external/pubs/ft/wp/2000/wp0044.pdf.

Darwin C 1876, *The Autobiography of Charles Darwin*, quoted in ‘Thomas Malthus (1766–1834)’, www.ucmp.berkeley.edu/history/malthus.html.

DeLong JB 2001, *Macroeconomics*, Irwin McGraw-Hill, New York, p. 120.

Dornbusch R, Bodman P, Crosby M, Fischer S and Startz R 2002, *Macroeconomics*, McGraw-Hill, Sydney, p. 52.

Douglas PH 1976, ‘The Cobb–Douglas production function once again: Its history, its testing, and some new empirical values’, *The Journal of Political Economy*, vol. 84, no. 5, October, pp. 903–16.

Easterly W 2001, *The Elusive Quest for Growth*: *Economists’ Adventures and Misadventures in the Tropics*, MIT Press, Cambridge, MA.

Malthus T 1798, ‘An essay on the principle of population’.

Organization for Economic Co-operation and Development (OECD) n.d., ‘Active population: Aged 15-64: All persons for Australia’, retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/LFAC64TTAUM647S.

Organization for Economic Co-operation and Development (OECD) n.d., 'Gross domestic product by expenditure in constant prices: Total gross domestic product for Australia', retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/NAEXKP01AUA189S.

United Nations 2017, 'World population prospects: The 2017 revision', Department of Economic and Social Affairs, Population Division, https://www.compassion.com/multimedia/world-population-prospects.pdf.

University of Groningen and University of California, Davis n.d. 'Average annual hours worked by persons engaged for Australia', retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/AVHWPEAUA065NRUG.

University of Groningen and University of California, Davis n.d., 'Capital stock at constant national prices for Australia', retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/RKNANPAUA666NRUG.

The World Bank n.d., 'World development indicators', http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators&.

CHAPTER 15

Saving, capital formation and comparative economic growth

After working your way through this chapter you should be able to answer the following questions.

15.1 Based on the national income accounting identity, what is the relationship between investment and national saving?

a) Does it matter if the economy is open or closed?

15.2 How can a production function be written in per capita terms?

15.3 What does the graph of a per capita production function look like?

15.4 What is a saving function?

a) How does this relate to the production function?

15.5 What is the economy's steady state?

a) What is the difference between total investment, replacement investment and net investment?

b) How are investment and saving related in the steady state?

c) What factors would cause the steady state to change?

d) How does the economy attain its steady state?

15.6 In what sense do countries converge?

a) What is meant by conditional convergence?

b) What do we learn from the empirical evidence on convergence?

15.7 According to the Solow–Swan model, what is the economy's long-run rate of growth?

15.8 What role does total factor productivity play in promoting long-run growth?

15.9 What is the Solow paradox?

SETTING THE SCENE

Many of the world's least economically developed countries are in Africa. We see this in a variety of indicators. For example, while it is estimated that around 9 per cent of the world's population was affected by severe food insecurity in 2016, the corresponding figure in Africa was 27 per cent (Hunger Notes 2018). The prevalence of disease is much higher in Africa than elsewhere and the effects can be devastating. One estimate, for example, is that malaria costs Africa $US12 billion in lost gross domestic product (GDP) a year (European Alliance Against Malaria 2018). The average life span for African males is 61 years, for females, 64 years; in middle Africa it is 57 years for males and 60 years for females—the corresponding figures globally are 70 years for males and 74 years for females (Statista 2018).

Yet the World Economic Forum has described African economies as ‘lions on the move’ (Leke & Barton 2016). Another report states that ‘Africa’s growth prospects are amongst the world’s brightest. Six of the world’s 12 fastest-growing countries are in Africa’ (Odusola 2018).

Can we reconcile the reality of African poverty with the prospect of rapid African economic growth? Economists have long theorised that emerging economies can grow quickly, outpacing the performance of the already developed world. We saw this in the 1960s with the ‘Asian tiger’ economies (Hong Kong, Singapore, South Korea and Taiwan), with post-war Japan and West Germany, and more recently with mainland China. Perhaps it is now Africa’s turn. To understand why, we need to examine the roles of capital accumulation and technological advancement in driving economic growth. Though not the whole story, as economic growth is extraordinarily complex, it is these two factors that loom largest in economists’ understanding of the growth experience of the world’s economies.

15.1 SAVING, INVESTMENT AND ECONOMIC GROWTH

LO 15.1

Saving and investment play a large role in economists' theories about economic growth. This chapter will show you why. But before we discuss the importance of saving and investment to countries' economic growth outcomes we should say at the outset that economists recognise the enormous range of other factors that can influence a country's growth performance. For example, some countries must face extremes of climate which, relative to countries with more temperate conditions, may make it difficult to sustain economic growth. Monsoons and floods in Bangladesh, for example, have almost certainly inhibited that country's economic growth. Factors that affect economic growth need not be confined to features of the natural landscape. We have spoken, for example in Chapter 14, of how political instability may adversely affect total factor productivity.

These and many other factors undoubtedly affect economic growth. However, many economists believe that capital formation plays a key role in promoting long-run growth, responsible for countries that are relatively poor being able to grow. This is because when countries are relatively impoverished and consequently have an existing capital stock that is small, additions to that capital stock have a large impact on the economy and can provide a catalyst for very rapid economic growth. Japan and Germany's rapid post-war recoveries are spectacular examples of how economies can grow rapidly from a position of relative impoverishment by building up their stocks of capital.

15.1.1 SAVING, INVESTMENT AND THE INCOME ACCOUNTING IDENTITY

In Chapter 4 we looked in detail at the topics of saving and investment. We saw that saving comprises that part of current income that is not consumed. We also saw that both the private and public sectors can save. Private sector saving is made by households and firms. Public sector saving is related to the government's budget deficit or surplus; public savings accumulate if the government runs a budget surplus while public savings are run down if the government runs a deficit. National saving, the extent to which the entire nation withholds income from current consumption, is the sum of private sector and public sector saving.

A nation's investment also represents resources that are withheld from current consumption. These resources are used to acquire new capital, the plant and equipment used by firms to produce output, or to set aside resources to replace depreciated capital.

Both saving and investment therefore represent the holding back of resources from current income and both are used to generate future benefits. In terms of saving, these benefits are the future levels of consumption that can be enjoyed. Regarding investment, the benefits are the profits obtained by firms when the output produced by the new or replenished capital is sold.

Not surprisingly, given that both investment and saving relate to resources held back from current consumption, there is a link between the two concepts. To develop this link we return to a concept first introduced in Chapter 2, the *national income accounting identity*. For simplicity we will deal only with a closed economy, one that does not engage in either exports or imports. We will deal with some of the open-economy implications of the national income identity in Chapter 16.

The closed economy national income accounting identity is reproduced below:

Equation 15.1

$$Y = C + I + G$$

Equation 15.1 states that in a closed economy, the economy's GDP, Y, can be divided between households' consumption, C, firms' investment, I, and the government's expenditure, G.

From the concept of the *circular flow of income*, also introduced in Chapter 2, we know that it is possible to interpret the left-hand side of Equation 15.1 in terms of *either* the value of production, income or expenditure. To show the formal relationship that exists between saving and investment, it is easiest to adopt the income interpretation of GDP. Consider, for a moment, the uses towards which income can be put. These are consumption, C, saving, S, and the payment of taxes, T. Using an income interpretation of GDP, it must therefore be the case that:

$$Y = C + S + T$$

Equation 15.2

Equation 15.2 details all the *uses* to which income can be put. Given that both Equations 15.1 and 15.2 feature Y on the respective left-hand sides, we can substitute 15.2 into 15.1 to arrive at:

$$C + S + T = C + G + I$$

Equation 15.3

After cancelling out consumption, which appears on both sides of Equation 15.3, and rearranging the remaining terms, we are left with the following expression:

$$S + (T - G) = I$$

Equation 15.4

In Chapter 4 we introduced the left-hand side of Equation 15.4 as *national saving*. Equation 15.4 is the basis for arguing that there exists a fundamental relation between an economy's saving and its investment; as the equation shows, in a closed economy, national saving is equivalently the same as investment. Since both saving and investment relate to resources that are held back from current consumption for future use, this equivalence between the two concepts is not all that surprising. Note also that this is a *closed-economy* result. In an open economy, it is possible through international borrowing to draw on the saving generated in other countries, and so national saving need not be exactly equal to investment. We will return to this point in later chapters. For now, we will maintain the assumption of a closed economy.

CONCEPT CHECK 15.1

Review the material in Chapter 4. What is the role of the real interest rate in ensuring equality between savings and investment?

15.2 THE NEO-CLASSICAL (SOLOW–SWAN) MODEL OF ECONOMIC GROWTH

LO 15.2–15.8

We now turn to a famous model in economics, the **neo-classical growth model**. This model predicts the existence of a positive relation between a country's preparedness to put aside current resources for the purposes of saving and investment and its long-run per capita GDP. The model was developed independently by Robert Solow (the same person who gave his name to the Solow residual—see Chapter 14) and an Australian economist, Trevor Swan (Solow 1957; Swan 1956). As well as being called the neo-classical model, this approach to the analysis of economic growth is often called the **Solow–Swan model**.

In this section we derive a simple version of the Solow–Swan growth model. The starting point for the model is a theoretical concept we have met before, the *production function* (see Chapter 14). Recall that the production function is a simplified representation of the way that firms combine capital and labour to produce output.

Since economists and policymakers often focus on the implications on growth for the level of **per capita income** (the amount of income per person), it is usual to interpret the Solow–Swan model in per capita or, more usually, per worker terms. That is, we focus on the amount of *capital per worker* and its implications for *per worker GDP*. It does take a bit of work to write the production function in per worker terms. We begin with a standard production function $Y = Af(K, L)$ where all variables are defined as in Chapter 14. (See equation 14.5. For simplicity, the multiplication sign and time subscripts have been omitted.) To get this production function in per worker terms, we divide both primary factors of production by L which transforms the right-hand side of the production function into $Af\left(\frac{K}{L}, \frac{L}{L}\right) = Af\left(\frac{K}{L}, 1\right)$. Remembering that under constant returns to scale, a proportionate change in both factors of production leads to the same proportionate change in output, it follows that $\frac{Y}{L} = Af\left(\frac{K}{L}, 1\right)$; multiplying both primary factors of production by $\left(\frac{1}{L}\right)$ implies the production of $\left(\frac{1}{L}\right)$ times the output, $\left(\frac{Y}{L}\right)$. Note that it is usual to ignore the distinction between the labour force and the population so that $\frac{Y}{L}$ can be interpreted as per capital GDP or per worker GDP. Since the '1' on the right-hand side of the production function cannot change, it is conventional to write the production function, in per capita terms, as:

$$\frac{Y}{L} = Af\left(\frac{K}{L}\right)$$ **Equation 15.5**

Per capita GDP therefore will depend on total factor productivity and on the amount of capital relative to the size of the labour force.

Equation 15.5 has a straightforward interpretation, namely that the higher is the capital stock relative to the size of the labour force, the higher will be per capita GDP. Another way to think about this is to recall the analysis of Chapter 13, Section 13.4, where we noted the important role of average productivity in driving growth in per capita GDP. The per capita production function identifies an important means of bringing about this increase in average labour productivity, namely, increasing the amount of capital available to each worker.

Note that we continue to assume diminishing marginal productivity, but now it is in terms of the **capital–labour ratio** (the term we shall use from now on for $\frac{K}{L}$). This means that increases in the capital–labour ratio lead to increases in per capita GDP, but this occurs at a diminishing rate; increasing the capital–labour ratio from \$100 of capital per worker to \$110 of capital per worker, for example, leads to a larger increment to per capita GDP than if capital per worker increased from \$1000 to \$1010. We illustrate this principle in Figure 15.1.

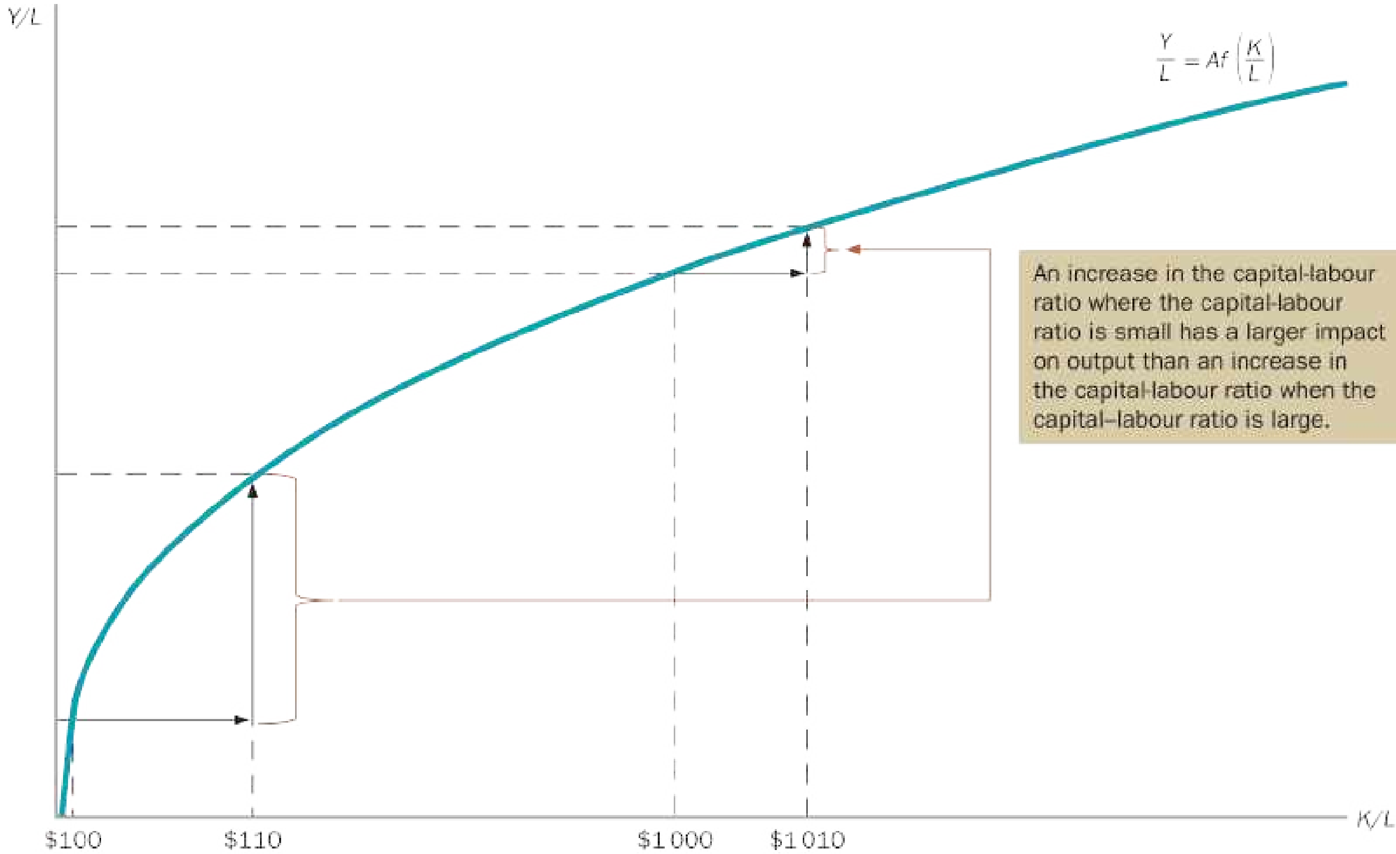

Figure 15.1 **The diminishing marginal productivity of the capital–labour ratio**

Note: Increasing the capital–labour ratio from $100 of capital per worker to $110 leads to a larger increase in per capita GDP than increasing the capital–labour ratio from $1000 of capital per worker to $1010.

So far, we have interpreted the production function in terms of the amount of output that can be produced, that is, we have used the *production measure* of GDP as the left-hand side variable in the production function. However, it is perfectly possible to give the production function another very important interpretation. Remembering the implications of the *circular flow of income*, which we spelled out in Chapter 2, the production function can be viewed as showing the level of *per capita income* that will be earned in the economy at each level of the capital–labour ratio.

The characteristically curved shape of the production function, which is associated with the diminishing marginal productivity of the capital–labour ratio, raises a key question, one that both Solow and Swan were keen to answer in their original work. This is the question of whether there is any limit to economic growth. Given that increases in the capital–labour ratio lead to progressively smaller and smaller increases in per capita output, does there exist the possibility that growth will eventually stop? Would the accumulation of capital, in other words, proceed to the point where no further increase in per capita output was possible?

Economists use a special term for a situation in which per capita output is no longer growing: the **steady state**. An economy in the steady state is one where growth in per capita income has come to a halt; in the Solow–Swan model this occurs because there is no longer growth in the capital–labour ratio. But how could such a situation come about?

The answer is to look at the relationship between investment and the capital stock. Until now we have been representing investment primarily in terms of additions to the capital stock. However, there are two types of investment, and we now need to take this into account. The first type is **replacement investment**, which involves purchases of new plant and equipment that is either to replace worn-out depreciated capital or to provide new capital for a growing population; the effect of replacement investment is to keep the capital–labour ratio constant. The second type of investment is **net investment**. This is investment over and above replacement investment. It is net investment that leads to increases in the amount of capital per worker (or, equivalently, increases in the capital–labour ratio). Total investment in the economy is the sum of replacement and net investment. We write this as follows:

$$\frac{I}{L} = \frac{RI}{L} + \frac{NI}{L}$$

Equation 15.6

where *RI* is replacement investment and *NI* is net investment; note that everything is measured in per capita terms.

We now introduce another piece of notation; let $\Delta\left(\frac{K}{L}\right)$ be the change in the capital–labour ratio (remember that economists by convention use the Greek letter delta, Δ, to signify the change in a variable). Given that it is only net investment per person, $\frac{NI}{L}$, that changes the capital–labour ratio—replacement investment serves only to keep the capital–labour ratio constant—it must be the case that $\Delta\left(\frac{K}{L}\right) = \frac{NI}{L}$. This means we can write Equation 15.6 as:

$$\frac{I}{L} = \frac{RI}{L} + \Delta\left(\frac{K}{L}\right)$$ **Equation 15.7**

Can we say more about replacement investment, *RI*? The need for replacement investment arises because of the depreciation of the existing capital stock and because of the growth in the size of the population. For simplicity, we will make two assumptions about depreciation and population growth. First, we will assume that the capital stock depreciates at a *constant* rate over time, denoted by *d*; this is a number such as 0.10, which would correspond to a rate of depreciation of 10 per cent—this means that over a year, 10 per cent of the existing capital stock wears out and needs replacement. Should *d* be 0.05, 5 per cent of the capital stock would need to be replaced each year. With respect to the population, we will assume that this grows at a constant rate of *n*; if, for example, *n* is equal to 0.02, we would be saying that the population grows at a rate of 2 per cent a year.

Let us suppose then that *d* is equal to 0.05 and that *n* is equal to

0.02. This year's capital stock would therefore have to grow by 7 per cent in order just to keep the capital–labour ratio from falling. In symbols, this can be written as follows:

$$\frac{RI}{L} = (d+n)\left(\frac{K}{L}\right)$$

Equation 15.8

Returning for the moment to Equation 15.7, let us revisit investment per worker, $\frac{I}{L}$. As we saw in Section 15.1.1, there is equality between the amount of investment in the economy and the total saving generated by the economy. To keep things simple, we will assume that the total saving generated by the economy is some constant fraction of the economy's total income; this fraction is called the **saving rate**. We will use θ, the Greek letter theta, to denote the economy's savings rate. For example, if θ is equal to 0.3 we would be saying that the average person in the economy withholds 30 per cent of their income in the form of saving. Since, from the national income accounting identity, saving and investment are equal, it must be the case that:

$$\frac{I}{L} = \theta\left(\frac{Y}{L}\right)$$

Equation 15.9

That is, investment per worker will be some proportion of per capita income and that proportion is given by the saving rate.

Combining Equations 15.9, 15.8 and 15.7, we have the following relation between investment (saving), replacement investment and net investment:

$$\theta\left(\frac{Y}{L}\right) = (d+n)\left(\frac{K}{L}\right) + \Delta\left(\frac{K}{L}\right)$$

Equation 15.10

Equation 15.10 says that the amount of investment per worker in the economy (which is equivalent to saving per worker) can be divided between the economy's replacement and net investment. If we now rearrange Equation 15.10 so that the overall change in the capital–labour ratio is on the left-hand side of the equation, we get the following very important relation:

$$\Delta\left(\frac{K}{L}\right) = \theta\left(\frac{Y}{L}\right) - (d+n)\left(\frac{K}{L}\right)$$

Equation 15.11

In a moment we will move to a diagrammatic treatment of what we have just derived, but first let us see exactly what Equation 15.11 is saying; *understanding Equation 15.11 is essential to understanding the Solow–Swan model*. Equation 15.11 states that the capital–labour ratio will grow (that is, $\Delta\left(\frac{K}{L}\right)$ will be a positive number) only if the total saving in the economy exceeds replacement investment. This makes perfect sense; the capital–labour ratio will increase only when the total investment in the economy is more than what is needed to replace depreciated capital equipment or to provide new capital equipment for a growing population.

Equation 15.11 also, importantly, tells us the condition under which the economy will achieve its *steady state*—recall that this is when there is no change to the size of the per capita capital stock and hence no change in per capita output. As you can see from Equation 15.11, the capital–labour ratio will be unchanging when all investment is just replacement investment $\left[\theta\left(\frac{Y}{L}\right)=(d+n)\left(\frac{K}{L}\right)\right]$. Only then will $\Delta\left(\frac{K}{L}\right)=0.$

15.2.1 A DIAGRAMMATIC TREATMENT

To understand better the implications of the Solow–Swan model for economic growth, it is useful to move to a diagrammatic version of the model. This begins with the production function. Since production and income are equivalent—from the national income accounting identity—the production function can be interpreted as an income function, showing the levels of per capita income associated with each level of the capital–labour ratio. This interpretation of the production function is important because it enables us to draw a separate function that corresponds to the amount of *per capita saving* generated in the economy. In the Solow–Swan model, saving is assumed to be some constant proportion of income. This means that a **saving function** will look very much like the production function but will lie below the production function since saving is a proportion of income. An example of a production and saving function is drawn in Figure 15.2. In Figure 15.2 we assume that 30 per cent of per capita income is saved. Therefore, if the level of per capita capital is $1000 of capital per worker, and total income, reading from the production function, is $3000, saving must be equal to $900.

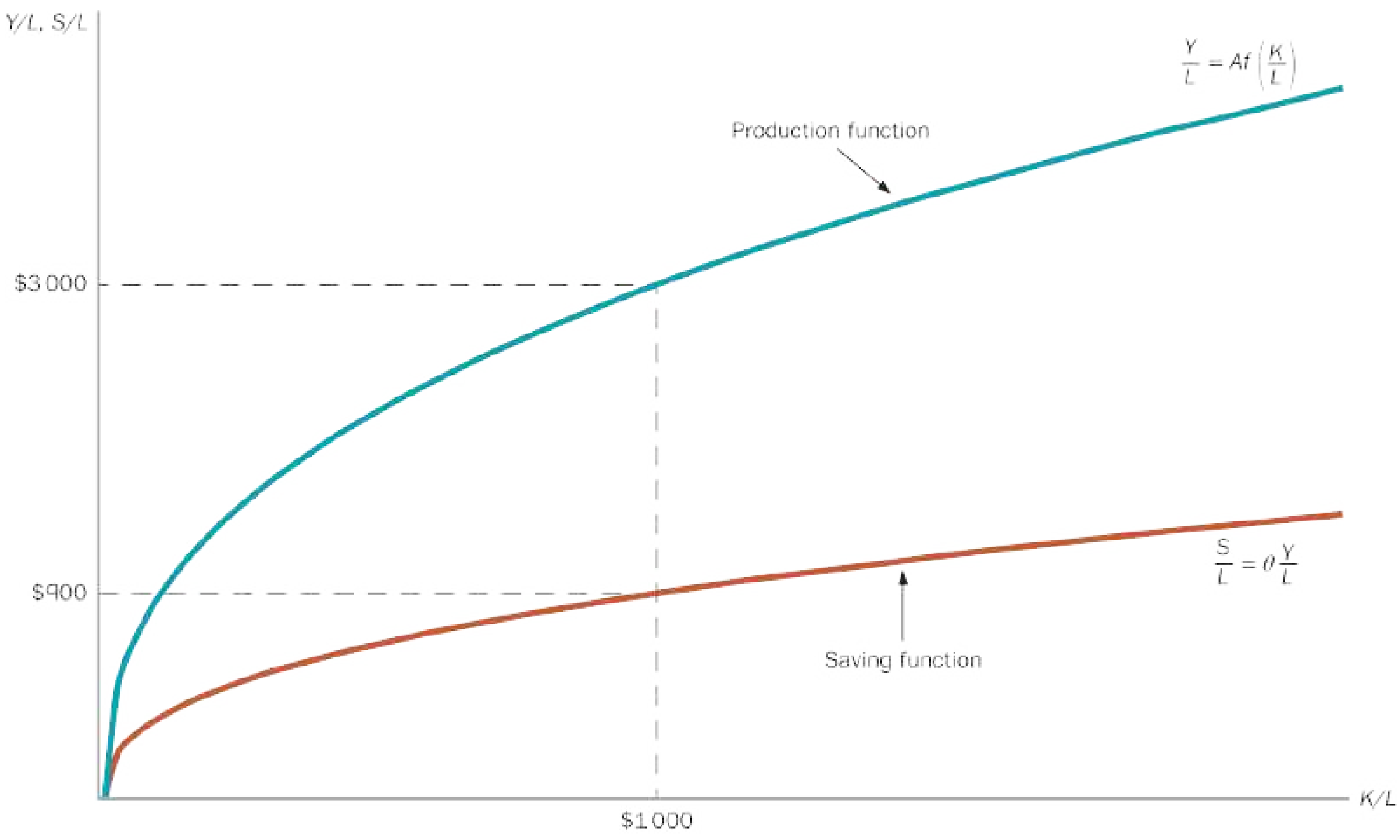

Figure 15.2 **Production and saving functions**

Note: Since saving is proportional to income, the saving function has the same basic shape as the production function but lies underneath.

We now introduce replacement investment into the analysis. Recall that replacement investment is assumed to be described by Equation 15.8. This equation shows that replacement investment is *linearly* related to the capital–labour ratio; as the capital–labour ratio increases so does replacement investment, at a constant rate determined by the sum of the population growth rate and the rate of depreciation. Figure 15.3 adds a line to Figure 15.2 that represents replacement investment. This line, the $\frac{RI}{L}$ schedule, will be a straight line with its slope given by $(d+n)$.

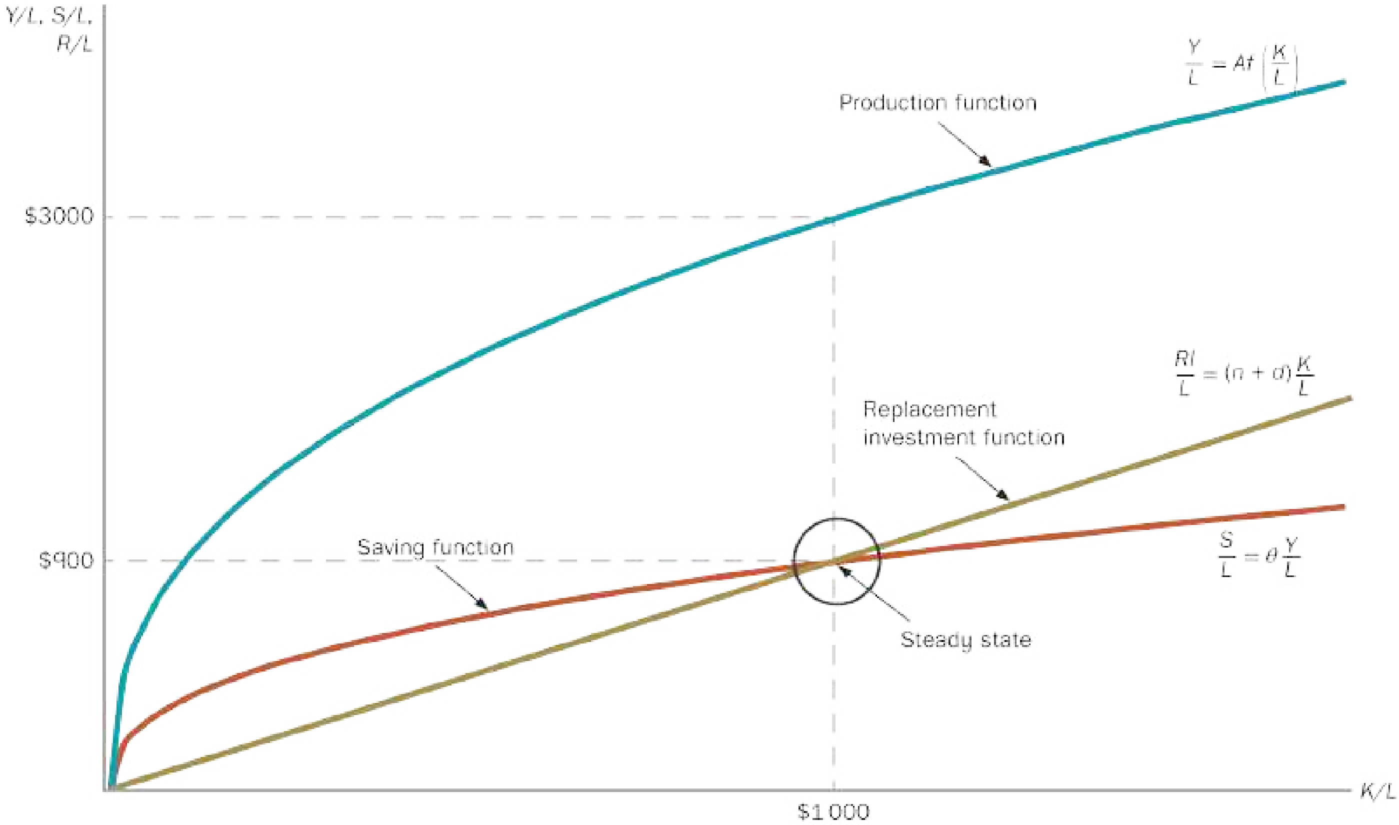

Figure 15.3 **Production, saving and replacement investment functions**

Note: Replacement investment can be represented by a straight line with slope given by (d + n).

Note the intersection of the $\frac{RI}{L}$ and saving schedules. This point is circled in the diagram. At this point, the economy would be at its steady state since the total amount of investment, $900, matches the total amount of replacement investment. Since this means that all investment is replacement investment, the per capita capital stock is not changing; this defines the economy's steady state.

Although we have identified the steady state, we have not yet shown that the economy will have any automatic tendency to reach that steady state. In fact, this is quite easy to show. Consider Figure 15.4. Suppose that the economy has a capital–labour ratio of $500. This is below the steady-state capital–labour ratio of $1000.

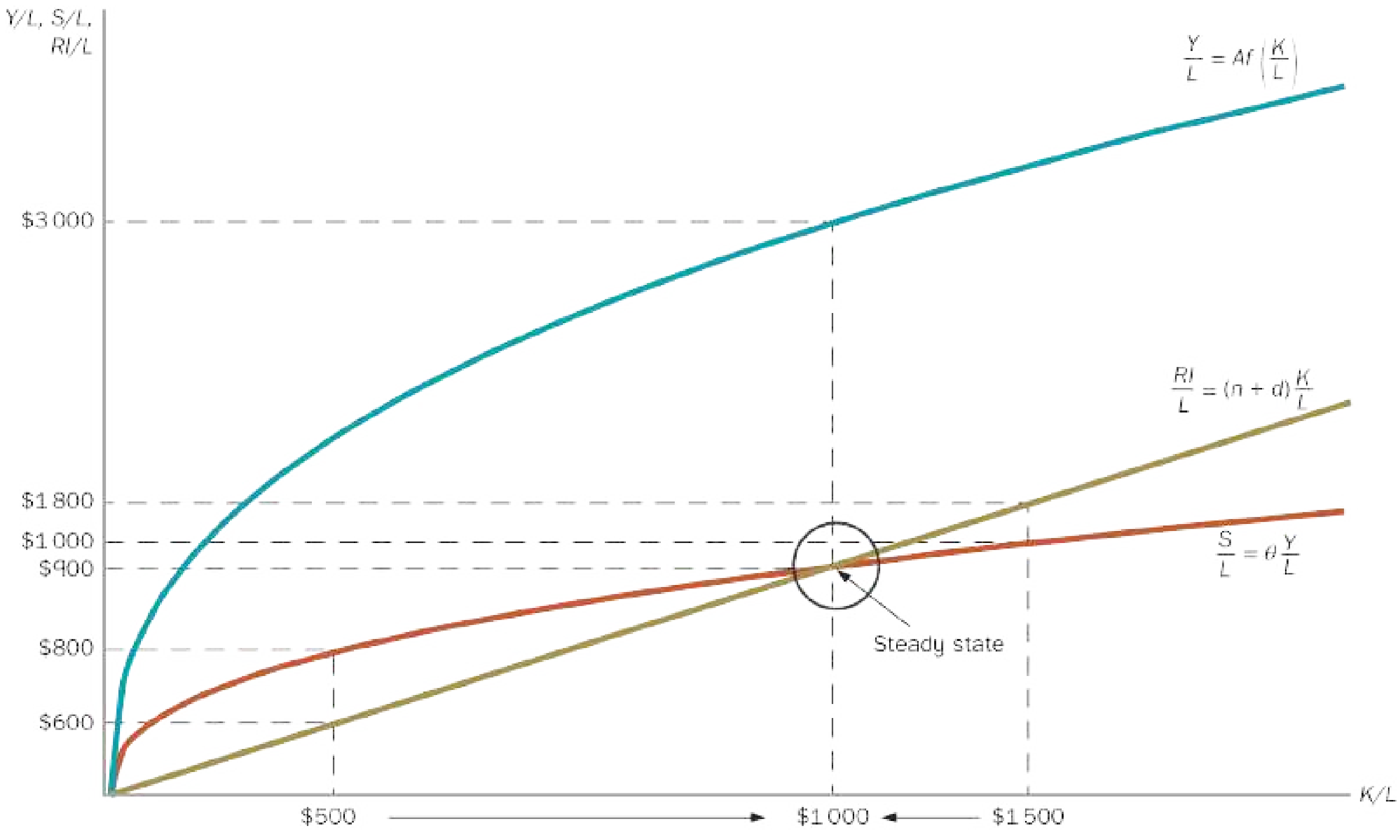

Figure 15.4 **Will the economy be at its steady state?**

Note: Should the economy be either above or below its steady-state capital–labour ratio, the difference between total investment and replacement investment will cause the per capita capital stock to move towards its steady state.

You can see from Figure 15.4 that with a per capita capital stock of $500, saving in the economy totals $800 while replacement investment is only $600. Given the equality between saving and investment, this means that total investment exceeds replacement investment by $200. As a result, the per capita capital stock will increase (as indicated by the arrow), and this will continue until the steady-state value for $\frac{K}{L}$, $1000, is reached.

What if the per capita capital stock was larger than its steady-state value? For example, suppose the per capita capital stock was $1 500. Referring to Figure 15.4, you can see that the replacement investment that would be needed to keep the capital stock at that level, $1 800, exceeds the actual level of investment, $1 000. As a result, the per capita capital stock falls (there is not enough replacement investment to offset the rates of depreciation and population growth); the capital–labour ratio continues to fall until the steady state is reached.

CONCEPT CHECK 15.2

Explain what happens to the economy's steady state and to the rate of economic growth if:

a) the rate of population growth slows
b) the savings rate falls.

At this stage we should pause and reflect on the implications of what we have shown. The existence of a steady state has some profound implications for the way we think about economic growth. The idea that the economy has a steady state implies that *growth in per capita income occurs only when the economy has an existing capital–labour ratio that is below its steady state.* Only then will the capital–labour ratio be increasing, since total investment would exceed replacement investment, and hence only then will there be growth in per capita income.

Growth can therefore be likened to a race with the steady state as the finish line. Once there, the economy invests only enough to keep its capital–labour ratio from changing, and hence growth in per capita income comes to an end. This is an outcome of the diminishing marginal returns assumption. As the capital–labour ratio increases, diminishing marginal returns set in, which means that subsequent increases in the capital–labour ratio have less and less of an impact on per capita income. Eventually, a point is reached where any further additions to the capital–labour ratio make such a small addition to per capita income that not enough extra saving is generated to do anything other than engage in replacement investment. Once that point is reached, the economy will be at its steady state.

Implication number 1

All else being equal, the Solow–Swan model predicts an end to growth in per capita income, as countries eventually reach their steady state.

The analogy of a race is also useful when discussing the second implication of the Solow–Swan model: countries that are poor will grow at a relatively faster rate than countries that are rich. A country that is well behind in the 'growth race' will grow faster than those countries in the lead and will eventually catch up; this is known as the **convergence hypothesis** .

Implication number 2

The Solow–Swan model predicts that per capita income in poor countries will grow at a faster rate than in rich countries, *as long as both groups of countries have the same long-run steady state.*

Where does the convergence between rich and poor countries come from? The answer is the diminishing marginal productivity of capital. Consider two countries, Poorland and Richland. Poorland is a country just beginning to grow. It has a very low capital–labour ratio; let us say that per person the capital stock is only worth $5. Richland is a mature developed economy, one that started its economic growth many years previously. As a result, Richland has a much larger per capita capital stock than Poorland; let us say it is worth $500. In all other respects we will assume that Richland and Poorland are similar—they have the same propensity to save, their capital stocks depreciate at the same rate, their populations grow at the same rate and their respective levels of total factor productivity are also the same. In effect, the countries differ only in the size of their capital–labour ratios.

The growth outcomes facing Richland and Poorland are illustrated in

Figure 15.5 . Since the two economies have the same production function (by assumption), the same saving behaviour and the same rates of depreciation and population growth, they share the same steady state; this is a per capita capital stock worth $625. You can see in Figure 15.5 that both countries have per capita capital stocks that fall below this steady state. In both countries saving will be more than what is required for the purposes of replacement investment. Both Poorland and Richland will therefore have growing capital–labour ratios. Poorland, however, will receive a relatively larger boost to its output from each extra $1 addition to the capital stock than will Richland; this is because of the diminishing marginal productivity of capital. Poorland, having an existing small capital stock, will find that each additional unit of capital will have a big impact on the amount of output that is produced. For Richland the situation is quite different. Richland's capital–labour ratio is already large and so significant diminishing returns have already set in. Each additional unit of capital will make only a small difference to the amount of output that Richland's firms can produce.

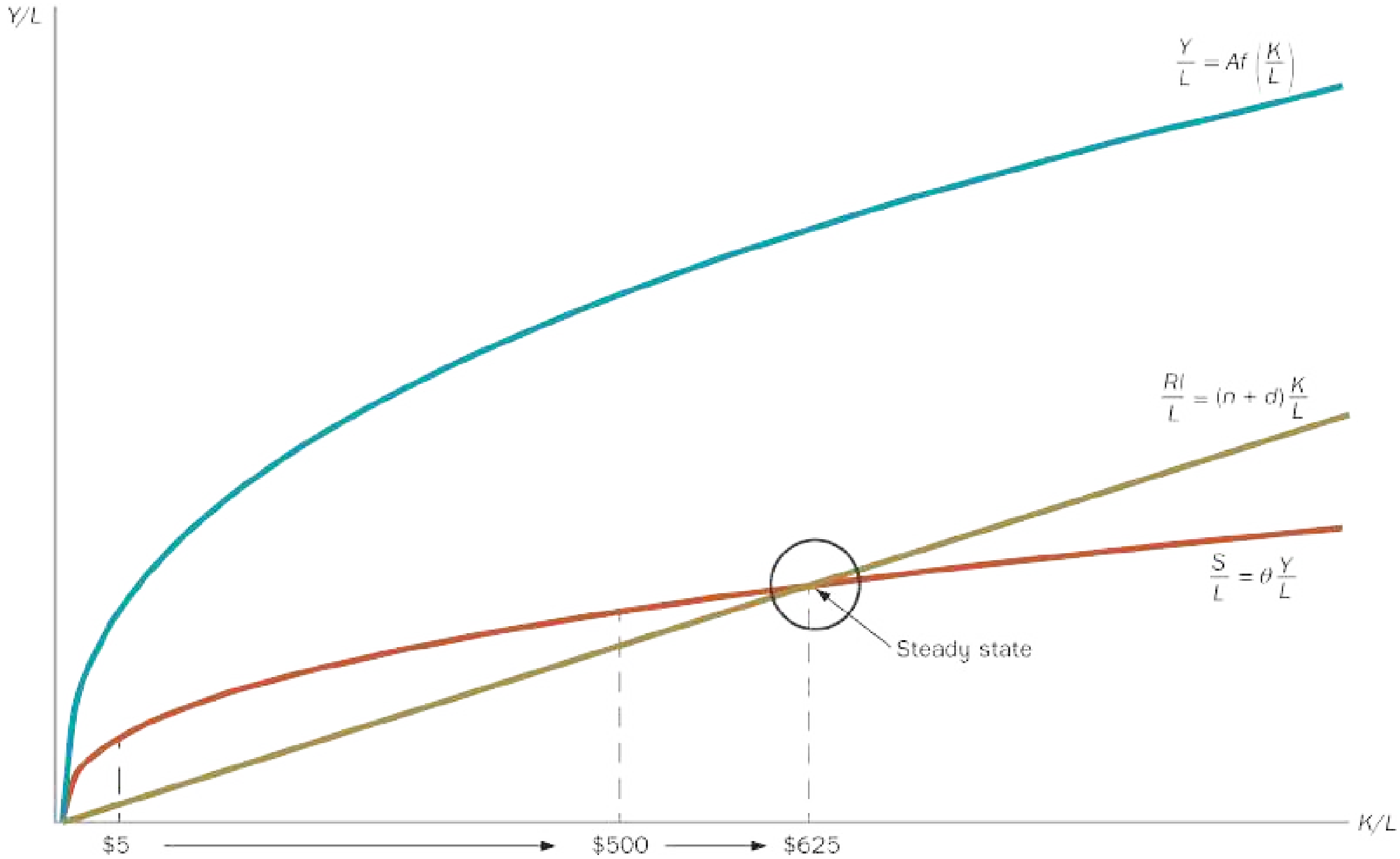

Figure 15.5 **Background to convergence**

Note: Poorland has a relatively small per capita capital stock of $5, while Richland has a relatively large per capita capital stock of $500. Both countries are below their steady state and therefore both countries will find that their per capita capital stocks are growing. However, because of diminishing marginal productivity, the additions to the capital stock for Richland have a smaller impact on per capita output than additions to Poorland's per capita capital stock.

The implication of all of this is that Poorland will grow at a faster rate than Richland. To return once again to the analogy of the race, it is as if Poorland, although starting much further back, eventually catches up to Richland, so that they have the same finishing line. The finishing line is, of course, the steady state. Figure 15.6 illustrates this catch-up.

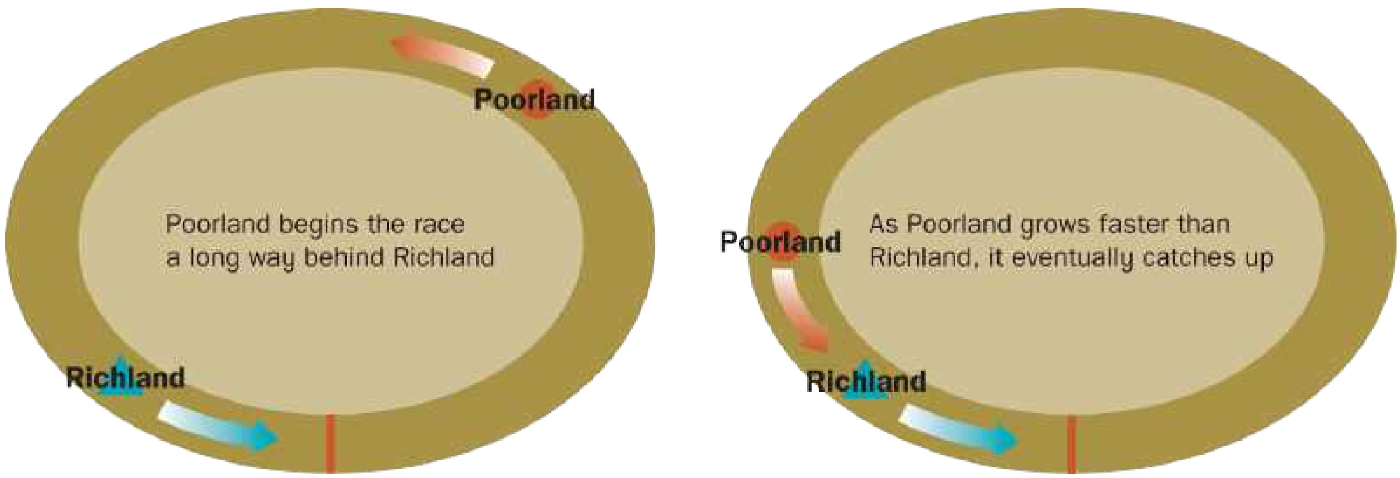

Figure 15.6 **Convergence as a race**

Note: Poorland starts the growth race a long way behind Richland. However, because of the diminishing marginal productivity of capital, Poorland grows relatively faster and eventually catches up to Richland.

15.2.2 EVIDENCE

The Solow–Swan model makes a very precise prediction about **comparative economic growth**. This is the term that economists give to the study of different countries' growth experiences and how growth in one country compares to growth in other countries. According to the Solow–Swan model, countries that start out relatively poor grow relatively quickly and as a result catch up (or converge) to countries that start out relatively rich. Let us think for a moment about how an economist would test to see if this theory describes the way that the real world works. What evidence would convince economists that the convergence hypothesis is a useful way to think about comparative economic growth?

A key thing to look for would be evidence that countries that were relatively poor in the past had subsequently grown at a faster rate than countries that were relatively rich in the past. An economist investigating the convergence hypothesis would choose some base year from the past—call this $year_b$—and measure per capita income for a cross-section of countries for that year. The next stage would be to calculate for those countries the average annual growth rates in per capita income for all the years since the base year. If the convergence hypothesis is correct, then, based on these calculations, the economist should be able to draw a graph for these countries that would look like the stylised representation shown in Figure 15.7.

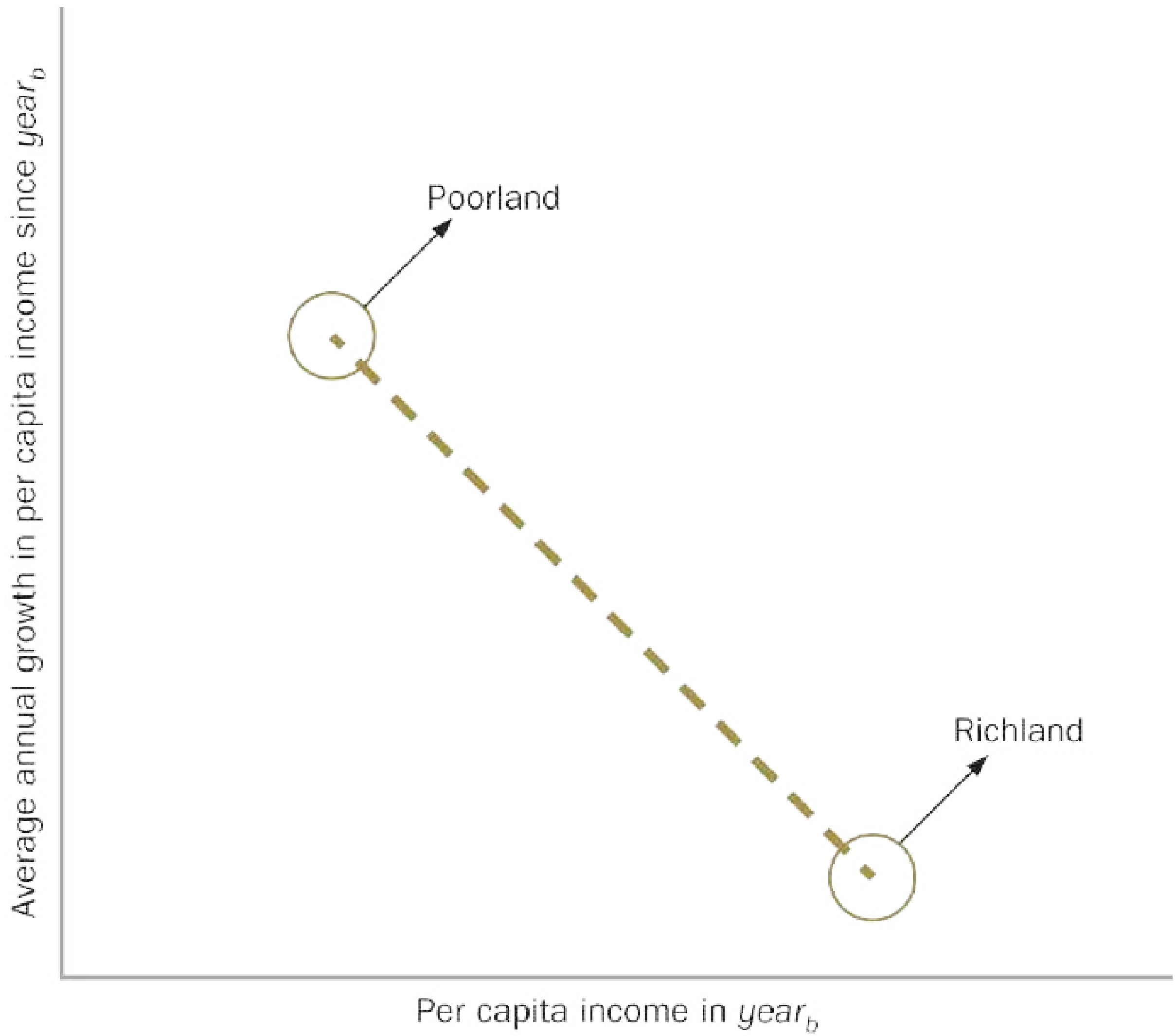

Figure 15.7 **Stylised representation of convergence**

Note: An economist testing the convergence hypothesis would look for evidence of a negative relation between per capita income in some base year and the average rate of economic growth since that base year.

Each dot in Figure 15.7 represents the data for one country; for example, the dots at either end represent respectively, the data for Poorland and for Richland. Note that we have drawn the dots in Figure 15.7 so that if joined by a line, that line would have a negative slope. This is what we would *expect* to find if the convergence hypothesis were true; the negative slope is indicative of countries starting out poor having the relatively highest growth rates. On the other hand, countries that were rich in the base year grow only relatively slowly thereafter.

Do we see negatively sloped lines such as that in Figure 15.7 in real-world data? The answer is: sometimes. Consider Figure 15.8. This shows data for a collection of high-income countries belonging to the Organization for Economic Cooperation and Development (OECD). The base year is 1970.

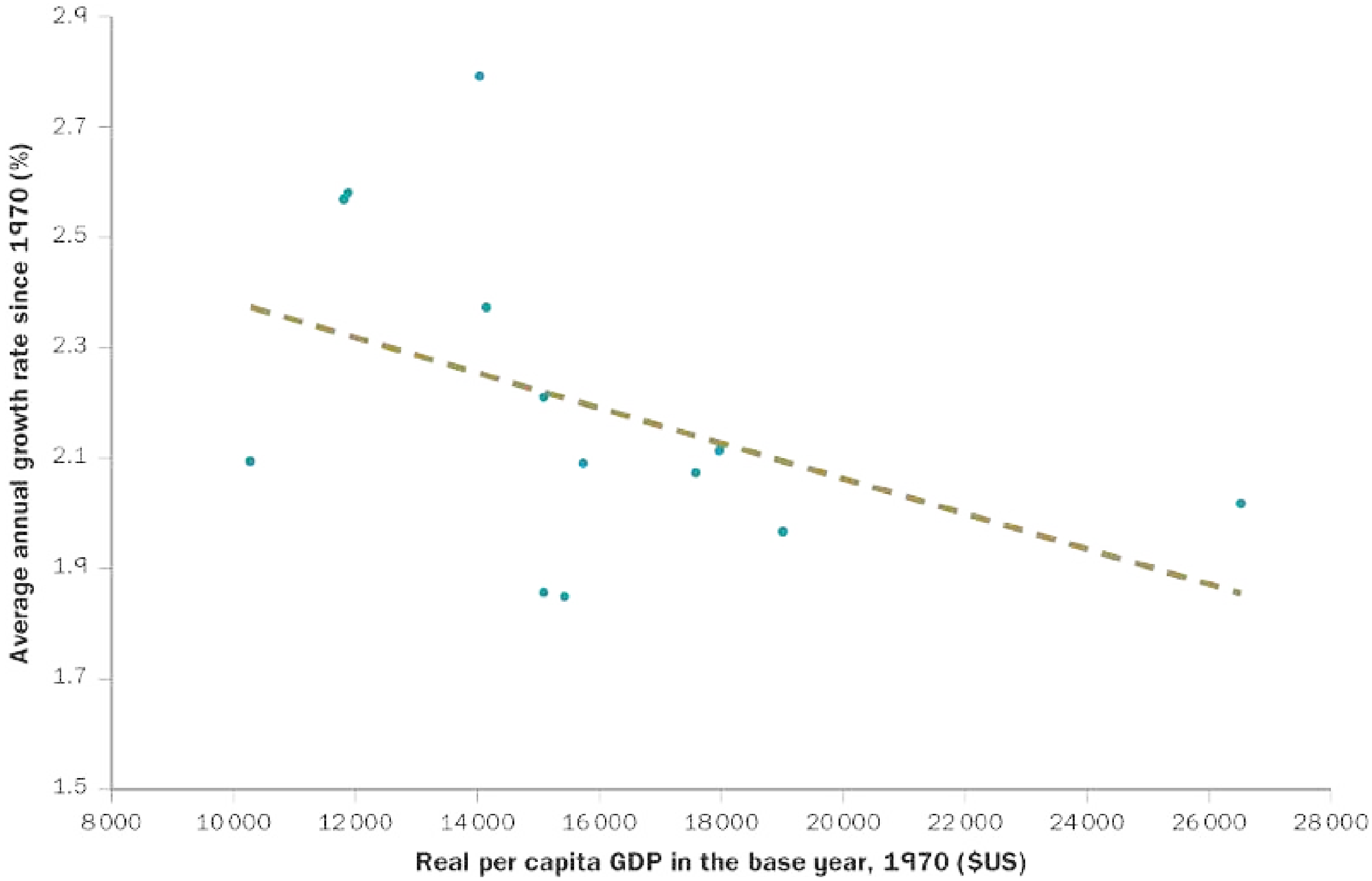

Figure 15.8 **Convergence in high-income OECD countries (1970–2014)**

Note: The negative slope of the trend line fitted to these data is consistent with the convergence hypothesis.

Source: Based on data from Feenstra RC, Inklaar R and Timmer MP 2015, 'The next generation of the Penn World Table',*American Economic Review*, vol. 105, no.10, pp. 3150–82, www.ggdc.net/pwt.

As evidenced by the negative slope of the trend line fitted to these data, the experience of these countries is clearly consistent with the convergence hypothesis. (The countries are Australia, Denmark, Finland, France, Germany, Greece, Italy, Japan, New Zealand, Sweden, Switzerland, the United

Kingdom and the United States.) Countries that were relatively poor in 1970 have grown fastest in the subsequent 37 years.

In some sense, we should not be too surprised about finding convergence for this set of countries. If you look back to Figure 15.5 you will see that the convergence result relies on the *only* difference between the countries being their respective levels of the capital–labour ratio. In all other respects the countries are the same; this is reflected in the fact that in Figure 15.5 we did not have to draw separate production functions for the two countries, nor did we draw separate saving or depreciation curves. Countries that share a common production function and have the same saving and depreciation behaviour will have the same steady state, and this is what makes convergence feasible. Does this help us to explain the result in Figure 15.8 ? The countries in Figure 15.8 are unlikely to be exactly alike (no two countries ever are). But they are all high-income, mature, industrialised economies and are therefore likely to be similar, and for that reason we might expect that these countries would have a good chance of satisfying the requirements of the convergence hypothesis.

Figure 15.8 , however, relates to a relatively small subset of the world's countries. Is there any evidence of convergence for a wider collection of countries? To answer this question, we take the broadest collection of countries for which data exist. This comprises the countries in the Penn World Tables for which there exist data from 1970 onwards. Figure 15.9 plots the data for these countries; once again we display real per capita GDP in the base year on the horizontal axis and the subsequent rate of growth in real per capita GDP on the vertical axis. As you can see from Figure 15.9, there is no sign of convergence for this very broad collection of countries (note the trend line is virtually horizontal). It is as if, for the entire world's countries, economic growth is completely unrelated to the level of GDP in the past. On first appearances, this is quite striking evidence against the convergence hypothesis.

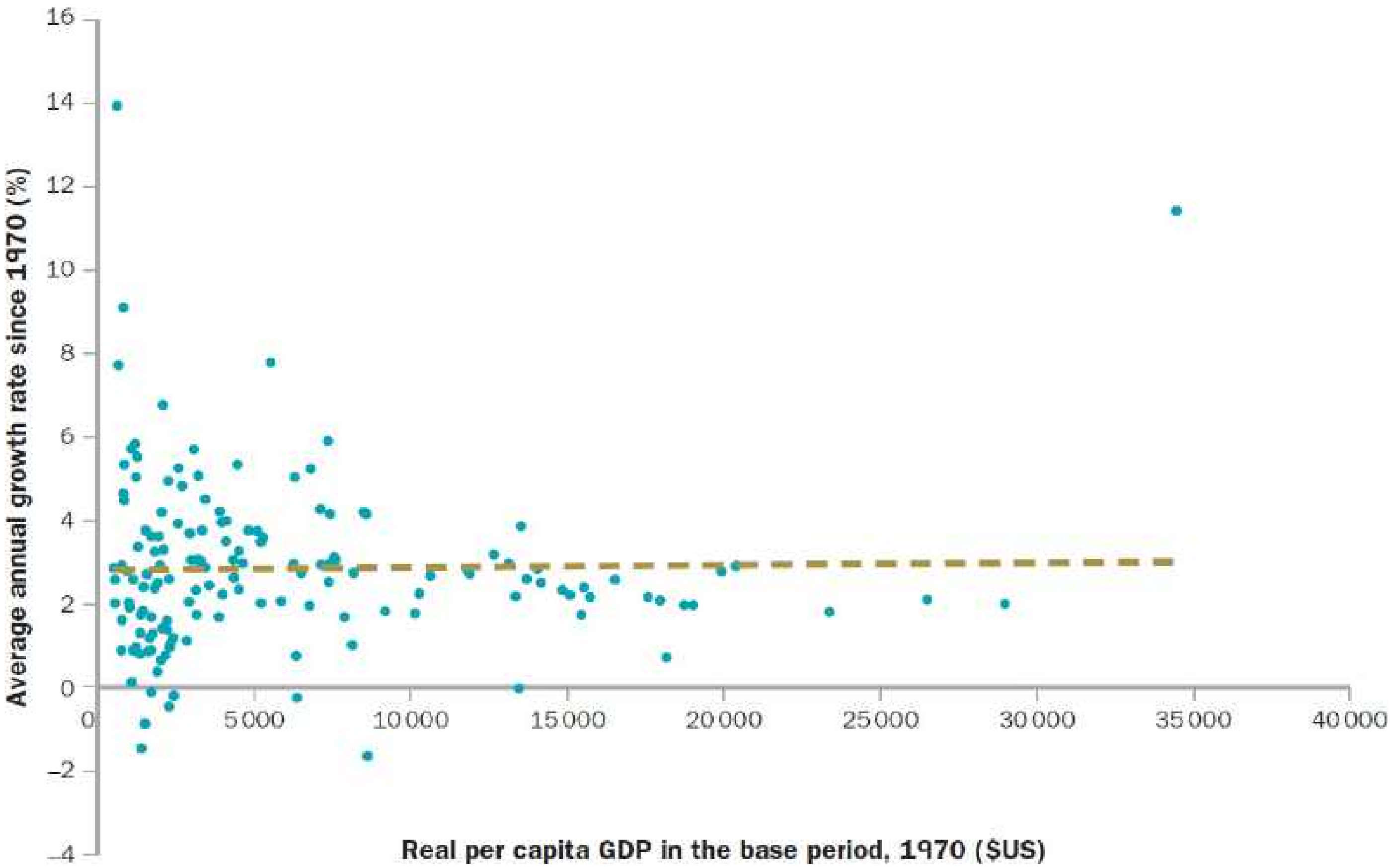

Figure 15.9 **Convergence for the world?**

Note: When we take all the world's countries, there seems little evidence in favour of the convergence hypothesis.

Source: Based on data from Feenstra RC, Inklaar R and Timmer MP 2015, 'The next generation of the Penn World Table', *American Economic Review*, vol. 105, no.10, pp. 3150–82, www.ggdc.net/pwt.

Yet it only takes a moment's reflection to suggest that taking such a disparate group of countries as in Figure 15.9 is a very unfair test of convergence. This is because of the requirement that countries share a common steady state if convergence is to hold. The likelihood of this condition being satisfied with so many countries is remote indeed.

Where do Figures 15.8 and 15.9 leave the convergence hypothesis? These figures show that convergence is present in the data, but only if we restrict the analysis to countries that are reasonably similar in their broad economic characteristics. We should not expect convergence across the complete spectrum of the world's countries. In recognition of this, economists now speak of **conditional convergence**; that is, for countries that are similar, convergence is a definite possibility.

CONCEPT CHECK 15.3

Consider two economies, Freedonia and Moldavia. Freedonia has a production function given by $\left(\frac{Y}{L}\right) = 2\left(\frac{K}{L}\right)^{0.5}$, a savings rate of 10 per cent, a depreciation rate of 2 per cent and a population growth rate of 1 per cent. Moldavia has an identical economy to Freedonia except that it has a level of total factor productivity only half as large as Freedonia. Calculate the steady-state values of $\left(\frac{K}{L}\right)^*$ and $\left(\frac{Y}{L}\right)^*$ for both countries. Would you expect these countries to converge? Explain.

▹▹ RECAP

The Solow–Swan model of economic growth relates economic growth to changes in the capital–labour ratio. An important concept in the Solow–Swan model is the steady state. This is where the economy no longer grows in per capita terms. Such a situation is possible if the total amount of investment in the economy is equal to replacement investment.

The diagrammatic treatment of the Solow–Swan model of economic growth shows that the model makes two important predictions about growth in per capita income. First, growth in per capita income eventually ends as countries reach their steady state. Second, countries that differ only in the size of their respective per capita capital stocks eventually converge to the same steady state.

The evidence on the convergence hypothesis is mixed. For countries that are similar to each other, it is possible to find evidence of convergence. For broader collections of countries, no such evidence exists. In recognition of this, economists now speak in terms of conditional convergence.

THINKING AS AN ECONOMIST 15.1

Long-run economic growth

In 2010 one of the most remarkable scholars of the world's economic history, Angus Maddison, died. Among Professor Maddison's many achievements was the collection of very long spans of data on countries' economic performance, in some cases dating back to the year 1AD. Figure 15.10 plots one of the data sets collected by Professor Maddison, updated to include the years to 2016, measuring the United Kingdom's real per capita GDP since 1700. The remarkable feature of these data is they show no long-run tendency for the United Kingdom's economy to have ever stopped growing in terms of real per capita GDP. A student of the Solow–Swan model might well ask: Where is the steady state?

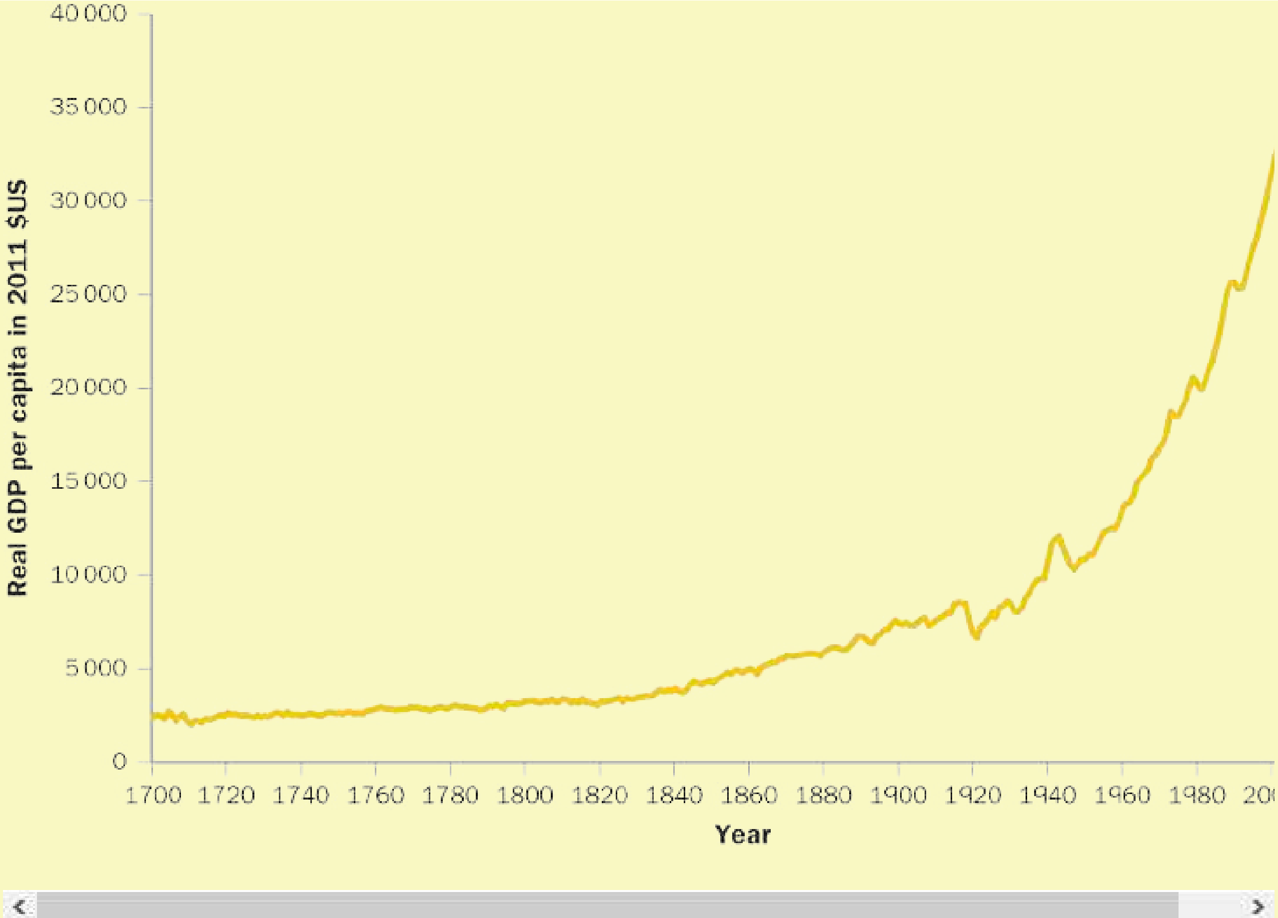

Figure 15.10 **The UK economy in the long run**

Note: Real per capita GDP in the United Kingdom has increased since 1700, showing no sign of settling down at a steady state.

Source: Bolt J, Inklaar R, de Jong H and Luiten van Zanden J 2018, Maddison Project Working Paper, no. 10, Maddison Project Database, version 2018, www.ggdc.net/maddison.

The Solow–Swan model has shown remarkable resilience over the years, being one of the most enduring of all economic models. Nevertheless, as highlighted by the evidence in Figure 15.10, its prediction of an end to per capita income growth does not match what has actually happened to countries like the United Kingdom, or indeed the experiences of New Zealand, Australia, the United States and many others. Can we reconcile the model with the reality of so many countries having experienced long-run economic growth?

When faced with this apparent contradiction between the prediction of the model and the reality of long-run growth, many economists point to the need to introduce explicitly an additional factor into the Solow–Swan model: technological change. The effects of technological change in the Solow–Swan model are illustrated in Figure 15.11. We assume that this economy begins in a steady state at point A with a capital–labour ratio $\left(\frac{K}{L}\right)_0^*$ and a steady-state level of real per capita income $\left(\frac{Y}{L}\right)_0^*$. Suppose a new technology is then introduced that raises the average productivity of workers. The effect will be to shift the production function upwards, as more output can be produced at each level of the capital–labour ratio than was previously the case (note that total factor productivity has now increased from A_0 to A_1). Given the assumption that saving is proportional to income, the upward shift in the production function has the effect of shifting the saving schedule upwards as well. The result, as can be seen from Figure 15.11, is the establishment of a new steady state at point B. At the original steady state, we now have saving per capita in excess of what is required for replacement investment. As a consequence, the capital–labour ratio will increase until the new steady state, point B, is attained.

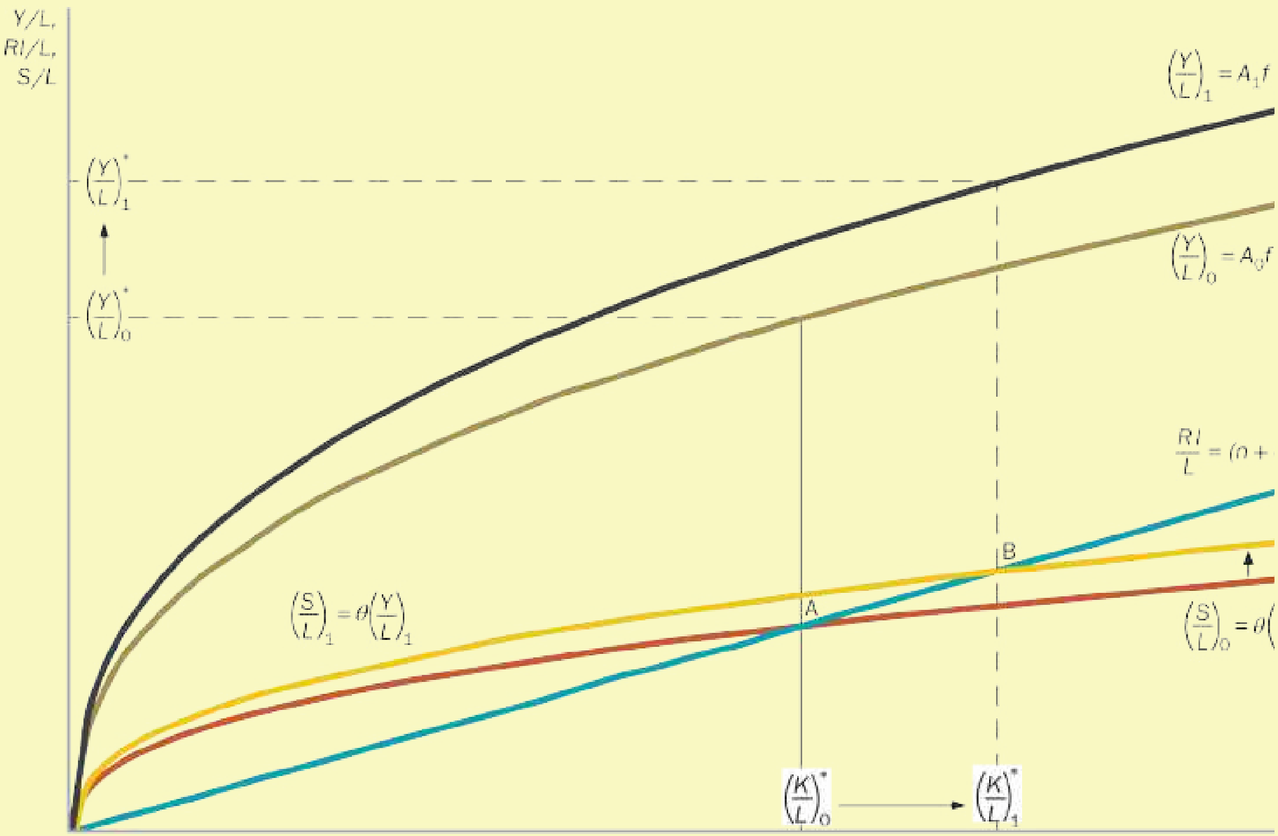

Figure 15.11 **Technological change in the Solow–Swan model**

Note: Technological change shifts the steady state to the right, creating the opportunity for further growth in real per capita income.

The technological change has led to a period of growth in per capita GDP from $\left(\frac{Y}{L}\right)_0^*$ to $\left(\frac{Y}{L}\right)_1^*$. However, the growth is short lived as the economy eventually reaches a new steady state at point B. Nevertheless, this example provides the clue as to how some countries have achieved sustained, long-run growth. The answer, in the Solow–Swan model, must be a continual process of technological change, so that the production function constantly shifts upwards. This means the economy's steady state continues to shift to the right along the capital–labour axis, creating the conditions needed for growth in per capita income. If the economy never catches up to its steady state, the result will be continuous, long-run, economic growth. This, of course, is consistent with what we noted in Chapter 14, namely, that for mature economies, total factor productivity appears to be the most important factor driving long-run economic growth.

THINKING AS AN ECONOMIST 15.2

Has the ITC revolution aided economic growth?

As discussed above, technological change may well be the key to understanding long-run economic growth. Two eminent economists, in writing about this way of thinking about growth, had this to say about the impact that new technology has had on economic life.

The tremendous increase in material well-being that has taken place in advanced economies since the industrial revolution has been characterised by change and innovation. We do not just have more of the same goods and services; we also have new ones that would have been unimaginable to someone in the eighteenth century. People then knew nothing of such modern marvels as personal computers, jet aeroplanes, satellite communication, microwave ovens and laser surgery. The knowledge of how to design, produce and operate these products and processes had to be discovered, through a succession of countless innovations. More than anything else, it is these innovations that have created the affluence of modern times. Beyond making us richer, they have transformed the way we live and work (Aghion & Howitt 1998, p. 1).

Recently, economists have been thinking about the impact of the new developments in information technology and communications (ITC) on economic growth. First, we should note that it is not just the existence of the new technologies that can make a difference; it is also that people have ready access to the new technology. Figure 15.12 gives one indication of the dispersion of an integral part of ITC, the internet. For a small number of countries there is widespread access to the internet. As Figure 15.12 demonstrates, however, most countries have a long way to go before matching the ease of access to the internet that exists in the country that leads the world in internet access, Iceland.

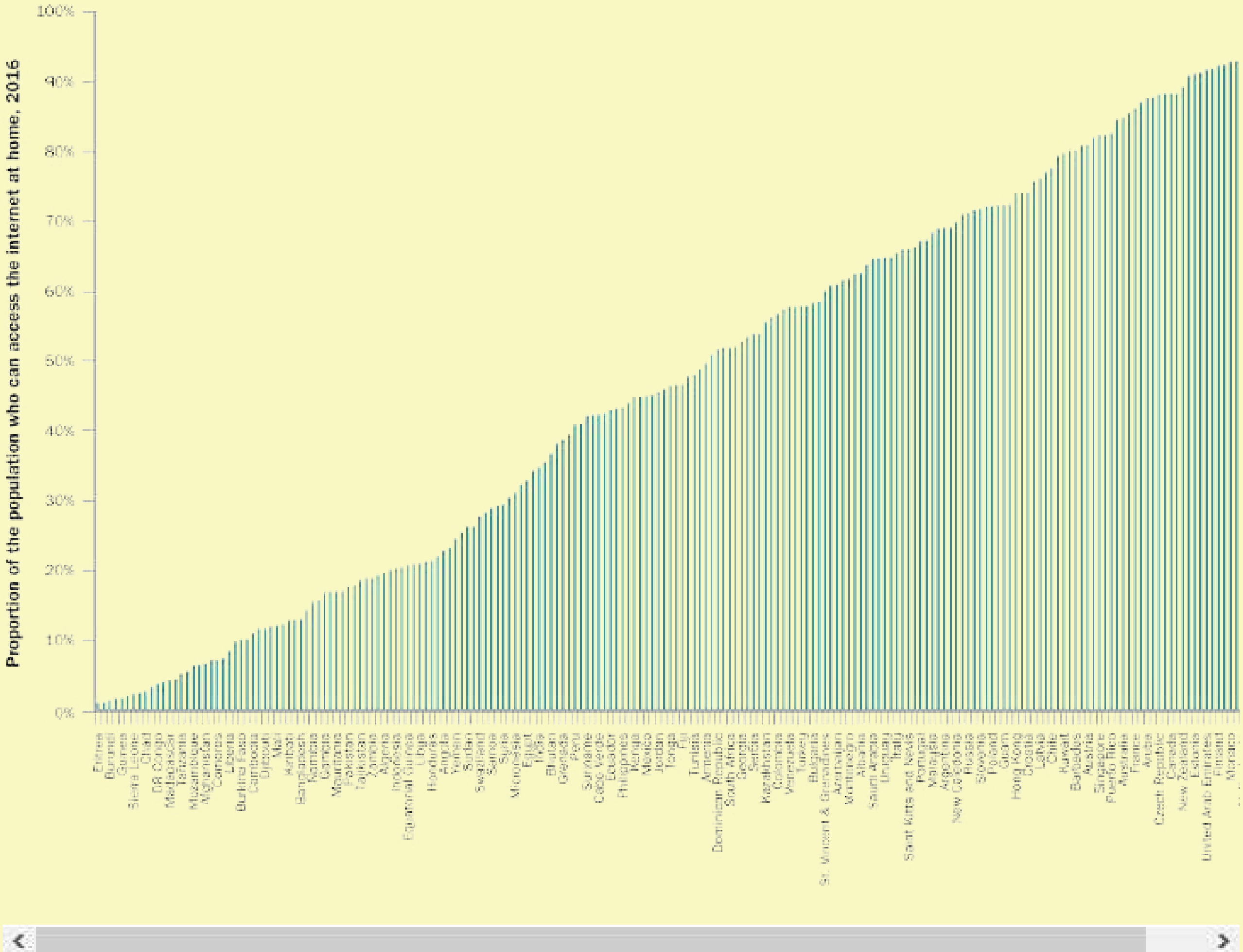

Figure 15.12 **The proportion of the population who can access the internet at home, 2016**

Source: The World Bank n.d., 'World development indicators', http://datatopics.worldbank.org/world-development-indicators/userguide.html.

To what extent has the growth in ITC boosted productivity?

Perhaps, surprisingly, this has been a matter of some controversy. Robert Solow once famously said, ‘You can see the computer age everywhere but in the productivity statistics’ (Solow 1987). What he meant was that relative to the magnitude of the investment in ITC, the productivity gains seemed modest. This has become known as the Solow paradox.

Figure 15.13 illustrates the Solow paradox. This figure shows an estimate of total labour productivity for Australia. In the 1970s, labour productivity grew at an average annual rate of 1.6 per cent. Since 1990, and despite the incredible technological advances we have seen since then, labour productivity has averaged an annual growth rate of 1.3 per cent, below the rate of the 1970s.

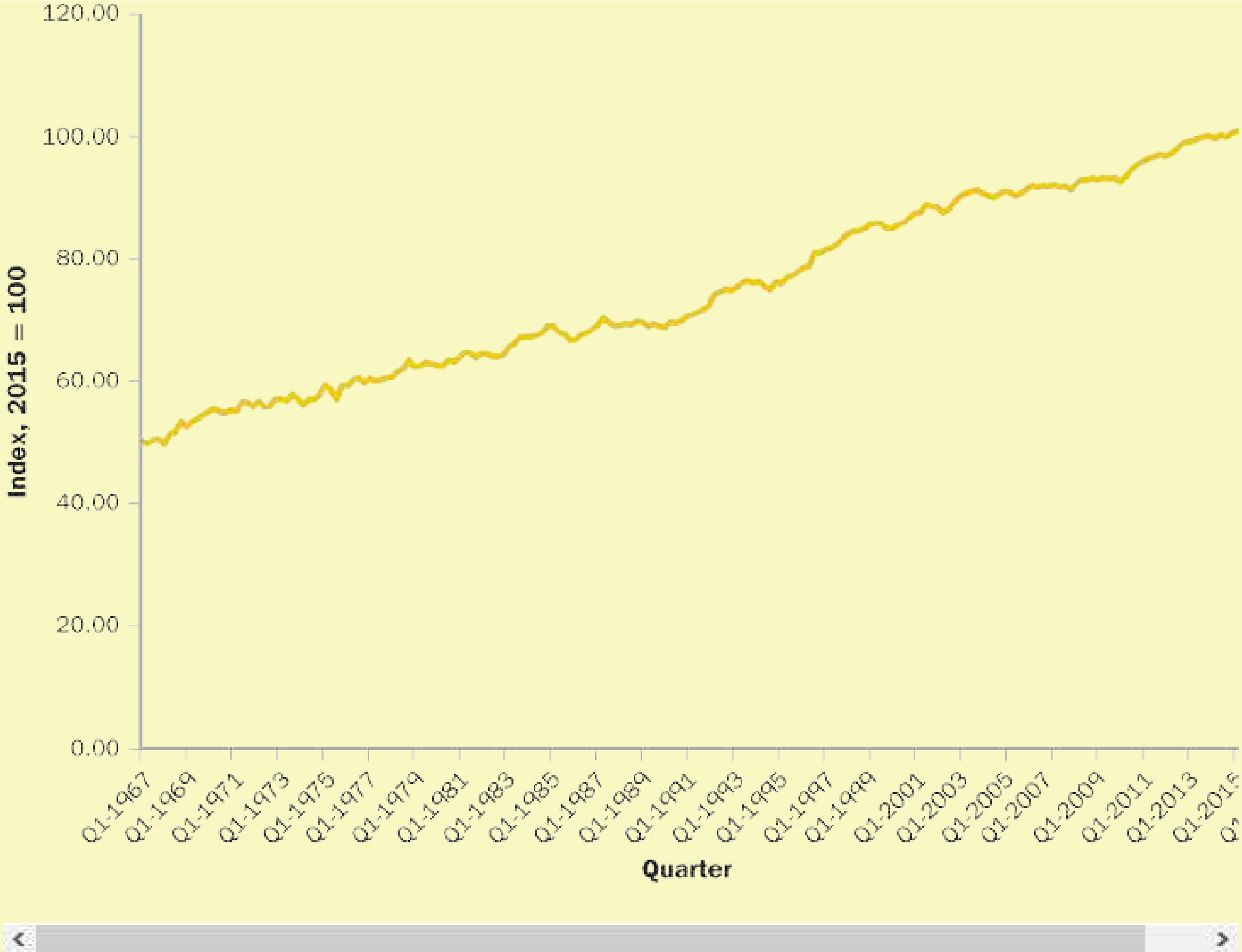

Figure 15.13 **Total labour productivity, Australia**

Note: Labour productivity in Australia has grown at a smaller rate since 1990 than it did in the 1970s.

Source: Based on data from Organization for Economic Co-operation and Development 2018, 'Early estimate of quarterly ULC indicators: Total labor productivity for Australia', retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/ULQELP01AUQ661S.

Various hypotheses have been advanced to explain the Solow paradox. One explanation is that it takes time for the productivity effects of new inventions to become apparent. For example, it has been estimated that it took around 40 years before the adoption of electricity had much of an impact on output (David 1990). If ITC is similar, it may simply be too early to expect substantial productivity improvements. A second explanation is that once depreciation is taken account of, ITC equipment is a relatively small part of the total capital stock. The argument here is that a significant proportion of investment in ITC is to replace superseded equipment (since ITC equipment very quickly becomes outmoded). This implies that large gross investment figures for ITC do not necessarily translate into large net investment figures. And it is net investment (i.e. investment more than replacement investment) that adds to the capital stock. A third reason that is suggested is that the productivity gains from ITC may well be illusory. We now work differently because of our computers, but are we working more efficiently? Think how long you spend tinkering with your essays now that editing is so much more feasible; such ‘fine-tuning’ was far more difficult when essays were handwritten or typed on a manual typewriter.

THINKING AS AN ECONOMIST 15.3

Does democracy boost economic growth?

Perhaps the central issue in international relations in the twenty-first century is the question of political structure: whether democracies outperform non-democracies across a range of dimensions. Clearly, this is an issue that extends beyond economics since a nation's political structure affects all aspects of life. Economists' main contribution to this debate has been to examine the economic impact that political structure has: specifically, do democracies have better economic growth outcomes than non-democracies?

There is a range of reasons why we might expect democracies to perform well. Two reasons seem particularly important. The first is the ability of democracies to punish poor-performing governments. A government that is not providing rising living standards over time is unlikely to survive at the ballot box. The central economic idea that people respond to incentives should make democratically elected governments favour policies that promote the wellbeing of the electorate—otherwise governments soon find themselves in opposition. Second, democracies tend to favour the rule of law more than authoritarian regimes. One key feature that has emerged from economists' empirical studies of economic growth is that corrupt regimes tend to have relatively poor growth outcomes. This is not at all surprising. Corruption makes it much harder for people to preserve the proceeds from their labour. Although corruption at some level probably occurs in all countries, the most corrupt regimes are societies with little regard for property rights and the rule of law; such countries feature arbitrary expropriations of people's wealth. Numerous studies have found that these extremely corrupt societies have dismal economic growth records (see Easterly 2002).

Yet what is surprising from the many empirical studies that have been made by economists, comparing a range of countries' growth experiences, is that once corruption and other factors that might affect growth are considered, democracy itself contributes very little. Some studies have even found that democracy has a *negative* impact on growth.

Should we conclude then that the economic growth benefits from democracy have been overstated? This is the subject of a great deal of research. One useful insight that has emerged is that democracy is best thought of not in terms of *levels* but as a stock variable. This may seem an esoteric distinction, but it seems to make a difference. The studies that have found democracy to have either a null or negative effect on growth look for statistical relations between indices of democracy and economic growth. These indices enter the analysis as levels—that is, a country with an index value of 75 in, say, 2003, is considered to be more democratic than a country with an index value of 50. What these studies show is that the first country does not necessarily have a better growth outcome than the second country, and findings of this type are the basis for the claim that democracy has no effect on growth. A paper by four US scholars has challenged this view (Gerring *et al*. 2005). Their research shows that if the length of time a country has been a democracy is considered, so that a country that has been democratic for some time has built up a larger stock of democracy than a country that has only recently undergone democratic reforms, then democracy does have a significant impact on growth. Like so much in life, it is experience that counts; according to this research the growth benefits from democracy are there, but they take time to become apparent.

▹▹ RECAP

The Solow–Swan model predicts countries will experience an end to growth in real per capita GDP as countries attain their steady state. This goes against the evidence that many countries have experienced growth for hundreds of years. An explanation for this contradiction is provided by technological change, which increases the steady-state capital–labour ratio and allows growth to continue.

SUMMARY

- In a closed economy the amount of investment that is undertaken is identically equal to the amount of national saving.
- The Solow–Swan model is based on a production function expressed in per capita terms, so that the level of per capita output (or income) depends on total factor productivity and the ratio of capital to labour. An increase in the amount of capital per worker will lead to a higher per capita income; this relationship is characterised by diminishing marginal productivity so that the biggest boosts to per capita income occur when the capital–labour ratio increases from a small base.
- A key finding of the Solow–Swan model is the characterisation of an economy's steady state, that is, a situation in which there is no further growth in per capita income. Such a steady state is achieved when all the investment (or saving) in the economy finances only replacement investment. Should the economy find itself with a per capita capital stock that is either higher or lower than the steady state per capita capital stock, there will be changes to the capital stock that will move the economy to the steady state. In that sense, economic growth occurs when the economy grows to attain its steady state.
- The diminishing marginal productivity of capital means that countries with relatively low per capita capital stocks will grow at a

faster rate than countries with relatively high per capita capital stocks. This gives rise to the possibility of convergence; relatively poor countries will catch up in terms of per capita income. This result depends on countries being identical in every respect, other than the size of their respective capital stocks. Empirical evidence supports convergence for those countries that seem to have broadly similar economic characteristics. This is known as conditional convergence.

- An explanation for countries experiencing long-run growth in real per capita GDP is provided by technological change, which increases the steady-state capital–labour ratio and allows growth to continue.

KEY TERMS

capital–labour ratio 380

comparative economic growth 386

conditional convergence 389

convergence hypothesis 385

neo-classical growth model 379

net investment 381

per capita income 380

replacement investment 381

saving function 383

saving rate 382

Solow–Swan model 380

steady state 380

REVIEW QUESTIONS

1. In a closed economy, what is the relationship between national saving and investment? LO 15.1 **EASY**
2. How can a production function be written in per capita terms? LO 15.2 **MEDIUM**
3. Why is the relationship between the per capita capital stock and per capita GDP drawn as a curved line? LO 15.3 **EASY**
4. What is the difference between replacement investment and net investment? How do these relate to total investment? LO 15.6 **EASY**
5. What is meant by the economy's 'steady state'? Under what conditions will the economy be at its steady state? LO 15.5 **EASY**
6. Explain the process by which the steady state is attained if (a) the per capita capital stock is below the steady state and (b) the per capita capital stock is above the steady state. LO 15.5 **MEDIUM**

7. According to the Solow–Swan model, under what circumstances will an economy have a growing level of per capita income? LO 15.6 **MEDIUM**
8. What is the convergence hypothesis? To what extent does the available empirical evidence support the convergence hypothesis? LO 15.8 **MEDIUM**

PROBLEMS

1. Under what circumstances would an economy's steady-state level of real per capita income fall? LO 15.5 **MEDIUM**
2. By international standards, Australia's household saving rate is relatively low. What are the implications of this for Australia's steady state per capita capital stock? Does the fact that Australia is an open economy make a difference? Explain. LO 15.1 **MEDIUM**
3. Consider the following table:

SOURCES OF GROWTH: EUROPEAN 'GOLDEN AGE' VERSUS ASIAN 'GROWTH MIRACLE'				
	TOTAL OUTPUT	OF WHICH CAPITAL	LABOUR	TFP
Golden age 1950–73				
France	5.0%	1.6%	0.3%	3.1%
UK	3.0%	1.6%	0.2%	1.2%
West Germany	6.0%	2.2%	0.5%	3.3%
Asian miracle 1960–94				
China	6.8%	2.3%	1.9%	2.6%
Hong Kong	7.3%	2.8%	2.1%	2.4%
Indonesia	5.6%	2.9%	1.9%	0.8%
Republic of Korea	8.3%	4.3%	2.5%	1.5%
Thailand	7.5%	3.7%	2.0%	1.8%
Singapore	8.5%	4.4%	2.2%	1.5%

Source: Adapted from Crafts N 1998, 'East Asian growth before and after the crisis', International Monetary Fund, IMF Working paper 98/137, https://www.imf.org/external/pubs/ft/wp/wp98137.pdf.

Using a Solow–Swan diagram, choose any one European country and any one Asian country and compare and contrast the factors that have contributed to growth. LO 15.6 **HARD**

4. Is an increase in saving always the right policy for a country? (*Hint*: What is the effect on current generations versus future generations of an increase in the savings rate?) LO 15.6 **HARD**
5. Use a Solow–Swan diagram to show the circumstances in which a country might prefer to invest $100 in new capital equipment rather than $100 on research and development that would result in using the existing capital stock more efficiently. LO 15.6 **MEDIUM**
6. Suggest reasons for why we do not see convergence across all of the world's economies. LO 15.8 **MEDIUM**
7. Given that relatively poor countries have low capital stocks, why might opening their economies to the rest of the world assist their convergence to the high-income countries? LO 15.7 **MEDIUM**
8. Explain how corruption might retard economic growth. LO 15.7 **MEDIUM**
9. Which is more likely to lead to long-run economic growth: investment in physical capital or investment in human capital? LO 15.7 **MEDIUM**
10. Review the material on the multiplier from Chapter 7. Suppose the marginal propensity to save increases. Contrast the effects of

this on output in the basic Keynesian model and in the Solow–Swan model. Explain. LO 15.6 **HARD**

REFERENCES

Aghion P and Howitt P 1998, ‘Introduction’, *Endogenous Growth Theory*, MIT Press, Cambridge, MA.

Bolt J, Inklaar R, de Jong H and Luiten van Zanden J 2018, Maddison Project Working Paper, no. 10, Maddison Project Database, version 2018, www.ggdc.net/maddison.

Crafts N 1998, ‘East Asian growth before and after the crisis’, International Monetary Fund, IMF Working paper 98/137, https://www.imf.org/external/pubs/ft/wp/wp98137.pdf.

David P 1990, ‘The dynamo and the computer: A historical perspective on the modern productivity paradox’, *American Economic Review (Paper and Proceedings)*, vol. 80, no. 2, pp. 355–61.

Easterly W 2002, *The Elusive Quest for Growth*, MIT Press, Cambridge, MA, Chapter 12.

European Alliance Against Malaria 2018, ‘Malaria and poverty’, https://www.malariaconsortium.org/userfiles/file/Past%20events/factsheet2%20-%20malaria%20and%20poverty.pdf.

Feenstra RC, Inklaar R and Timmer MP 2015, ‘The next generation of the Penn World Table’, *American Economic Review*, vol. 105, no.10, pp. 3150–82, www.ggdc.net/pwt.

Gerring J, Bond P, Barndt WT and Moreno C 2005, 'Democracy and economic growth: A historical perspective', *World Politics*, vol. 57 (April), pp. 323–64.

Hunger Notes 2018, 'Africa hunger and poverty facts', https://www.worldhunger.org/africa-hunger-poverty-facts-2018/.

Leke A and Barton D 2016, '3 reasons things are looking up for African economies', World Economic Forum, https://www.weforum.org/agenda/2016/05/what-s-the-future-of-economic-growth-in-africa/.

Odusola A 2018, 'Africa's economic growth prospects amongst the world's brightest', Inter Press Service, 23 August, http://www.ipsnews.net/2018/08/africas-economic-growth-prospects-amongst-worlds-brightest/.

Organization for Economic Co-operation and Development 2018, 'Early estimate of quarterly ULC indicators: Total labor productivity for Australia', retrieved from Federal Reserve Bank of St Louis (FRED), https://fred.stlouisfed.org/series/ULQELP01AUQ661S.

Solow R, 1987, 'We'd better watch out', New York Times Book Review, 12 July 1987, p. 36.

Solow R 1957, 'Technical change and the aggregate production function’, *Review of Economics and Statistics*, vol. 39, pp. 312–20.

Statista 2018, ‘Average life expectancy in Africa for those born in 2018, by gender and region (in years)’, https://www.statista.com/statistics/274511/life-expectancy-in-africa/.

Swan, T. (1956), ‘Economic growth and capital accumulation’, *The Economic Record*, vol. 32, pp. 334–61.

The World Bank n.d., ‘World development indicators’, http://datatopics.worldbank.org/world-development-indicators/user-guide.html.

PART 4

OPEN-ECONOMY MACROECONOMICS

INTERACTIONS WITH the rest of the world are the lifeblood of an economy such as Australia's. In this part of the text we look closely at some of the macroeconomic issues that emerge from a nation's dealings with the rest of the world. These are among the most important economic issues of the day. International trade, the first topic we consider, is widely believed by economists to be an important reason why many economies can prosper. Moreover, trade holds out the promise to improve economic conditions in developing economies. Yet trade has its critics, seen most acutely in the debates surrounding globalisation and the emergence of tensions between some of the world's major economies. Similarly, the effects of exchange rates on the economy can be a significant matter for concern; indeed, sudden large changes in the exchange rate can be the cause of crises, both economic and sometimes political. These issues we will also canvass, as well as the related topic of a nation's balance of payments.

GRADUATE SPOTLIGHT

Name: Lucy Mraz
Degree studied: Bachelors of Economics and Business Management
University: University of Queensland
Current position: Graduate Economist
Employer: Deloitte Access Economics

Early on, what interested you about a career in economics?

Coming from a Czech family, I witnessed the impact that economic policy had on the lives of my parents and relatives. Understanding the fundamentals of economics can lead individuals as well as entire communities to better choices. I liked the idea of empowering myself with economic tools and making a positive impact. It also helps that I enjoy maths, history, psychology, sustainability and philosophy—turns out economics is an excellent intersection of them all.

What did you learn in the macroeconomics course that has been most useful in your career?

Macroeconomics provides you with a toolkit of how to approach a problem, including everything from work to play. Macroeconomics helps us understand how our decisions and interactions shape our environment and ultimately our wellbeing. Core concepts such as supply shocks, policy incentives and economic multipliers all provide pieces to a larger puzzle.

What have you been up to since graduation?

After time off for a holiday, I started a graduate position at Deloitte Access Economics in Melbourne. As part of the Energy and Resources team, I have been working on projects for both public and private clients, contributing advice to clean energy projects, regulating utilities, addressing water scarcity and assessing environmental impact.

What does your current job involve? Where is it taking you?

In my current role I use both quantitative and qualitative analysis to provide policy and commercial advice on a range of issues in the Energy and Resource sector. This covers a breadth of topics, such as environmental protection regulations, Australia’s transition to renewable energy, the potential for a ‘hydrogen economy’ and managing water scarcity in regional Australia. Each project requires a variety of skills, starting with client liaison to understand their core needs, researching and gathering information, analysing and interpreting data and synthesising the findings in a report or presentation. With many opportunities for upskilling and promotion, a career in macroeconomics can take you in many directions.

What do you enjoy most about your job?

As economic advisers, we assist governments and private corporations to make decisions that will enhance community outcomes. I get to work with intelligent people and have opportunities to take various courses, both on industry issues (e.g. how Australia’s electricity market operates) and personal development. The project teams allow for a lot of creativity and autonomy even at the graduate level, which in turn empowers me to take the initiative on subsequent projects.

What advice would you share with students who want to pursue a career in economics?

Take up subjects that you’re interested in, not just those that seem most employable. You’re likely to find your passion in these and that is the most employable element of all. Of course, there are a lot of valuable tools to be learned in econometrics and advanced core subjects. Also, read beyond university materials, follow the news and read books on the subject. Not only will you be more aware of current issues, but you’ll learn to reapply concepts to real-life scenarios. This will also help identify what is good and bad writing—communication is a key skill to have in this field.

What are your thoughts on the future of the economics industry?

I think greater automation and artificial intelligence are set to eliminate the more repetitive tasks, allowing more time for varied tasks such as client handling and interpretation of findings. This may lead to a greater divergence between generalists and specialists in the field, with generalists having more time to focus on client liaison, while specialists will require technical programming skills.

INDUSTRY SPOTLIGHT

Name: Kristina Clifton

Current Position: Senior Economist (Director)

Employer: Commonwealth Bank Australia (CBA)

Could you give us a brief summary of your career in economics so far?

I hold a Bachelor of Applied Finance (Honours) degree from Macquarie University. Prior to joining CBA, I spent 10 years at the Reserve Bank of Australia (RBA). While there I analysed Australian and international financial markets and dealt in the domestic market operations section. Prior to working at RBA, I spent two years working as a Markets Economist at the NAB. It has been useful to have both public and private sector work experience.

What does your current job involve?

I joined the CBA in 2016 as an economist responsible for analysing and communicating trends and developments in the Australian economy. On a day-to-day basis, we monitor and analyse the flow of economic data to determine how the economy is tracking and understand the key trends. We also aim to forecast the economic outcomes and key trends for the coming years. We communicate these trends to CBA’s customers and the public through our written publications, presentations and media work.

What advice would you share with students who want to pursue a career in economics?

There are lots of different types of careers in economics. It’s worth trying to get some different experiences, such as cadet and/or intern positions etc., to help to gain an understanding of some of the different types of work. Also, apply yourself to your studies as some jobs are available to only those with high grades.

What current macroeconomic event are you watching with interest?

I am watching the developments in housing markets closely at the moment. Dwelling prices are declining after many years of strong growth. There are a number of factors at play, including a reduction in interest only lending by the larger banks, a general tightening in lending standards from the major lenders and a pullback in investor activity in the housing market. But Australia’s high rate of population growth, courtesy of immigration, and strong jobs market means that we are less likely to experience a crash. Economists and policy makers are not so much interested in the dwelling price falls but rather on how falling prices will impact the broader economy.

CHAPTER 16

International trade

After reading this chapter, you should be able to answer the following questions.

- 16.1 How does free trade contribute to the welfare of a country's citizens?
- 16.2 Under what circumstances will a country have a comparative advantage in the production of a commodity?
- 16.3 Under what circumstances will an economy be a net importer of a good or service?
- 16.4 Under what circumstances will an economy be a net exporter of a good or service?
- 16.5 Which groups in society win and which groups lose when an economy moves to free trade?
- 16.6 What are the effects of a tariff on (a) consumers, (b) producers and (c) the government?
- 16.7 What are the effects of a quota on (a) consumers, (b) producers and (c) the government?
- 16.8 In what sense is protectionism inefficient?

SETTING THE SCENE

Throughout history, many countries have found international trade to be an effective means of generating a sustained increase in income. To do so requires countries to identify commodities in which, relative to the rest of the world, they are efficient producers. Countries are said to have a comparative advantage in the production of such commodities. Comparative advantage can become the basis for countries developing successful export industries.

Nepal is an example of a country for which this is very much a live issue. In a ranking of the world's 229 countries by per capita gross domestic product (GDP), Nepal is listed at 197, (CIA 2017) making it one of the world's poorest countries. Finding a way of increasing per capita income for the Nepalese people is a priority.

For Nepal, a comparative advantage in natural products such as herbs, ayurvedic medicines and aromatic oils could become an important source of future prosperity. Buoyant global demand for natural remedies and a natural environment conducive to the production of these herbs provide a market opportunity to (literally) grow a successful Nepalese export industry.

Nepali herbs and herbal products are in high demand in the international market. 'Of around 100 species of herbs produced in the country, 30 are export quality. Nepal is famous in the world for its aromatic oil,' says Govind Prasad Ghimire, founding member and president of Nepal Herbs and Herbal Products Association (NEHHPA).

But are demand and a favourable natural environment enough to guarantee success? There are important questions about the broader economic conditions required to nuture a developing export industry. A potential comparative advantage, such as Nepal has in herbal products, is a necessary but not sufficient condition for success Infrastructure, a stable political environment and a skilled workforce are just some of the prerequisites needed to develop a new export industry. However, once all the pieces are in place, international trade has proven time and time again to be an important driver of improved living standards in countries like Nepal. In this chapter, we will show why.

Reference

Shrestha S 2017, ‘Nepal yet to cash in on global demand for herbs’, *My Republica*, 5 January, https://myrepublica.nagariknetwork.com/news/nepal-yet-to-cash-in-on-global-demand-for-herbs/. Copyright 2018 Nepal Republic Media Pvt.

16.1 PRODUCTION AND CONSUMPTION POSSIBILITIES AND THE BENEFITS OF TRADE

LO 16.1, 16.2

It is always possible for a country to act in isolation and ignore the opportunities to trade with other countries. As we will demonstrate, however, this would rarely be to a country's advantage. To see why, we must first turn to how an individual country might organise its productive activities in the absence of trade, using the concept of the production possibilities curve and what this might imply for the consumption opportunities available to that country's population. We then contrast this with the opportunities available should free trade occur.

16.1.1 THE PRODUCTION POSSIBILITIES CURVE

FIND ONLINE

To simplify things, we will consider economies in which only two goods (coffee and computers) are produced and consumed. In this context the **production possibilities curve (*PPC*)** is a graph that shows the maximum amount of each good that can be produced, at every possible level of production of the other good. (For an economy in which there are more than two goods produced and consumed, the *PPC* shows the maximum amount of each good that can be produced at any level of production of all the other goods. Focusing on the two-good case allows us to draw two-dimensional diagrams. However, our conclusions apply to the many-good case.) To see how the *PPC* is constructed, let us consider a hypothetical economy, which we will call Brazil and which has only one worker, Carlos, who can produce two goods, coffee and computers.

EXAMPLE 16.1 – THE *PPC* FOR A ONE-WORKER ECONOMY

A Brazilian worker, Carlos, can produce either 100 kg of coffee or one computer per week. Carlos works 50 weeks per year. Construct the *PPC* for this one-person economy.

To construct the *PPC* for this one-person economy, we first ask how much coffee Brazil could produce if Carlos worked full-time producing coffee. Since Carlos works for 50 weeks a year and can produce 100 kg of coffee per week, he could produce 5000 kg of coffee in a year. Thus, if we plot coffee production on the vertical axis of the graph of Brazil's *PPC*, the vertical intercept of the *PPC* will be 5000 kg of coffee per year (point *A* in Figure 16.1). Likewise, if Carlos produced only computers, he could produce one computer per week, or 50 computers per year. So, the horizontal intercept of Brazil's *PPC* is 50 computers per year (point *B* in Figure 16.1).

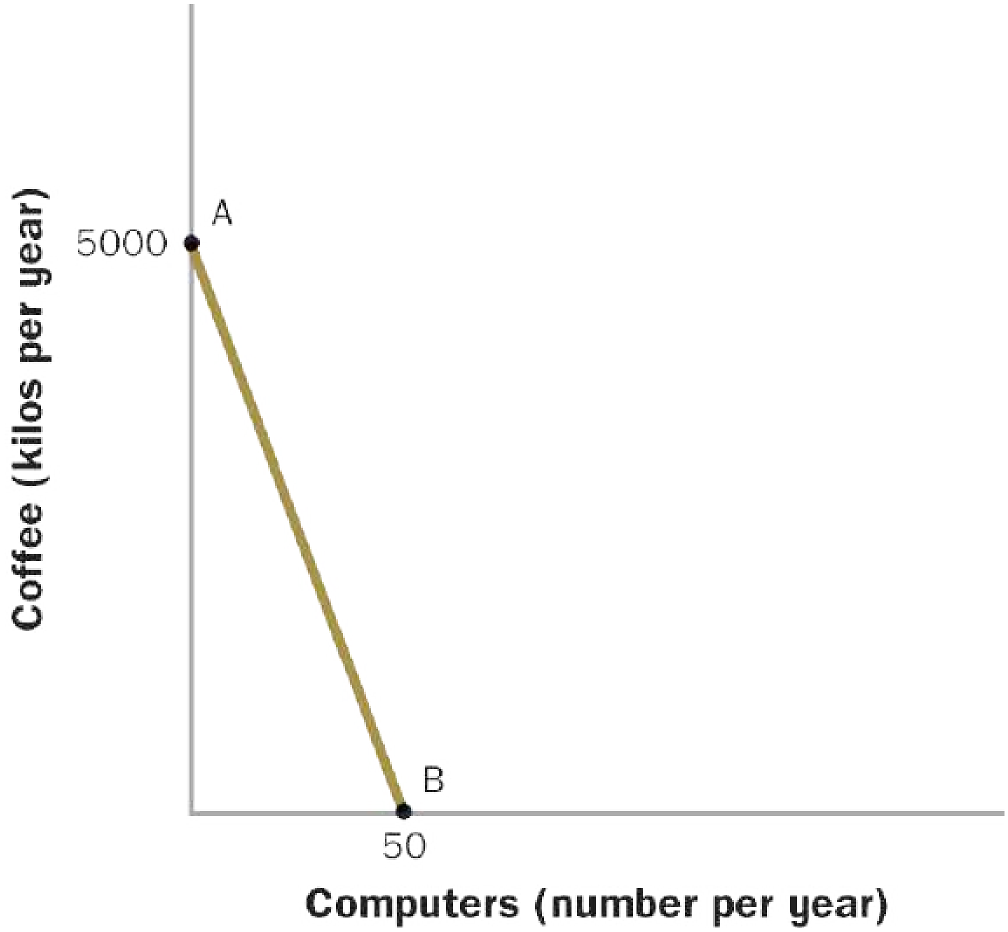

Figure 16.1 **Production possibilities curve for a one-worker economy**

Note: The slope of the PPC reflects Carlos's opportunity cost of computers in terms of coffee production forgone.

We have found where the Brazilian *PPC* intersects the two axes of the graph. To find the rest of the *PPC*, imagine that Carlos is producing only coffee (point *A* in Figure 16.1), when he decides that he would like to make some computers as well. This requires Carlos giving up some time spent producing coffee and transferring that time into producing computers. Remembering that it takes Carlos a week to produce one computer and that a week spent producing coffee yields 100 kg, it therefore follows that each computer made by Carlos requires him to forgo the opportunity to produce 100 kg of coffee. We say that the *opportunity cost* for Carlos of producing a computer is 100 kg of coffee. Since this is the amount of coffee that must be forgone for Carlos to produce one computer, the opportunity cost (OC) is reflected in the slope of the production possibilities curve connecting points *A* and *B*. Along the *PPC*, Carlos is trading off the production of coffee and computers at the rate of 100 kg of coffee for every computer:

$$\begin{aligned}\text{Slope} &= \text{Carlos's OC}_{\text{computers}} \\ &= \frac{\text{Loss in coffee}}{\text{Gain in computers}} \\ &= \frac{-100\text{ kg of coffee/week}}{1\text{ computer/week}} \\ &= -100\text{ kg of coffee per computer}\end{aligned}$$

EXAMPLE 16.2 – THE *PPC* FOR A TWO-WORKER ECONOMY

We now suppose there are two Brazilian workers, Carlos and Maria, who can each produce coffee and

computers. As before, Carlos can produce either 100 kg of coffee or one computer per week. Maria can produce either 100 kg of coffee or two computers per week. Both Carlos and Maria work 50 weeks per year. Construct the *PPC* for this two-person economy.

To construct the *PPC* for this two-person economy, we first ask how much coffee Brazil could produce if both Carlos and Maria worked full-time producing coffee. Between them they can produce 200 kg of coffee per week; so in 50 weeks they could produce 10 000 kg of coffee. Thus, the vertical intercept of Brazil's *PPC* will be 10 000 kg of coffee per year (point *A* in Figure 16.2). Likewise, if Carlos and Maria produced only computers, between them they could produce three computers per week, or 150 computers per year. So, the horizontal intercept of Brazil's *PPC* is 150 computers per year (point *B* in Figure 16.2).

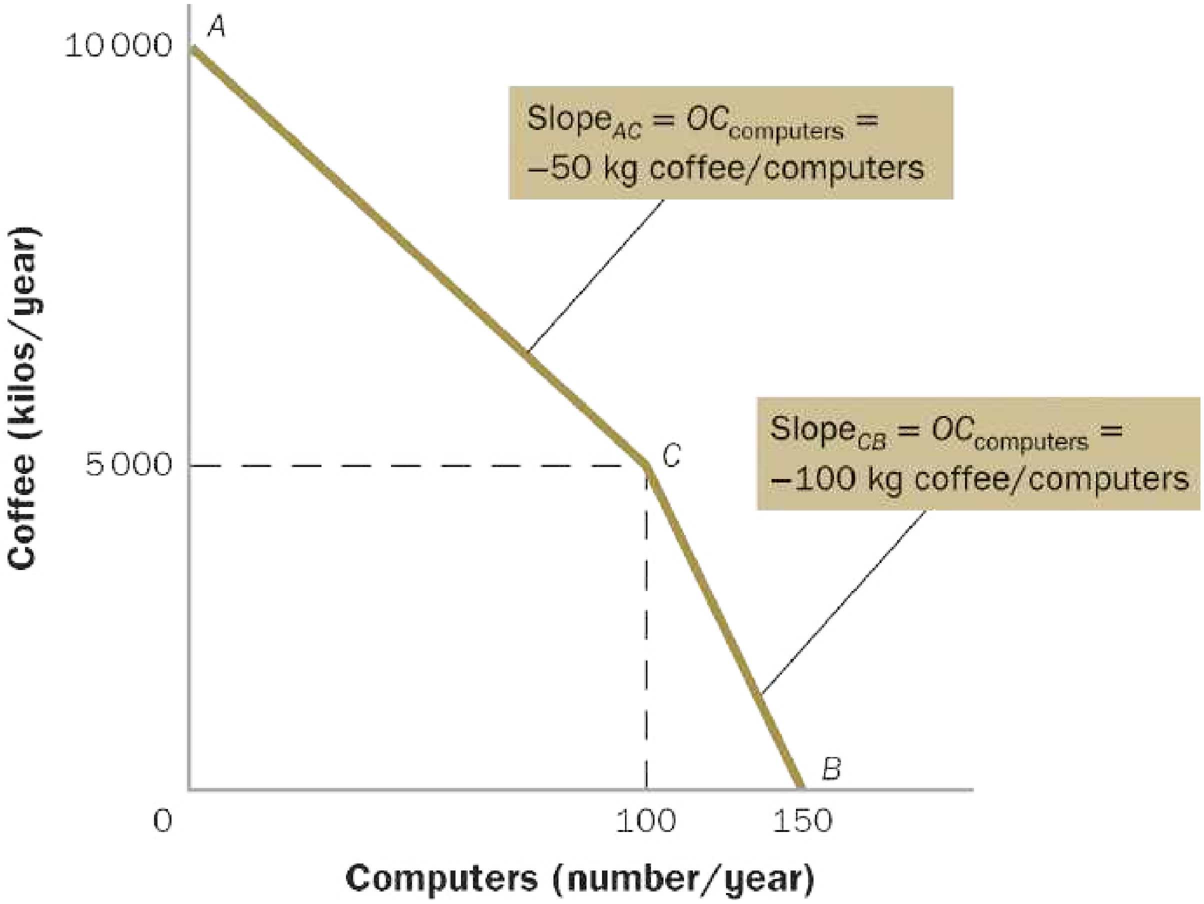

Figure 16.2 **Production possibilities curve for a two-worker economy**

In the portion of the *PPC* between points *A* and *C*, only Maria is producing computers, so the slope of the *PPC* in that range reflects Maria's opportunity cost of computers in terms of coffee production forgone. At point *C*, Maria spends all her time on computers and Carlos spends all his time on coffee. Between points *C* and *B* any additional computers must be produced by Carlos. Thus between points *C* and *B* the slope of the *PPC* reflects Carlos's opportunity cost of producing computers in terms of coffee production forgone.

Now imagine that Carlos and Maria are producing only coffee (point *A* in Figure 16.2), when they decide that they would like to make some computers as well. In this situation which worker should switch from producing coffee to producing computers?

To answer this question, we need to find the one with the lowest opportunity cost or **comparative advantage** in producing computers. To do this we must calculate these opportunity costs. For Carlos, this is the same as in Example 16.1; he can produce either 100 kg of coffee or one computer per week. Because producing a computer leaves him one week less to devote to coffee production, which reduces his coffee output by 100 kg, Carlos's opportunity cost of producing one computer is 100 kg of coffee. Maria can produce either 100 kg of coffee or two computers per week, so her opportunity cost of producing a computer is 100/2, or 50 kg of coffee. Because Maria's opportunity cost of producing a computer is lower than Carlos's, she has a comparative advantage in producing computers. In the interests of achieving the lowest possible opportunity cost it follows that Maria should be the one to move into computer production. For his part Carlos has a comparative advantage in producing coffee (see Concept check 16.1), so he should specialise in coffee.

Starting from point *A* in Figure 16.2, where only coffee is produced, we can imagine that Maria begins to produce increasing numbers of computers. The slope of the line emanating from point *A* equals Maria's opportunity cost of producing a computer, $OC_{\text{computers}}$, where cost is measured as a negative quantity:

$$\begin{aligned}\textbf{Slope} &= \textbf{Maria's } \mathbf{OC_{computers}} \\ &= \frac{\textbf{Loss in coffee}}{\textbf{Gain in computers}} \\ &= \frac{\mathbf{-100\ kg\ of\ coffee/week}}{\mathbf{2\ computer/week}} \\ &= \mathbf{-50\ kg\ of\ coffee\ per\ computer}\end{aligned}$$

As Maria increases the share of her time devoted to computer production, we move down along the straight line from point *A* in Figure 16.2. The slope of the *PPC* is constant in this region at −50 kg of coffee per computer, Maria's opportunity cost of computers.

Maria's time is limited to 50 weeks per year; if she keeps increasing her computer production she will eventually reach a point at which she produces only computers and no coffee. At that point annual production by the two workers taken together will be 100 computers (produced by Maria) and 5000 kg of coffee (produced by

Carlos, who spends all his time producing coffee). This combination of production is shown at point *C* on the *PPC*.

Once Maria's time is fully devoted to making computers, Brazil can increase its computer production only if Carlos begins to build some computers too. However, Carlos's opportunity cost, measured as kilograms of coffee forgone per computer produced, is greater than Maria's. Hence at point *C* the slope of the *PPC* changes, creating a 'kink' in the graph. The slope of the *PPC* to the right of point *C* is given by Carlos's opportunity cost of producing computers, −100 kg of coffee.

Note that the slope of the *PPC* to the right of point *C* is more negative than the slope to the left of point *C*, so that the *PPC* declines more sharply to the right of that point. The fact that the opportunity cost of a computer increases as more computers are produced (the *principle of increasing opportunity cost*) implies the outwardly bowed shape that is characteristic of a production possibilities curve, as shown in Figure 16.2.

CONCEPT CHECK 16.1

Example 16.2 showed that Maria has a comparative advantage in producing computers. Show by comparison of opportunity costs that Carlos has a comparative advantage in producing coffee.

EXAMPLE 16.3 – THE PRODUCTION POSSIBILITIES CURVE FOR A MANY-WORKER ECONOMY

Although the economy considered in Example 16.2 included only two workers, the main ideas apply to economies with more workers. Suppose, for example, that we added a third Brazilian worker, Pedro, whose opportunity cost of producing computers is higher than Maria's but lower than Carlos's.

The *PPC* for this three-person economy would look something like Figure 16.3. Between points *A* and *C* on the *PPC* shown in Figure 16.3, all computers are produced by Maria, who has the greatest comparative advantage in computer production. Thus, the slope of the *PPC* between points *A* and *C* is determined by Maria's opportunity cost, measured as the amount of coffee production forgone for each additional computer produced.

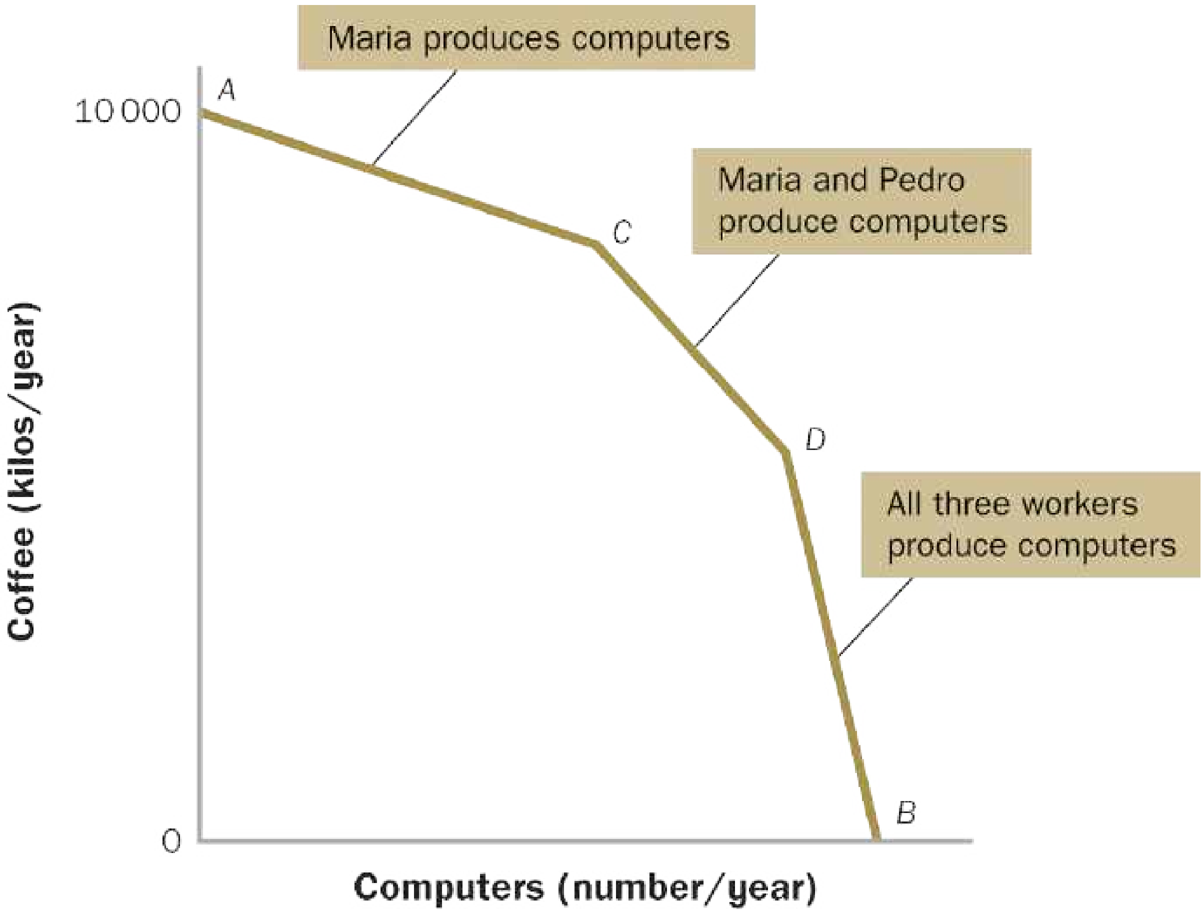

Figure 16.3 **Production possibilities curve for a three-worker economy**

At point *C*, Maria is dedicating all her time to computer production, so someone else must produce any additional computers. Pedro has the next lowest opportunity cost of producing computers, so (following the *principle of increasing opportunity cost*) he begins to produce computers at point *C*. The slope of the *PPC* between points *C* and *D* is determined by

Pedro’s opportunity cost, which is greater (more negative) than Maria’s opportunity cost. At point *D* in Figure 16.3, Pedro is producing all the computers he can; so, finally, Carlos begins to produce computers as well. Thus, the slope of the *PPC* between points *D* and *B* reflects Carlos’s opportunity cost. Because opportunity cost increases as we move from left to right in the figure, the slope of the *PPC* becomes more and more negative, leading once again to the outwardly bowed shape.

The *PPC* for a three-person economy has two ‘kinks’, at points *C* and *D*. Between points *A* and *C* only Maria produces computers, and the slope of the *PPC* represents her opportunity cost of producing computers. At point *C* Maria is spending all her time making computers, so any additional computers will be produced by Pedro, whose comparative advantage is the next greatest. Between points *C* and *D* the slope of the *PPC* is determined by Pedro’s opportunity cost. At point *D* Pedro is also fully occupied producing computers, so that Carlos must begin producing them if computer production is to increase further. Between points *D* and *B* the slope of the *PPC* reflects Carlos’s opportunity cost.

By similar logic, we can construct a case in which there are many workers, perhaps millions. With many workers, the part of the nation’s *PPC* that is associated with each individual worker becomes very small. As a result, the *PPC* for an economy with many workers has a smoothly bowed shape, as shown in Figure 16.4. With a smoothly curved *PPC*, the slope at each point still reflects the opportunity cost of producing an additional computer, as illustrated in Figure 16.4. For example, at point *C* in Figure 16.4 the opportunity cost of producing an extra computer is given by the slope of the line that just touches the *PPC* at that point. Because computers will be produced first by workers with the greatest comparative advantage (the lowest opportunity cost), the slope of the *PPC* becomes more and more sharply negative as we read from left to right in the figure (e.g. compare point *C* with point *D*).

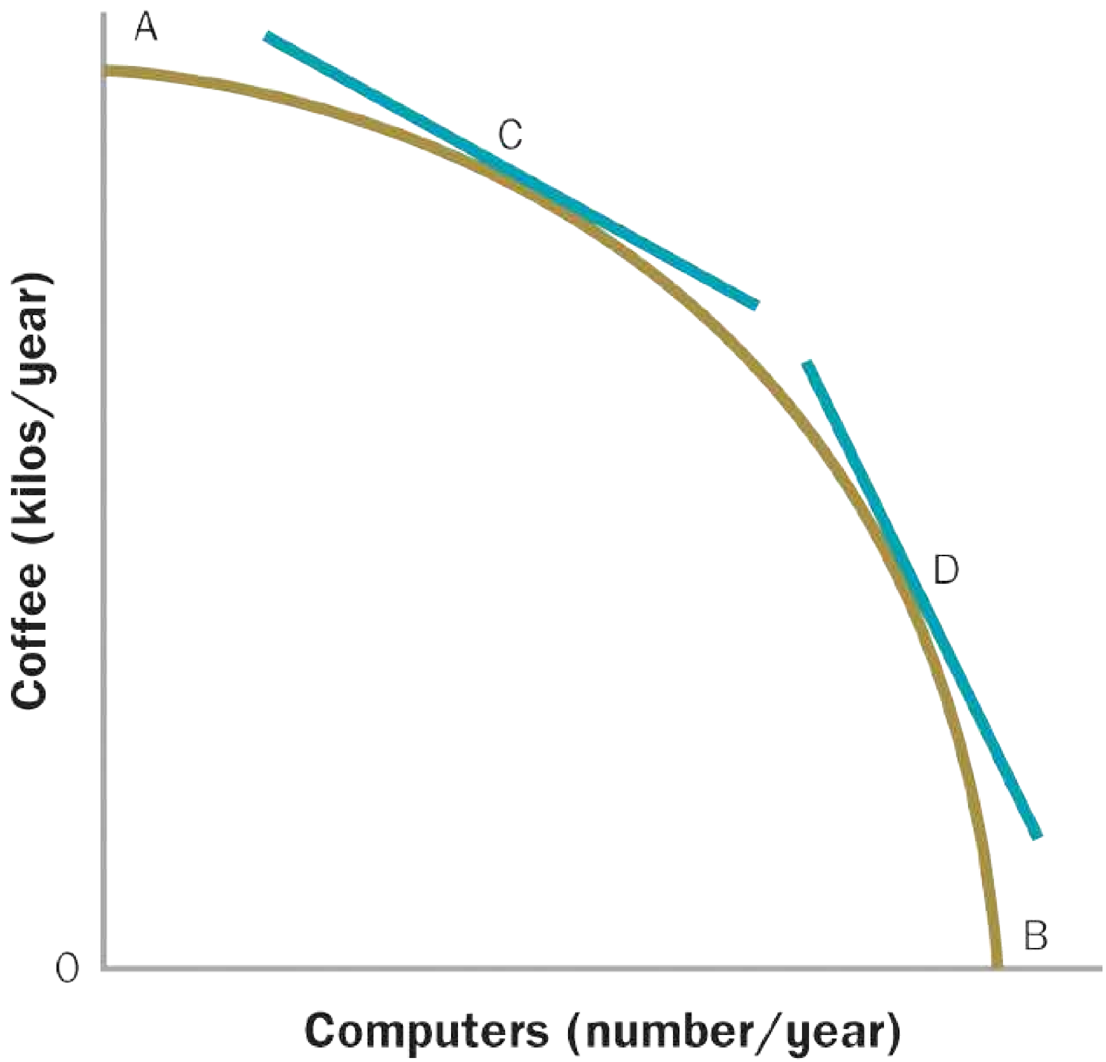

Figure 16.4 **Production possibilities curve for a many-worker economy**

To repeat, the *PPC* for a many-worker economy has a smooth, outwardly bowed shape. At each point on the *PPC*, the slope of the curve reflects the opportunity cost, in terms of coffee forgone, of producing an additional computer. For example, the opportunity cost of a computer at point *C* equals the slope of the line that just touches the *PPC* at that point, and the opportunity cost of a computer at point *D* equals the slope of the line that just touches the *PPC* there. Because the opportunity cost of producing another computer increases as more computers are produced, the slope of the *PPC* becomes more and more negative as we read from left to right on the graph.

16.1.2 CONSUMPTION POSSIBILITIES WITH AND WITHOUT INTERNATIONAL TRADE

A country's *PPC* shows the quantities of different goods that its economy can produce. However, economic welfare depends most directly not on what a country can *produce* but on what its citizens can *consume*. The combinations of goods and services that a country's citizens might feasibly consume are called the country's **consumption possibilities**.

The relationship between a country's consumption possibilities and its production possibilities depends on whether the country is open to international trade. In a closed economy with no trade, people can consume only the goods and services produced within their own country. In a closed economy, then, society's consumption possibilities are identical to its production possibilities. A situation in which a country is economically self-sufficient, producing everything its citizens consume, is called **autarky**.

The case of an open economy, which trades with the rest of the world, is quite different. In an open economy people are not restricted to consuming what is produced in their own country, because part of what they produce can be sent abroad in exchange for other goods and services. Indeed, we will see in this section that opening an economy to trade may allow citizens to consume more of everything. Thus, in an open economy a society's consumption possibilities are typically greater than (and will never be less than) its production possibilities. We will illustrate this critical point with reference to the simple two-worker economy studied earlier in the chapter, and then consider the more general case of a many-worker economy.

EXAMPLE 16.4 – BRAZIL'S CONSUMPTION POSSIBILITIES WITH TRADE

Two Brazilian workers, Carlos and Maria, can produce coffee and computers as described in Example 16.2**. Initially the country is closed to trade, and Maria produces only computers while Carlos produces only coffee. Then the country opens to trade. World prices are such that 80 kg of coffee can be traded for one computer on the international market and vice versa. How does the opening of Brazil to trade affect Maria's and Carlos's opportunity to consume coffee and**

computers?

If Maria is producing only computers and Carlos is producing only coffee, then Brazil is at point *C* on the *PPC* shown in Figure 16.5 (which is the same as the *PPC* shown in Figure 16.2). At that point Maria is spending all her time producing 100 computers a year and Carlos is spending all his time producing 5000 kg of coffee a year. If Brazil were closed to trade, Maria and Carlos could obtain more coffee only by producing fewer computers. Specifically, starting at point *C* on the *PPC*, they could obtain 50 additional kilograms of coffee by giving up one computer—by having Maria work half a week less on computers and half a week more producing coffee.

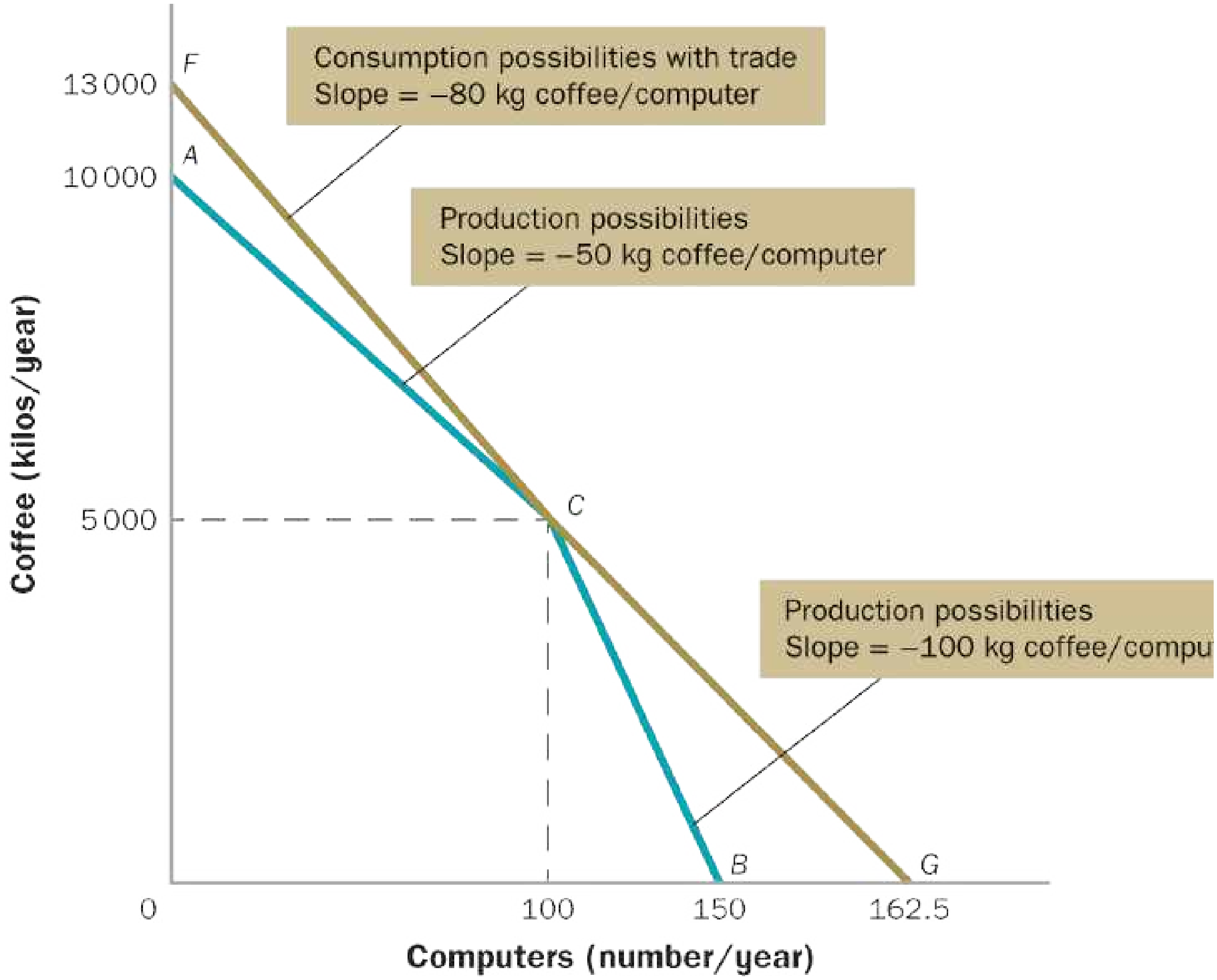

Figure 16.5 **Brazil's consumption possibilities with trade**

If Brazil opens up to trade, however, we will suppose that Maria and Carlos can get 80 kg of coffee in exchange for one computer simply by trading computers for coffee on the international market. In other words, they can get an extra 80 kg of coffee for each computer they give up. To illustrate the degree to which the opportunity to trade benefits Brazil, recall from Example 16.2 that, with no trade, Maria's and Carlos's maximum coffee consumption is 10 000 kg per year (the vertical intercept of the Brazilian *PPC*). With the opportunity to trade, Maria can trade the 100 computers produced at point *C* for 8000 kg of coffee (80 kg of coffee per computer × 100 computers). Together with the 5000 kg of coffee Carlos produces, the coffee obtained through trade raises Brazil's maximum annual coffee consumption from 10 000 to 13 000 kg per year, as indicated by point *F* in Figure 16.5. Because trade creates the possibility for Brazil to consume as much as 13 000 kg of coffee per year, point *F* is included in Brazil's consumption possibilities, though it would have been **unattainable** to the Brazilians before the opening up of trade.

Furthermore, with the opportunity to trade, Maria and Carlos can consume any combination of coffee and computers represented on the straight line between points *F* and *G* in Figure 16.5. This straight line has a slope of 80 kg of coffee per one computer, which is the rate at which the two goods can be exchanged on the international market. So simply by trading computers for coffee, Maria and Carlos can improve their consumption possibilities at any point except *C*, where their production and consumption possibilities are the same.

Suppose, for example, that starting from point *C* on Brazil's *PPC*, shown in Figure 16.5, Maria and Carlos decide they want to consume more computers rather than more coffee. With no ability to trade, the opportunity cost of obtaining one more computer at point *C* would be 100 kg of coffee—that is, the amount of coffee that would be lost by having Carlos work one more week at producing an extra computer, and hence one week less at producing coffee. With trade, however, Brazilians can obtain an extra computer at the cost of only 80 kg of coffee (the price of computers on the international market). In the extreme, if they wanted to consume only computers the Brazilians could trade the 5000 kg of coffee Carlos produces at point *C* for 5000/80 = 62.5 computers, for a total consumption (with the 100 computers Maria produces) of 162.5 computers. This maximum consumption amount is indicated by point *G* in Figure 16.5. Comparing point *G* with point *B*, we can see that the opportunity to trade increased Brazil's maximum consumption of computers from 150 to 162.5.

The line *FG* represents Brazil's consumption possibilities—the combinations of coffee and computers that Carlos and Maria might feasibly consume—when the Brazilian economy is open to trade. By comparing Brazil's consumption possibilities without trade (line *ACB*) and with trade (line *FG*), we can see that Maria and Carlos have a wider range of consumption opportunities when their economy is open.

CONCEPT CHECK 16.2

Prior to the opening of trade, suppose that Brazilian residents consumed 80 computers per year. How much coffee were they able to consume each year? Suppose that the Brazilians open up to trade, but they choose to continue to consume 80 computers per year. Now how much coffee can they consume? In answering, use the *PPC* and consumption possibilities we found in Example 16.2. Does opening to trade make the Brazilians better off?

The same points just made in Example 16.4, which illustrates a two-worker economy, apply in the case of a many-worker economy. Figure 16.6 shows this more general case. With many workers, the *PPC* (curve *ACB* in the figure) is smoothly bowed. Point *A*, where the *PPC* intercepts the vertical axis, indicates the maximum amount of coffee the economy can produce, and point *B*, the horizontal intercept of the *PPC*, shows the maximum number of computers the economy can produce. The intermediate points on the *PPC* represent alternative combinations of coffee and computers that can be produced. As in the two-worker economy, the slope at each point on the *PPC* indicates the opportunity cost of producing one additional computer. The more computers that are already being produced, the greater the opportunity cost of increasing computer production still further. Hence the slope of the *PPC* becomes increasingly negative as we read from left to right.

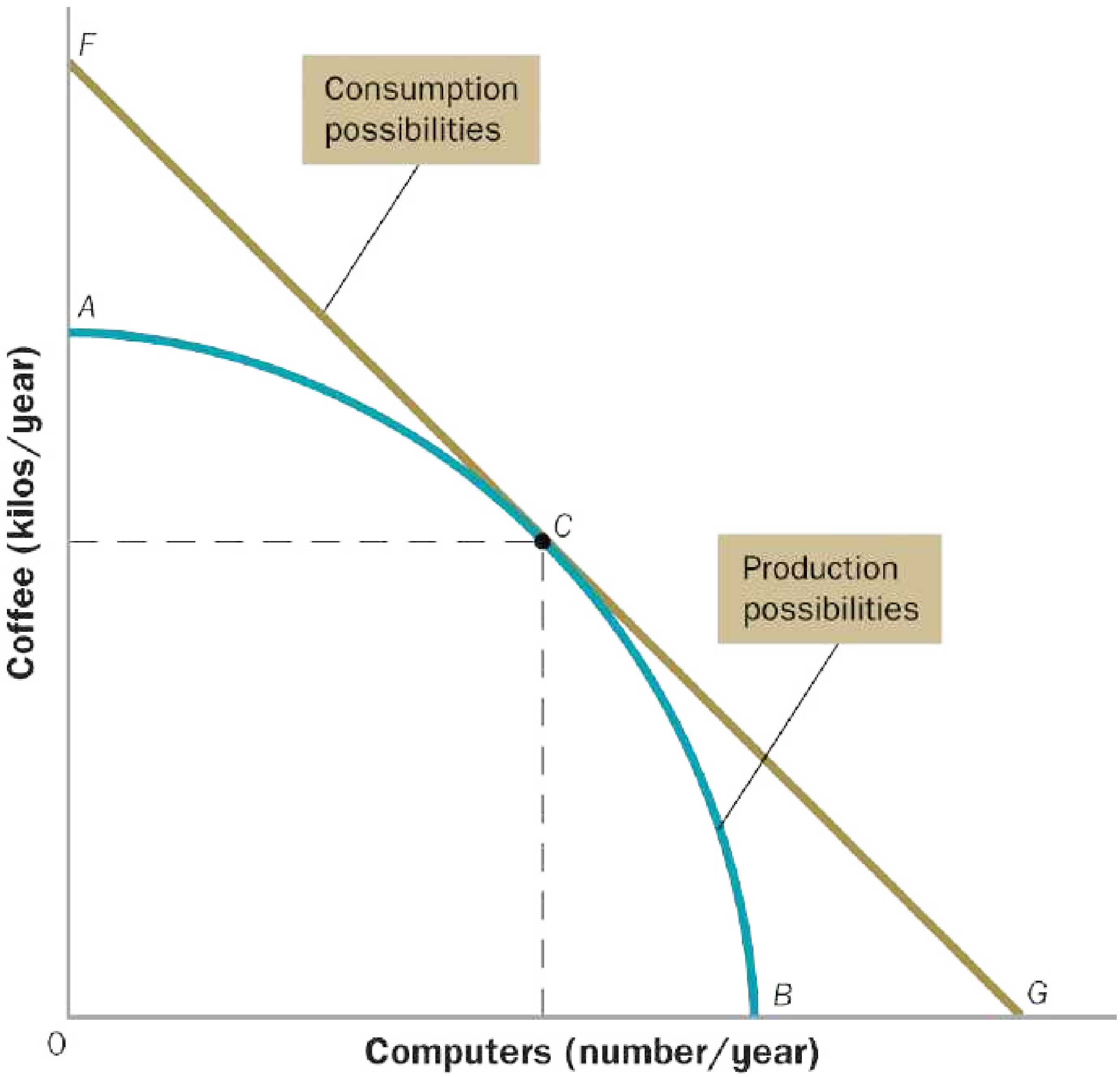

Figure 16.6 **Consumption possibilities in a many-worker economy**

Note: The *PPC* for a many-worker economy is the smooth, outwardly bowed line *ACB*. If the country is open to trade its consumption possibilities lie on the line *FG*, which just touches the *PPC* at point *C*. The slope of this line equals the rate at which coffee can be traded for computers at world prices. The country maximises its consumption possibilities by producing at point *C* and then trading to reach its most desired point on line *FG*.

Line *FG* shows the consumption possibilities for this economy if it is open to trade. This line has two key features. First, it is drawn so that it just touches the *PPC* at point *C* in Figure 16.6. Second, the slope of line *FG* is determined by the relative prices of coffee and computers on the world market. Specifically, as in the two-worker case (Figure 16.5), the slope of line *FG* tells us how much coffee must be exchanged on world markets to obtain an additional computer.

With access to international trade, Brazil can consume the greatest amount of both coffee and computers by producing at point *C* on the *PPC* and trading on the international market to obtain the desired combination of coffee and computers on line *FG*. (The exact combination of coffee and computers Brazilians will choose depends on the needs and wants of the population.)

Why should the Brazilians produce at point *C*? At point *C*, and only at that point, the slope of the *PPC* equals the slope of the consumption possibilities line, *FG*. Hence, only at point *C* is the opportunity cost of increasing domestic computer production equal to the opportunity cost of purchasing an extra computer on the world market. If the opportunity cost of producing a computer domestically exceeded the opportunity cost of purchasing a computer on the world market, Brazil would gain by reducing its computer production and importing more computers. Likewise, if the opportunity cost of producing a computer domestically was less than the opportunity cost of purchasing a computer abroad, Brazil would gain by increasing computer production and reducing computer imports. Brazil's best production combination, therefore, is at point *C*, where the domestic and international opportunity costs of acquiring an extra computer, measured in terms of coffee forgone, are equal.

We have already stated the general conclusion that can be drawn from this analysis. Once again, by opening itself up to trade a country can consume more of every good than if it relied solely on its own production (a situation known as autarky). Graphically, the consumption possibilities line in Figure 16.6 lies above the *PPC*, showing that through trade Brazil can consume combinations of computers and coffee that would not be attainable if its economy were closed to trade. (The single point at which consumption possibilities do *not* lie above production possibilities in Figure 16.6 is at point *C*, where production possibilities and consumption possibilities are the same. If Brazilian residents happen to prefer the combination of computers and coffee at point *C* to any other point on *FG*, then they obtain no benefit from trade.)

BACKGROUND BRIEFING 16.1

The World Trade Organization and the case for free trade

Among the many important changes to the world economic environment in the aftermath of World War II was the establishment of the General Agreement on Tariffs and Trade

(GATT). This was an attempt to bring order to international trade. Chaotic trading arrangements prior to the war, and the aggressive use of tariffs and trade barriers, were seen as one of the contributing factors to the Great Depression of the 1930s. A coordinated approach to trade and a more formal dispute-resolution process when countries disagreed over trading arrangements was thought to be an important step towards easing international tensions and promoting prosperity across nations.

The GATT has subsequently evolved into the World Trade Organization (WTO), which formally came into existence on 1 January 1995 as an outcome of the so-called ‘Uruguay Round’ of trade negotiations. Whereas GATT focused almost exclusively on trade between nations in goods, the WTO also deals with trade in services and in intellectual property, both of which were a minuscule proportion of world trade when GATT was established, but which are now of large and growing importance.

The WTO has a set of broad guiding principles. First, that trade should not be discriminatory; for example, nations belonging to the British Commonwealth used to give each other ‘most favoured nation’ status—that is, trade between these countries would proceed on more favourable terms than were extended to non-Commonwealth countries. Such arrangements are now not in accordance with WTO principles. Second, trade should be freer; tariffs, quotas and other impediments to free trade between nations should be gradually removed according to schedules arrived at through negotiation. Third, trade should be competitive, in the sense that the prices that govern trade should reflect market conditions and be not distorted in any way. And fourth, that the special circumstances of developing countries be recognised and assistance offered where appropriate to allow these countries to participate in the world trading system.

The WTO operates through the implementation of periodic trade rounds. These are gatherings of the member countries of the WTO aimed at securing consensus about further reform and liberalisation of the international trading system. There have been nine trade rounds since 1947. The most recent, the Doha Round, began in November 2001. Progress, however, has been slow. A series of ministerial meetings have been held since Doha to try to implement the aims of the Doha meeting, particularly about reform of agricultural trade, with mixed success. At the time of writing the most recent of these was held in Bali in 2013.

Assessing the success of the WTO and its predecessor, the GATT, like so much in economics, is complex. Part of the problem is to establish criteria against which to evaluate the impact of trade reform. On some measures, trade reforms have created significant gains for countries. For example, the World Bank has calculated that moving to free trade would increase the world's income in 2015 by US$290 to US$460 billion with the gains being greatest for developing countries (Van der Mensbrugghe 2018).

Yet these are aggregate figures and hide the fact that not everyone always wins from liberalising trade. For this reason, there is often vehement opposition to moves to open trade, as we have seen in the various protest movements that have evolved in recent years and that vigorously oppose organisations such as the WTO. The basic problem is that countries' underlying economic structures are not unaffected by trade reform. This creates winners and losers within individual countries. Specifically, opening a country to a less regulated trading environment almost certainly means that a smaller range of goods and services will be produced in that country. In fact, there are real advantages available to countries who choose to specialise in the production of a small range of goods and services and who then import the rest of the goods and services they need. But this means that some people will lose their jobs as what they once produced is now sourced from elsewhere. These people may be forced to accept employment in very different sectors of the economy to where they once worked, perhaps at what we in the West would regard as extremely low wages, with often quite terrible working conditions. Although, in theory, it should be possible for the winners under trade liberalisation to compensate the losers and still retain a net gain, in practice it is all too easy to point to examples where this has not happened.

Our purpose in the remainder of this chapter is to present the economic argument for free trade. This argument states that a country's overall welfare is enhanced by joining the international trading system. Without question this is one of the most important pieces of economic analysis that you will learn. It underpins the whole rationale for the WTO and the push towards even greater globalisation in the twenty-first century. For that reason, it is an argument that should be more widely understood, particularly by opponents of international trade. Trade has the potential to enrich people's lives, and indeed has already done so for a large proportion of the world's population.

16.1.3 COMPARATIVE ADVANTAGE AND INTERNATIONAL TRADE

In Examples 16.2 and 16.3 we demonstrated the principle of comparative advantage, namely that the most efficient way to organise production from society's point of view is to have workers specialise in the activity in which they have the relatively lowest opportunity cost or comparative advantage. The same consideration applies in the case of trade between nations; that is, there are gains to be had if countries focus their activities on the production of commodities in which, relative to other countries, they have a comparative advantage. We will use the framework of the many-worker *PPC* to show this.

Consider two countries, Brazil and South Korea. Both countries can produce two commodities, coffee and computers. However, we will assume that Brazil is relatively more efficient than South Korea in coffee production; that is, within Brazil the production of extra coffee requires fewer resources to be transferred from computer production than would be the case in South Korea. The implications of this assumption are illustrated in Figure 16.7, which shows the respective production possibilities curves for the two countries.

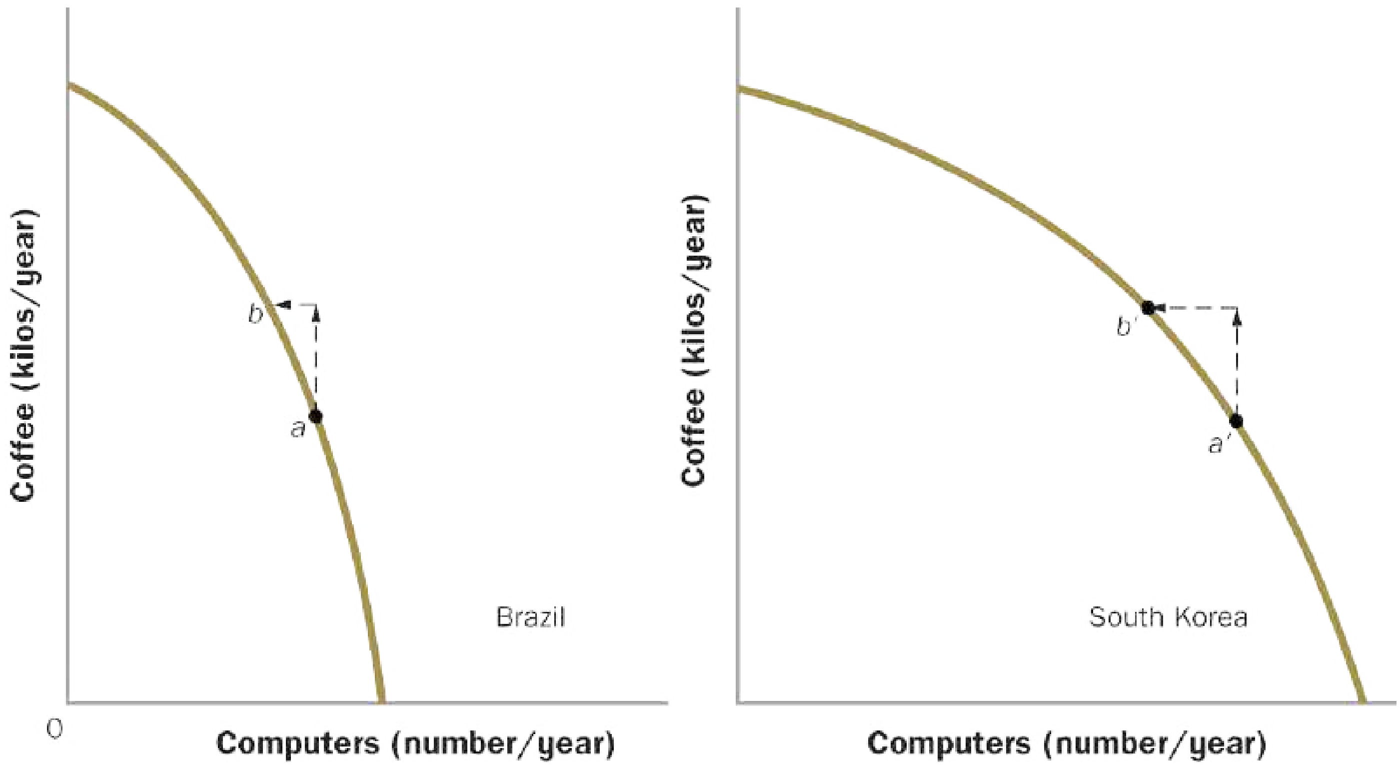

Figure 16.7 **Comparative advantage**

Note: The slopes of the respective production possibilities curves show that Brazil has a comparative advantage in coffee.

The assumption we have made about comparative advantage, that Brazil is relatively more efficient than South Korea in the production of coffee, is reflected in the slopes of the respective *PPC*s. As you can see from Figure 16.7, Brazil's *PPC* is drawn relatively steeper than South Korea's *PPC*. Suppose, for example, that Brazil was producing at point *a* on its *PPC* and wished to move its production to point *b*, increasing its coffee production at the expense of the production of computers. Suppose also that South Korea, starting at point *a′* on its *PPC*, wished to do the same: increase coffee production by the same amount as Brazil and decrease the production of computers, moving to point b'. From Figure 16.7 you can see that in Brazil's case this would involve a smaller reduction in the number of computers produced than would be the case in South Korea. This indicates that Brazil has a comparative advantage in the production of coffee; fewer resources need to be transferred from the production of computers to facilitate extra coffee production in Brazil than is the case in South Korea. Or, to put it another way, Brazil is relatively more efficient in the production of coffee than is South Korea.

Let us consider both countries in autarky. Figure 16.8 shows production taking place at point a for Brazil, and point a' for South Korea. Let us focus on Brazil first. Starting from point a, the rate at which coffee must be given up in return for computers is given by the slope of the line FG. We will suppose the numerical value of this slope is −100 kg of coffee per extra computer (or 0.01 of a computer for every extra kilogram of coffee). For South Korea, producing at a', the rate at which computers must be given up in return for coffee is given by the slope of the line $F'G'$, which we will suppose to be −60 kg of coffee per extra computer (or 0.017 of a computer for every extra kilogram of coffee).

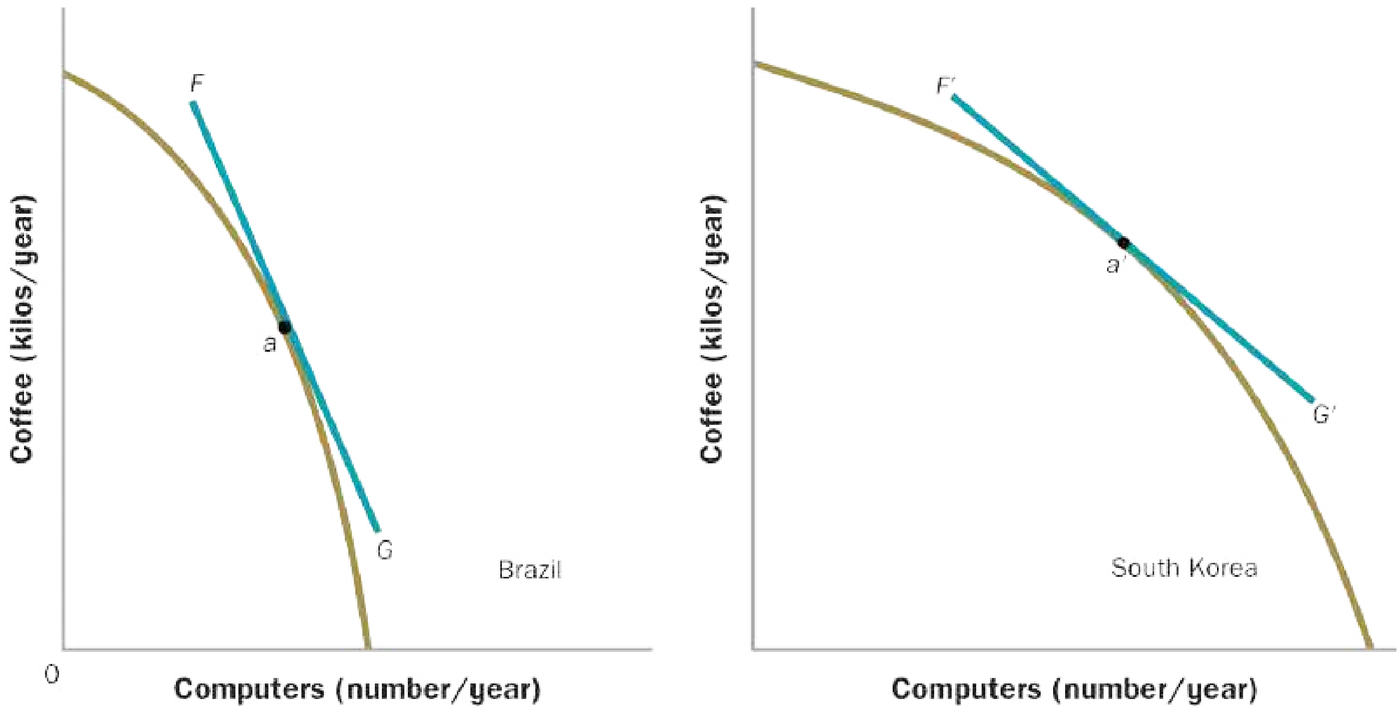

Figure 16.8 **Production in autarky**

Note: In autarky, countries can produce at any point on their production possibilities curves. For each country the rate at which coffee and computers must be exchanged should production vary is given by the slope of the line that just touches the production possibilities curves at the respective production points.

What happens if trade between the two countries is now opened? We will suppose that trade can take place at the rate of 80 kg of coffee per computer. The consumption possibilities line for each country, once trade is opened, will therefore have a slope of −80 kg of coffee per extra computer (or 0.014 of a computer for every extra kilogram of coffee). The consumption possibilities line, which applies to both countries, is shown by *HI* in Figure 16.9 .

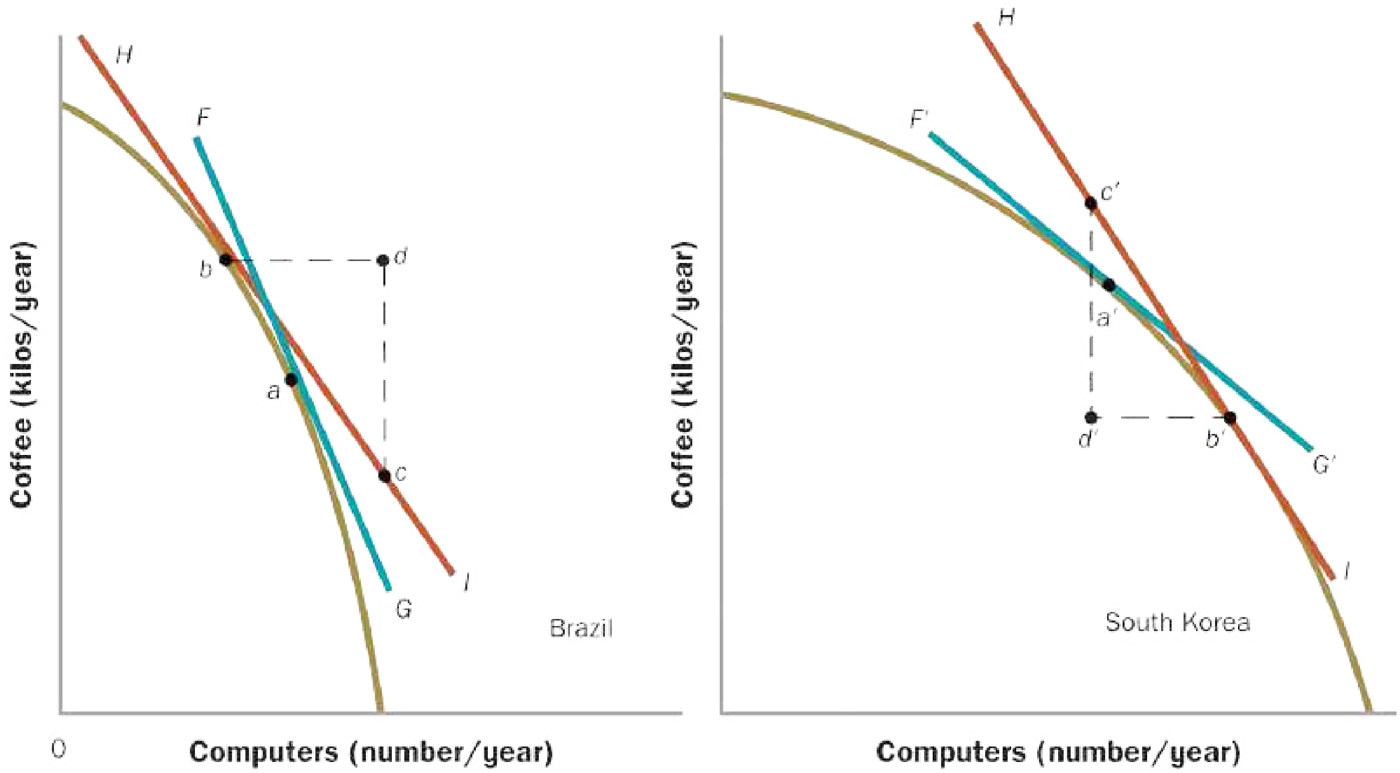

Figure 16.9 **Production and consumption possibilities once trade is opened**

Note: Once trade is opened, both countries will have consumption opportunities given by the slope of the line *HI*.

Using the same argument that we outlined when discussing Figure 16.6, production in each country will adjust so that the consumption possibilities line just touches the respective production possibilities curves at the points where production takes place: for Brazil this is at point b; for South Korea it is at point b'.

These production changes highlight a key point. In Brazil the opening of international trade has led to more production of coffee and less production of computers relative to autarky, coffee being the industry in which Brazil has a comparative advantage. For South Korea it is the opposite; international trade has led to more production of computers and less production of coffee relative to autarky, computers being the industry in which South Korea has a comparative advantage. From this, we conclude that *trade favours the producers of the commodity in which a country has a comparative advantage and leads to a transfer of productive resources from the other industry*.

What are the implications for consumers? Once trade opens, Brazilian consumers face a relatively lower price of computers, 80 kg of coffee per computer, than they did in autarky when the price was 100 kg of coffee per computer. We would expect Brazilian consumers therefore to increase their demand for computers and reduce their demand for coffee, moving to a point such as *c* on the consumption possibilities line. South Korean consumers face a different situation. Relative to autarky, where computers were relatively inexpensive (remember, computers then cost only 60 kg of coffee), computers are now relatively more expensive when trade opens (it now costs 80 kg of coffee to purchase one computer). South Korean consumers are therefore likely to move to a point such as c' on the consumption possibilities line, increasing their demand for coffee and reducing their demand for computers relative to autarky. The important thing to note here is that consumers in both countries are better off than when their respective countries were in autarky; as demonstrated in Figure 16.9, consumption can now take place at points beyond the *PPC*, something not possible prior to trade.

Finally, what does this analysis tell us about the pattern of international trade between the two countries? Let us start with Brazil. Comparing point *b* in Figure 16.9, where production takes place, with point *c*, which represents consumption, we can see that Brazil produces more coffee and fewer computers than are demanded by its own consumers. Brazil, therefore, will become an exporter of coffee and an importer of computers. In Figure 16.9, comparing the production and consumption points for Brazil, you can see that Brazil exports an amount equivalent to *dc* of coffee and imports an amount equivalent *bd* of computers. In South Korea the situation is exactly the opposite. Comparing point *b′*, where production takes place, with point *c′*, consumption, it is apparent from Figure 16.9 that South Korea produces more computers and less coffee than the quantities demanded by its own consumers. South Korea, therefore, will be an exporter of computers and an importer of coffee. South Korean imports of coffee are equivalent to the distance *d′c′*; South Korean exports of computers are *b′d′*. In this 'two-country' world, Brazil's exports of coffee (*cd*) are equivalent to South Korea's imports of coffee (*c′d′*), while South Korea's exports of computers (*b′d′*) equal Brazil's imports of computers (*bd*).

The analysis of Figure 16.9 demonstrates a fundamental point about international trade: *once a country moves from autarky to international trade, it will export the commodity in which it has a comparative advantage and import the other commodity*.

BACKGROUND BRIEFING 16.2

What is the China trade shock?

The China trade shock, a term most commonly associated with economists David Autor, David Dorn and Gordon Hanson, is used to describe the dramatic change in international trade patterns that resulted from China’s rise as a major player in the global economy over the past few decades.

In a series of influential studies, these economists and their collaborators investigated the costs of the shock to US workers. They found that employment has fallen in US industries and regions most exposed to import competition from China—something that our theory in this chapter helps explain. However, they did not find strong evidence of simultaneous offsetting employment increases in other sectors in the same regions, suggesting that the transition of workers into sectors in which the United States has comparative advantage has been neither quick nor easy—something that the theory does not emphasise.

Overall, these economists conclude that workers’ adjustment to trade shocks is often a slow and difficult process, and that local labour-force participation rates and unemployment rates in affected regions may take a decade or more to recover. Moreover, the slow adjustment means that trade shocks could lead to prolonged economic and social problems in affected communities.

While the research underlying these conclusions is still new and is still being examined, it serves as a reminder that for many workers, the short-term costs of trade may outweigh the short-term benefits. While opposition to trade among such workers is understandable, we should not conclude that the overall costs of trade outweigh the overall benefits. Rather, as these economists conclude in one of their studies: ‘Better understanding when and where trade is costly, and how and why it may be beneficial, is a key item on the research agenda for trade and labor economists. Developing effective tools for managing and mitigating the costs of trade adjustment should be high on the agenda for policymakers and applied economists’ (Autor, Dorn & Hanson 2016).

BACKGROUND BRIEFING 16.3

Australia’s free trade agreements

At the time of writing, Australia has entered into free trade agreements with 10 countries or groups of countries, including New Zealand, Singapore and the United States. There are other agreements that have been signed but not yet come into force including with Australia’s largest neighbour, Indonesia.

As the name suggests, these are agreements designed to remove barriers to trade, such as tariffs, and quotas, which are designed to protect domestic import competing industries from foreign competitors. What are the benefits of such **free trade agreements**? At the broadest level, as we have seen, free trade enables a country to reap the benefits from specialisation according to the principle of comparative advantage, that is, to concentrate production in commodities having a relatively low opportunity cost. Related to this, and an important consideration for those in Australia advocating free trade agreements, is greater access to large economies such as the United States; under the free trade agreement with the United States, Australian producers have access to a combined market of over 325 million people.

Calculating the dollar value of the benefits obtained from moves to free trade is extraordinarily complex and requires very sophisticated quantitative models of the economy. One recent estimate suggests the gains could be quite significant, with real income for the average Australian family being around $8500 higher in 2016 than would have been the case without the various moves to free trade that have been undertaken over the last few decades (Centre for

International Economics 2017).

Critics of free trade agreements believe these benefits to be overstated. There are many arguments. One is the objection to free trade that comes from those who stand to lose. For example, many Australian workers have voiced concerns about their job security under free trade. Another argument is that free trade agreements will lead to trade diversion, whereby imports that Australia once sourced from Asia will now be purchased from countries with which Australia has a free trade agreement, such as the United States. The fear is that Asian countries will retaliate by raising trade barriers against Australian exports. (This argument has been put forcibly by University of Melbourne economist Ross Garnaut (2002).) Another concern that has been expressed is that Australia might have to abandon some of its subsidisation schemes under the free trade agreement, for example the Pharmaceutical Benefits Scheme, which allows Australian consumers to purchase pharmaceuticals at discounted prices, something that US drug companies have long protested about. Other critics have raised concerns of a non-economic nature, such as the free trade agreement leading to an influx of foreign movies and television at the expense of local content.

Regardless of these criticisms, free trade agreements continue to be a feature of Australia’s trading relations with other nations. Table 16.1 presents a summary of current agreements in force.

TABLE 16.1 Australian free trade agreements

FREE TRADE AGREEMENT	DATE ENTERED INTO FORCE
Australia–New Zealand (ANZCERTA or CER)	1 January 1983
Singapore–Australia (SAFTA)	28 July 2003
Australia–United States (AUSFTA)	1 January 2005
Thailand–Australia (TAFTA)	1 January 2005
Australia–Chile (ACl-FTA)	6 March 2009

ASEAN: Australia–New Zealand (AANZFTA)	1 January 2010 for eight countries: Australia, New Zealand, Brunei, Burma, Malaysia, the Philippines, Singapore and Vietnam. For Thailand: 12 March 2010. For Laos: 1 January 2011. For Cambodia: 4 January 2011. For Indonesia: 10 January 2012
Malaysia–Australia (MAFTA)	1 January 2013
Korea–Australia (KAFTA)	12 December 2014
Japan–Australia (JAEPA)	15 January 2015
China–Australia (ChAFTA)	20 December 2015
Comprehensive and Progressive Agreement for Trans-Pacific	30 December 2018

Partnership (CPTPP)	

Note: At the time of writing, these Australian free trade agreements are in force.

Source: Australian Government Department of Foreign Affairs and Trade 2018, 'Australia's free trade agreements (FTAs)', https://dfat.gov.au/trade/agreements/Pages/trade-agreements.aspx.

16.1.4 SOURCES OF COMPARATIVE ADVANTAGE

At the individual level, comparative advantage often appears to be the result of inborn talent. For instance, some people seem to be naturally gifted at programming computers while others seem to have a special knack for fixing bikes. But comparative advantage is more often the result of education, training or experience. Thus, we usually leave the design of kitchens to people with architectural training, the drafting of contracts to people who have studied law and the teaching of physics to people with advanced degrees in that field.

At the national level, comparative advantage may derive from differences in natural resources or from differences in society or culture. The United States, which has a disproportionate share of the world's leading research universities, has a comparative advantage in the design of electronic computing hardware and software. Canada, which has one of the world's highest per capita endowments of farm and forest land, has a comparative advantage in the production of agricultural products. Topography and climate explain why Thredbo specialises in the skiing industry while the Gold Coast specialises as a beach resort. And as we saw in the Setting the scene that opened this chapter, Nepal's environment gives it a comparative advantage in herbal products.

Seemingly non-economic factors can also give rise to comparative advantage. For instance, the emergence of English as the *de facto* world language gives English-speaking countries a comparative advantage over non-English-speaking nations in the production of books, movies and popular music. Even a country's institutions may affect the likelihood that it will achieve comparative advantage in a particular pursuit. For example, cultures that encourage entrepreneurship will tend to have a comparative advantage in the introduction of new products, whereas those that promote high standards of care and craftsmanship will tend to have a comparative advantage in the production of high-quality variants of established products.

▹▹ RECAP

The production possibilities curve (*PPC*) summarises efficient production in an economy. For an economy that produces only two commodities, points on the curve represent the maximum amount of production of any one commodity that is available, holding constant the amount of production of the other commodity. The *PPC* bows outward, since the opportunity cost of producing any one commodity increases if more of that commodity is produced.

When there are more than two workers the basic interpretation of the *PPC* does not change from the case where there are only two workers—it still summarises efficient production in an economy. The main difference is that the curve itself bows out in a much smoother fashion than for the simple two-worker case, since the region associated with the production activities of any one worker becomes quite small.

The pattern of trade between countries is determined by their respective comparative advantages. Countries can gain if resources are moved into the production of commodities in which they have a comparative advantage and then export those commodities. Commodities in which countries do not have a comparative advantage will be imported.

16.2 A SUPPLY AND DEMAND PERSPECTIVE ON TRADE

LO 16.3–16.5

We will now look more closely at the economic effects of trade. Understanding the ways in which trade impacts on the economy is an important step in being able to make informed decisions about the merits or otherwise of opening countries to free trade. We will start from the proposition demonstrated above that a country can potentially improve its overall consumption possibilities by shifting resources into the production of commodities in which it has a comparative advantage and then trading with other countries. In this section we look more carefully at how international trade affects supply and demand in the markets for specific goods. We will see that when it is costly for workers and firms to change industries, opening trade with other countries may create groups of winners and losers among producers, even as it helps consumers. This is one reason why some groups in society oppose moves towards free trade.

Let us take Brazil as an example: a country that we will continue to assume produces only two commodities, computers and coffee. Figure 16.10 shows the supply and demand for computers in that country. As usual, the price is shown on the vertical axis and the quantity on the horizontal axis. For now, think of the price of computers as being measured in terms of coffee rather than in terms of dollars (i.e. we measure the price of computers *relative* to the price of the other good in the economy). The upward-sloping curve in Figure 16.10 is the supply curve of computers, in this case for computers produced in Brazil; the downward-sloping curve is the demand curve for computers by Brazilian residents. The supply curve for computers in Brazil reflects the opportunity cost of supplying computers. Specifically, at any level of computer production the relative price at which Brazilian firms are willing to supply an additional computer equals their opportunity cost of doing so. The demand curve, which tells us the number of computers Brazilians will purchase at each relative price, reflects the preferences and buying power of Brazilian consumers.

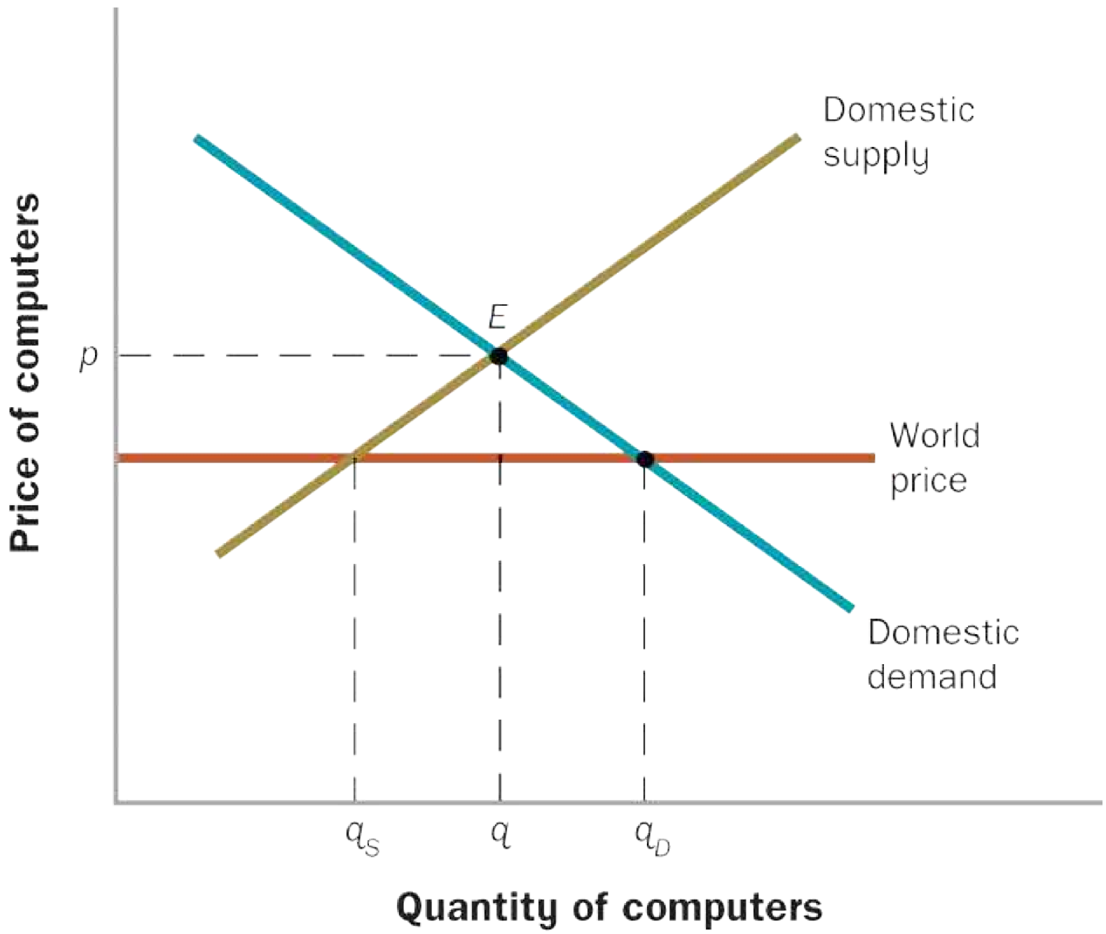

Figure 16.10 **The market for computers in Brazil**

If the Brazilian economy is closed to international trade then market equilibrium occurs where the domestic supply and demand curves intersect, at point *E* in Figure 16.10. The equilibrium price will be *p* and the equilibrium quantity *q*.

If Brazil opens its market to trade, however, the relevant price for computers becomes the **world price** of computers, the price at which computers are traded internationally. The world price for computers is determined by the worldwide supply and demand for computers. If we assume that Brazil's computer market is too small to affect the world price for computers very much, the world price can be treated as fixed, and represented by a horizontal line in the figure. Figure 16.10 shows the world price for computers as being lower than Brazil's closed-economy price.

If Brazilians are free to buy and sell computers on the international market, then the price of computers in Brazil must be the same as the world price. (No one in Brazil will buy a computer at a price above the world price, and no one will sell one at a price below the world price.) Figure 16.10 shows that at the world price Brazilian consumers and firms demand q_D computers, but Brazilian computer producers will supply only q_S computers. The difference between the two quantities, $q_D - q_S$, is the number of computers that Brazil must import from abroad. Figure 16.10 illustrates a general conclusion: *if the price of a good or service in a* **closed economy** *is greater than the world price, and that economy opens itself to trade, the economy will tend to become a net importer of that good or service*. Note that this is consistent with the analysis in Section 16.2.3 where the cost of a computer in Brazil in autarky, −100 kg of coffee, is higher than the free trade price of −80 kg of coffee. As we saw in Section 16.2.3, once trade opened, Brazil imported computers.

A different outcome occurs in Brazil's coffee market, shown in Figure 16.11. The price of coffee (measured relative to the price of computers) is shown on the vertical axis, and the quantity of coffee on the horizontal axis. The downward-sloping demand curve in the figure shows how much coffee Brazilian consumers want to buy at each relative price, and the upward-sloping supply curve shows how much coffee Brazilian producers are willing to supply at each relative price. If Brazil's economy is closed to trade with the rest of the world then equilibrium in the market for coffee will occur at point *E*, where the domestic demand and supply curves intersect. The quantity produced will be *q* and the price *p*.

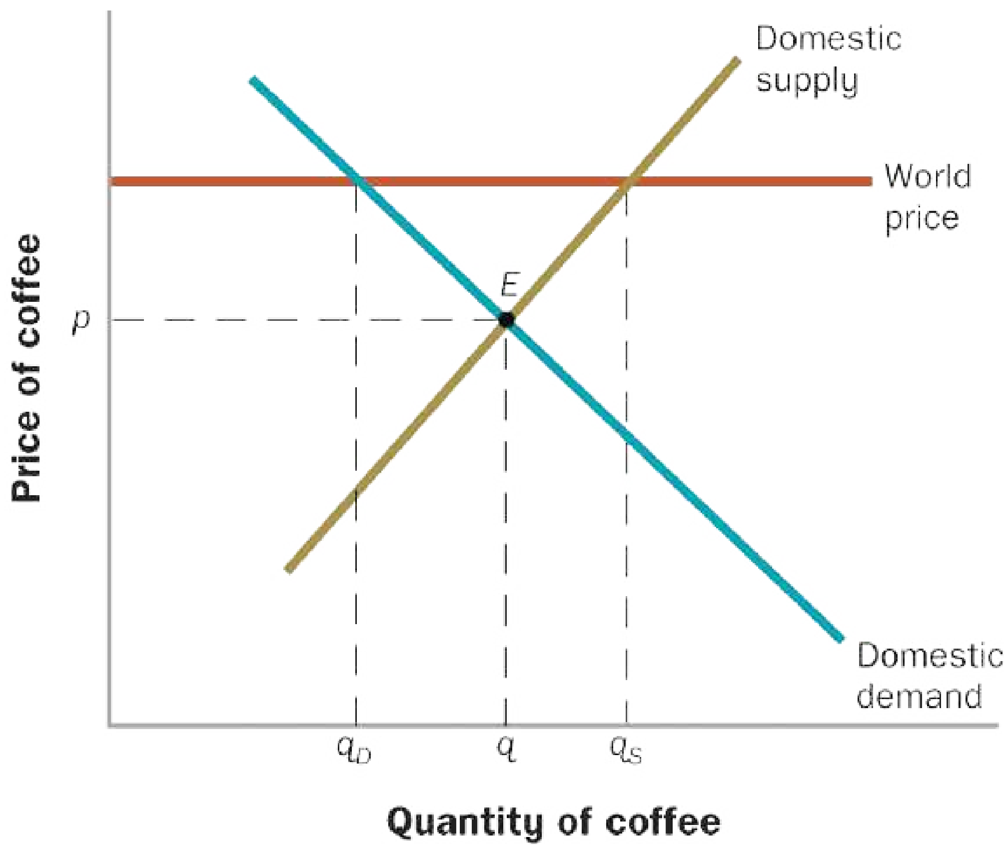

Figure 16.11 **The market for coffee in Brazil**

Now, imagine that Brazil opens its coffee market to international trade. As in the case of computers, if free trade in coffee is permitted then the prevailing price for coffee in Brazil must be the same as the world price. Unlike the case of computers, however, the world price of coffee as shown in Figure 16.11 is *higher* than the domestic equilibrium price. How do we know that the world price of coffee will be higher than the domestic price? Recall that the price of coffee is measured relative to the price of computers and vice versa. If the price of computers relative to the price of coffee is higher in Brazil than in the world market then the price of coffee relative to the price of computers must be lower, as each price is the reciprocal of the other. This reflects the fact that the opportunity cost of coffee in terms of computers must be lower in Brazil than in the rest of the world.

With no international trade, the equilibrium price and quantity of coffee in Brazil are determined by the intersection of the domestic supply and demand curves (point *E*). But if the country opens to trade, the domestic price of coffee must equal the world price. At the higher world price Brazilians will demand the quantity of coffee q_D, less than the amount supplied by Brazilian producers, q_S. The excess coffee supplied by Brazilian producers, $q_S - q_D$, is exported. Again, this is consistent with the analysis of Section 16.2.3 where we showed that Brazil would become an exporter of coffee once trade opened.

The general conclusion of Figure 16.11 is this: *if the price of a good or service in a closed economy is lower than the world price, and that economy opens itself to trade, the economy will tend to become a net exporter of that good or service.*

As in Section 16.2.3, these examples illustrate how the market translates comparative advantage leading to a relatively lower price into mutually beneficial gains from trade. If trade is unrestricted then countries with a comparative advantage in a good will profit by supplying that good to the world market and using the revenue earned to import goods in which they do not have a comparative advantage. Thus, the workings of the free market automatically ensure that goods will be produced where the opportunity cost is lowest, leading to the highest possible consumption possibilities for the world.

16.2.1 WINNERS AND LOSERS FROM TRADE

If trade is so wonderful why do some groups in society often resist free trade? An important reason is that although free trade benefits the economy, specific groups may not benefit. If groups that are hurt by trade have sufficient political influence they may be able to persuade politicians to enact policies that restrict the free flow of goods and services across borders.

The supply and demand analyses shown in Figures 16.10 and 16.11 are useful in clarifying who gains and who loses when an economy opens up to trade. Look first at Figure 16.10, which shows the market for computers in Brazil. When Brazil opens its computer market to international competition Brazilian consumers enjoy a larger quantity of computers at a lower price. Clearly, Brazilian computer users benefit from the free trade in computers. In general, *domestic consumers of imported goods benefit from free trade*. However, Brazilian computer producers will not be so happy about opening their market to international competition. The fall in computer prices to the international level implies that less-efficient domestic producers will go out of business, and that those who remain will earn lower profits. Unemployment in the Brazilian computer industry will rise and may persist over time, particularly if displaced computer workers cannot easily move to a new industry. (The wages paid to Brazilian computer workers will also fall, reflecting the lower relative price of computers.) We see that, in general, *domestic producers of imported goods are hurt by free trade*.

Consumers are helped, and producers hurt, when imports increase. The opposite conclusions apply for an increase in exports (see Figure 16.11). In the example of Brazil, an opening of the coffee market raises the domestic price of coffee to the world price and creates the opportunity for Brazil to export coffee. Domestic producers of coffee benefit from the increased market (they can now sell coffee abroad as well as at home) and from the higher price of their product. In short, *domestic producers of exported goods benefit from free trade*. Brazilian coffee drinkers will be less enthusiastic, since they must now pay the higher world price of coffee and can therefore consume less. *Thus domestic consumers of exported goods are hurt by free trade*.

Free trade is *efficient* in the sense that it increases the size of the pie available to the economy. Indeed, the efficiency of free trade is an application of what economists call the *equilibrium principle*: markets in equilibrium leave no unexploited opportunities for individuals. Despite the efficiency of free trade, some groups may lose from trade, which generates political pressures to block or restrict trade. In the next section we will discuss the major types of policy used to restrict trade.

▹▹ RECAP

If the world price of a commodity is greater than the domestic price in a closed economy, opening that economy to trade will lead to that commodity being exported. If the world price of a commodity is less than the domestic price in a closed economy, opening that economy to trade will lead to that commodity being imported.

A move to free trade creates winners and losers as follows:

WINNERS

- Consumers of imported goods
- Producers of exported goods

LOSERS

- Consumers of exported goods
- Producers of imported goods

16.3 PROTECTIONIST POLICIES: TARIFFS AND QUOTAS

LO 16.6–16.8

The view that free trade is injurious and should be restricted is known as **protectionism**. Supporters of this view believe the government should attempt to 'protect' domestic markets by raising legal barriers to imports. (Interestingly, protectionists rarely attempt to restrict exports even though they hurt consumers of the exported good.) Two of the most common types of such barriers are tariffs and quotas. A **tariff** is a tax imposed on an imported good; a *quota* is a legal limit on the quantity of a good that may be imported.

16.3.1 TARIFFS

The effects of tariffs and quotas can be explained using supply and demand diagrams. Suppose that Brazilian computer makers, dismayed by the penetration of 'their' market by imported computers, persuade their government to impose a tariff—that is, a tax on every computer imported into the country. Computers produced in Brazil will be exempt from the tax. Figure 16.12 shows the likely effects of this tariff on the domestic Brazilian computer market. The lower of the two horizontal lines in the figure indicates the world price of computers, not including the tariff. The higher of the two lines indicates the price Brazilian consumers will pay for imported computers, including the tariff. We refer to the price of computers including the tariff as p_T. The vertical distance between the two lines equals the amount of the tariff that is imposed on each imported computer.

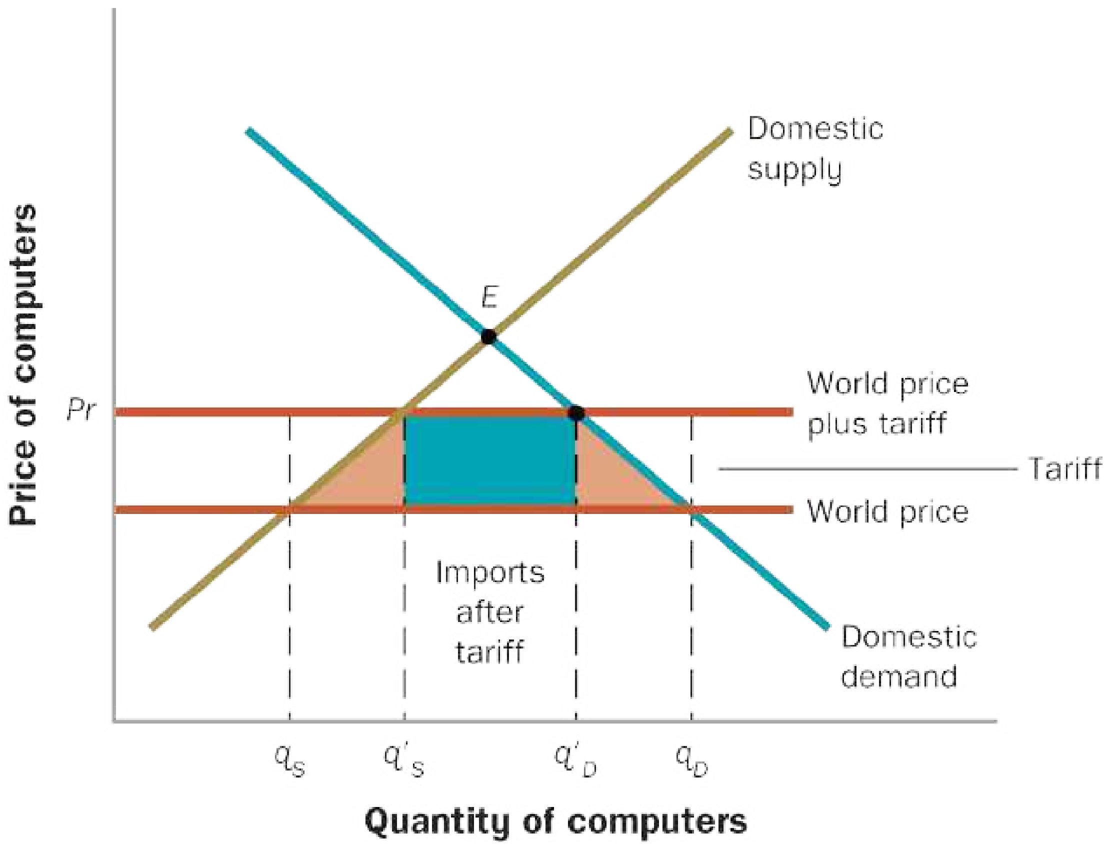

Figure 16.12 **The market for computers after the imposition of an import tariff**

Note: The imposition of a tariff on imported computers raises the price of computers in Brazil to the world price plus tariff, p_T, represented by the upper horizontal line. Domestic production of computers rises from q_S to q'_S, domestic purchases of computers fall from q_D to q'_D, and computer imports fall from $q_D - q_S$ to $q'_D - q'_S$. Brazilian consumers are worse off and Brazilian computer producers are better off. The Brazilian government collects revenue from the tariff equal to the area of the blue rectangle.

From the point of view of domestic Brazilian producers and consumers the imposition of the tariff has the same effects as an equivalent increase in the world price of computers. Because the price (including the tariff) of imported computers has risen, Brazilian computer producers will be able to raise the price they charge for their computers to the world price plus tariff, p_T. Thus, the price Brazilian consumers must pay—whether their computers are imported or not—equals p_T, represented by the upper horizontal line in Figure 16.12.

The rise in the price of computers created by the tariff affects the quantities of computers supplied and the quantities demanded by Brazilians. Domestic computer producers, receiving a higher price for computers, increase their production from q_S to q'_S (see Figure 16.12). Brazilian consumers, also reacting to the higher price, reduce their computer purchases from q_D to q'_D. As a result the number of imported computers—the difference between domestic purchases and domestic production—falls from $q_D - q_S$ to $q'_D - q'_S$.

Who are the winners and the losers from the tariff? Relative to an environment with free trade and no tariff, the winners are the domestic computer producers, who sell more computers and receive a higher price for them. The clearest losers are Brazilian consumers, who must now pay more for their computers. Another winner is the government, which collects revenue from the tariff. The blue area in Figure 16.12 shows the amount of revenue the government collects, equal to the quantity of computer imports after the imposition of the tariff, $q'_D - q'_S$, times the amount of the tariff.

There is a final point to be noted in this discussion of winners and losers. This is that, overall, society is worse off because of the tariff. This is the result of the gains achieved by the domestic computer producers and the government being not as large as the losses suffered by Brazilian consumers. To see this, note the two shaded triangles in Figure 16.12. Prior to the tariff consumers were able to purchase a quantity of computers equal to the respective bases of the two triangles (i.e. consumers purchased $q_S\, q'_S$ and $q_D\, q'_D$) at the world price. After the imposition of the tariff there is a loss to consumers as the $q_D\, q'_D$ computers are no longer purchased. While the $q_S\, q'_S$ computers are still purchased, a higher price is now charged that includes the tariff and this also results in a loss to consumers. These losses are not offset by any gains to producers or the government. As a result, Brazilian society, in aggregate, is made worse off as a result of the tariff.

EXAMPLE 16.5 – A TARIFF ON IMPORTED COMPUTERS

Suppose the demand for computers by Brazilian consumers is given by:

$$Q^D = 3000 - 0.5P_C$$

where Q^D is the annual quantity of computers demanded and P_C is the price per computer in dollars. The supply of computers by domestic Brazilian producers is:

$$Q^S = 1000 + 0.5P_C$$

where Q^S is the annual quantity of computers supplied.

a) Assuming that the Brazilian economy is closed to trade, find the equilibrium price and quantity in the Brazilian computer market.

b) Assume the economy opens to trade. If the world price of computers is $1500, find annual Brazilian consumption, production and imports of computers.

c) At the request of domestic producers, the Brazilian government imposes a tariff of $300 per imported computer. Find Brazilian consumption, production and imports of computers after the imposition of the tariff. How much revenue does the tariff raise for the government?

a) To find the closed-economy price and quantity we set supply equal to demand:

$$1000 + 0.5P_C = 3000 - 0.5P_C$$

Solving for P_C gives the equilibrium price, equal to $2000 per computer. Substituting this equilibrium price into either the supply equation or the demand equation, we find the equilibrium quantity of computers in the Brazilian market, equal to 2000 computers per year. This equilibrium price and quantity correspond to a point like point E in Figure 16.12.

b) If the economy opens to trade, the domestic price of computers must equal the world price, which is \$1500. At this price the domestic quantity demanded for computers is $3000 - 0.5(1500) = 2250$ computers per year; the domestic quantity supplied is $1000 + 0.5(1500) = 1750$ computers per year. These quantities correspond to q_D and q_S, respectively, in Figure 16.12. Imports equal the difference between domestic quantities demanded and supplied, or $2250 - 1750 = 500$ computers per year.

c) The imposition of a tariff of \$300 per computer raises the price from \$1500 (the world price without the tariff) to \$1800. To find Brazilian consumption and production at this price we set the price equal to \$1800 in the demand and supply equations. Thus, the domestic quantity demanded is $3000 - 0.5(1800) = 2100$ computers per year; the domestic quantity supplied is $1000 + 0.5(1800) = 1900$ computers per year. Imports, the difference between the quantity demanded by Brazilians and the quantity supplied by domestic firms, is $2100 - 1900 = 200$ computers per year. Thus the tariff has raised the price of computers by \$300 and reduced imports by 300 computers per year. The tariff revenue collected by the government is \$300/imported computer × 200 computers/year = \$60 000 per year.

CONCEPT CHECK 16.3

Repeat parts (b) and (c) of Example 16.5 under the assumption that the world price of computers is $1200. What happens if the world price is $1800?

16.3.2 QUOTAS

An alternative to a tariff is a **quota**, or legal limit, on the number or value of foreign goods that can be imported. One means of enforcing a quota is to require importers to obtain a licence or permit for each good they bring into the country. The government then distributes the same number of permits as the number of goods that may be imported under the quota.

How does the imposition of a quota on, say, computers affect the domestic market for computers? Figure 16.13, which is like Figure 16.12, illustrates the effect of a quota on imported computers. As before, assume that at first there are no restrictions on trade. Consumers pay the world price for computers, and $q_D - q_S$ computers are imported. Now, suppose once more that domestic computer producers complain to the government about competition from foreign computer makers and the government agrees to act. However, this time, instead of a tariff, the government imposes a quota on the number of computers that can be imported. For comparability with the tariff analysed in Figure 16.12, let us assume that the quota permits the same level of imports as entered the country under the tariff: specifically, $q'_D - q'_S$ computers. What effect does this ruling have on the domestic market for computers?

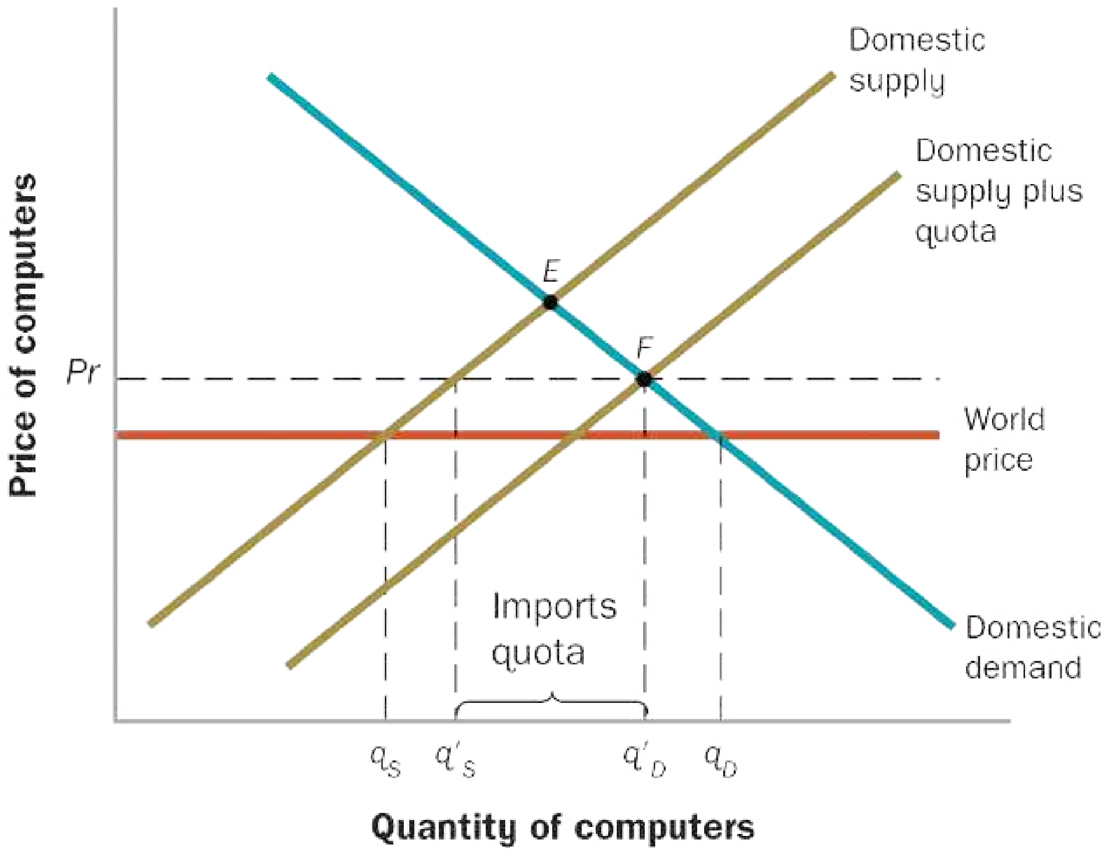

Figure 16.13 **The market for computers after the imposition of an import quota**

Note: Figure 16.13 shows the effects of the imposition of a quota that permits only $q'_D - q'_S$ computers to be imported. The total supply of computers to the domestic economy equals the domestic supply curve shifted to the right by $q'_D - q'_S$ units (the fixed amount of imports). Market equilibrium occurs at point *F*. The effects of the quota on the domestic market are identical to those of the tariff analysed in Figure 16.12. The domestic price rises to P_T, domestic production of computers rises from q_S to q'_S, domestic purchases of computers fall from q_D to q'_D and computer imports fall from $q_D - q_S$ to $q'_D - q'_S$. The quota differs from the tariff in that under a quota system the government collects no revenue.

After the imposition of the quota the quantity of computers supplied to the Brazilian market is the production of domestic firms plus the $q'_D - q'_S$ imported computers allowed under the quota. Figure 16.13 shows the quantity of computers supplied, inclusive of the quota. The total supply curve, labelled 'domestic supply plus quota', is the same as the domestic supply curve shifted $q'_D - q'_S$ units to the right. The domestic demand curve is the same as in Figure 16.12. Equilibrium in the domestic market for computers occurs at point F in Figure 16.13, at the intersection of the supply curve including the quota and the domestic demand curve. The figure shows that, relative to the initial situation with free trade, the quota:

1. raises the domestic price of computers above the world price, to the level marked P_T in Figure 16.13
2. reduces domestic purchases of computers from q_D to q'_D
3. increases domestic production of computers from q_S to q'_S
4. reduces imports to $q'_D - q'_S$, consistent with a quota.

Like a tariff, the quota helps domestic producers by increasing their sales and the price they receive for their output, while hurting domestic consumers by forcing them to pay a higher price.

Interestingly, under our assumption that the quota is set to permit the same level of imports as the tariff, the effects on the domestic market of the tariff (Figure 16.12) and the quota (Figure 16.13) are not only similar, they are *equivalent*. Comparing Figures 16.12 and 16.13, you can see that the two policies have identical effects on the domestic price, domestic purchases, domestic production and imports.

Although the market effects of a tariff and a quota are the same, there is one important difference between the two policies: a tariff generates revenue for the government whereas a quota does not. With a quota, the revenue that would have gone to the government goes instead to those firms that hold the import licences. A holder of an import licence can purchase a computer at the world price and resell it in the domestic market at price P_T, pocketing the difference. Thus, with a tariff the government collects the difference between the world price and the domestic market price of the good; with a quota private firms or individuals collect that difference. Why then would the government ever impose a quota rather than a tariff? One possibility is that the distribution of import licences is a means of rewarding the government's political supporters. Sometimes, international political concerns may also play a role.

EXAMPLE 16.6 – EFFECTS OF AN IMPORT QUOTA

Suppose the supply of and demand for computers in Brazil is as given in Example 16.5**, and the government imposes an import quota of 200 computers. Find the equilibrium price in the domestic computer market, as well as the quantities produced by domestic firms and purchased by domestic consumers.**

The quantity of computers supplied by domestic Brazilian producers was stated in Example 16.5 to be $1000 + 0.5P_C$. The quota allows 200 computers per year to be imported. Thus the total quantity of computers supplied, including both domestic production and imports, is 1000 + 0.5P_C + 200, or 1200 + 0.5P_C. Setting the quantity supplied equal to the quantity demanded, we get:

$$1200 + 0.5P_C = 3000 - 0.5P_C$$

Solving for P_C, we find that the price of computers in the domestic Brazilian market is \$1800. Domestic production of computers is 1000 + 0.5(1800) = 1900 computers per year, while the quantity demanded domestically is 3000 − 0.5(1800) = 2100 computers per year. The difference between domestic quantity demanded and domestic production, 200 computers per year, is made up by imports.

Note that the domestic price, domestic production and domestic demand are the same in Examples 16.5 and 16.6. Thus the tariff and the quota have the same effects on the domestic market for computers. The only difference between the two policies is that, with a quota, the government does not get the tariff revenue it got in Example 16.5. That revenue goes instead to the holders of import licences, who can buy computers on the world market at \$1500 and sell them in the domestic market at \$1800.

Tariffs and quotas are not the only barriers to trade erected by governments.

Importers may be subject to unnecessarily complex bureaucratic rules (so-called red tape barriers), and regulations of goods that are nominally intended to promote health and safety sometimes have the side effect, whether intentionally or unintentionally, of restricting trade. One example is European restrictions on imports of genetically modified foods. Although these regulations were motivated in part by concerns about the safety of such foods, they also help to protect Europe's politically powerful farmers from foreign competition.

16.3.3 THE INEFFICIENCY OF PROTECTIONISM

Free trade is efficient because it allows countries to take advantage of their comparative advantage and produce efficiently while expanding the consumption possibilities available to consumers. Conversely, protectionist policies that limit trade are inefficient—they reduce the total economic pie. Why, then, do governments adopt such policies? The reason is that tariffs and quotas benefit certain groups. Because those who benefit from these restrictions (such as firms facing import competition) are often better organised politically than those who lose from trade barriers (such as consumers in general), politicians are sometimes persuaded to enact the restrictions.

The fact that free trade is efficient suggests an alternative to trade restrictions. Because eliminating restrictions on trade increases the overall economic pie, in general the winners from free trade will be able to compensate the losers in such a way that everyone becomes better off. Government programs that assist and retrain workers displaced by import competition are an example of such compensation. Spreading the benefits of free trade—or at least reducing its adverse effects on certain groups—reduces the incentives of those groups to inhibit free trade.

Although we have focused on the winners and losers from trade, not all opposition to free trade is motivated by economic interest. For example, many anti-globalisation protesters cite environmental concerns. Protecting the environment is an important and laudable goal, but once again the *efficiency principle* suggests that restricting trade is not the most effective means of achieving that goal. Restricting trade lowers world income, reducing the resources available to deal with environmental problems. (High levels of economic development are in fact often associated with lower, not higher, amounts of pollution.) Furthermore, much of the income loss arising from barriers to trade is absorbed by poor nations trying to develop their economies. For this reason, leaders of developing countries are among the strongest advocates of free trade.

THINKING AS AN ECONOMIST 16.1

Who benefited from and who was hurt by voluntary export restraints on Japanese automobiles in the 1980s?

After the oil price increases of the 1970s, American consumers began to buy small, fuel-efficient Japanese automobiles in large numbers. Reeling from the new foreign competition, US automobile producers petitioned the US government for assistance. In response, in May 1981 the US government negotiated a system of so-called *voluntary export restraints*, or VERs, with Japan. Under the VER system, each Japanese auto producer would 'voluntarily' restrict exports to the United States to an agreed-upon level. VER quotas were changed several times before the system was formally eliminated in 1994. Who benefited from, and who was hurt by, VERs on Japanese automobiles?

Several groups benefited from the VER system. As should be expected, US auto producers saw increased sales and profits when their Japanese competition was reduced, and US auto workers benefited too. But Japanese automobile producers and workers also profited from the policy, despite the reduction in their US sales. The restrictions on the supply of their automobiles to the US market allowed them to raise their prices in the US market significantly—by several thousand dollars per car by the late 1980s, according to some estimates. From an economic point of view, the VERs functioned like a tariff on Japanese cars, except that the Japanese automobile producers, rather than the US Government, got to keep the tariff revenue. A third group that benefited from the VERs was European automobile producers and workers, who saw US demand for their cars rise when Japanese imports declined.

The biggest losers from the VER system were clearly American car buyers, who faced higher prices (particularly for Japanese imports) and reduced selection. During this period dealer discounts on new Japanese cars largely disappeared, and customers often found themselves paying a premium over the list price. Because the economic losses faced by American car buyers exceeded the extra profits received by US automobile producers (some of which may pass to workers too), the VERs produced a net loss for the US economy that at its greatest was estimated at more than $3 billion per year.

The US government's choice of a VER system, rather than a tariff or a quota, was somewhat puzzling. If a tariff on Japanese cars had been imposed instead of a VER system, the US government would have collected much of the revenue that went instead to Japanese auto producers. Alternatively, a quota system with import licences given to US car dealers would have captured some revenue for domestic car dealers rather than Japanese firms. The best explanation for why the US government chose VERs is probably political. US policymakers may have been concerned that the Japanese government would retaliate against US trade restrictions by imposing its own restrictions on US exports. By instituting a system that did minimal financial harm to—or even helped—Japanese auto producers, they may have hoped to avoid retaliation from the Japanese.

▹▹ RECAP

A tariff raises the price of imports to match the domestic price. The result is that an increased proportion of total demand is sourced from domestic production. Domestic firms and their workers gain from the tariff, as does the government, which receives revenue. Domestic consumers lose out.

Quotas achieve the same effects as tariffs but do so not with a tax but by restricting the supply of imports. Unlike tariffs, quotas do not generate revenue for the government. Instead they yield benefits for domestic producers. Domestic consumers again lose out.

Trade barriers mean that countries will not achieve the gains potentially available through trade. Countries are prepared to give up these gains, since moving to free trade creates winners *and* losers. In theory, it should be possible for the winners under a move to free trade to compensate the losers and remain better off.

SUMMARY

- A nation's production possibilities curve (*PPC*) summarises the available points of efficient production by showing, when holding the production of all other commodities fixed, what is the maximum amount of a commodity that can be produced.
- A nation's consumption set shows the combinations of goods available to consumers.
- In autarky, the consumption set comprises only those combinations of goods that can be produced domestically.
- Under free trade, it is possible that the consumption set is expanded beyond what can be produced locally.

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- Although free trade is beneficial to the economy, some groups—such as domestic producers of imported goods—are hurt by free trade.
- Groups that are hurt by trade may be able to induce the government to impose *protectionist* measures, such as tariffs or quotas. A *tariff* is a tax on an imported good that has the effect of raising the domestic price of the good. A higher domestic price increases domestic supply, reduces domestic demand and reduces imports of the good. A *quota*, which is a legal limit on the amount of a good that may be imported, has the same effects as a tariff, except that the government collects no tax revenue. (The equivalent amount of revenue goes instead to those firms with the legal authority to import goods.)

- Because free trade is efficient, the winners from free trade should be able to compensate the losers so that everyone becomes better off. Thus, policies to assist those who are harmed by trade, such as assistance and retraining for workers laid off by imports, are usually preferable to trade restrictions.

KEY TERMS

autarky 409

closed economy 419

comparative advantage 406

consumption possibilities 409

free trade agreements 416

production possibilities curve (*PPC*) 404

protectionism 421

quota 423

tariff 421

unattainable point 409

world price 418

REVIEW QUESTIONS

1. To which regional trade agreements is Australia a signatory? LO 16.1 **EASY**
2. Using supply and demand analysis, explain all the effects of levying a tariff on a commodity. Make sure you include the impacts on consumers, producers and the government. LO 16.6 **MEDIUM**
3. Using supply and demand analysis, explain all the effects of levying a quota on a commodity. Make sure you include the impacts on consumers, producers and the government. LO 16.7 **MEDIUM**
4. Suppose tariffs are lifted from the car industry. Identify the winners and losers from this policy and explain the nature of their gains or losses. LO 16.7 **MEDIUM**

PROBLEMS

1. Suppose that two countries, Australia and Venezuela, can produce only two goods, cotton and pineapples. The table below shows the amount of labour required in each country to produce one unit of each good. LO 16.1 **HARD**

	COTTON	PINEAPPLES
Venezuela	4	3
Australia	1	2

a) Complete the following table showing the opportunity costs associated with the production of cotton and pineapples in the respective countries.

	COTTON	PINEAPPLES
Venezuela	1 extra bale of cotton ⇒	1 extra pineapple ⇒
	______ fewer pineapples	______ fewer bales of cotton
Australia	1 extra bale of cotton ⇒	1 extra pineapple ⇒
	______ fewer pineapples	______ fewer bales of cotton

b) In which commodity does Australia have a comparative advantage? Why?

c) In which commodity does Venezuela have a comparative advantage? Why?

d) Assume that Australia and Venezuela each have 60 units of labour available. The following table shows one possible pattern of production across the two countries.

	COTTON	PINEAPPLES
Venezuela	12.5 bales	3.33 pineapples
Australia	30 bales	15 pineapples

How many workers are allocated to the respective industries in each country?

e) Show that if each country specialises in the production of the commodity in which it has a comparative advantage, total world output of cotton and pineapples could be increased.

f) Show, using diagrams, that if (i) the countries specialised according to the law of comparative advantage and (ii) the countries could trade with each other at a price ratio that allowed one bale of cotton to be exchanged for one pineapple, the citizens of both countries would be better off relative to the situation in which production was not specialised and trade did not occur.

2. The demand for vans in a certain country is given by: LO 16.3 **MEDIUM**

$$D = 12\,000 - 200P$$

where *P* is the price of a van. Supply by domestic van producers is:

$$S = 7000 + 50P.$$

a) Assuming that the economy is closed, find the equilibrium price and production of vans.

b) The economy opens to trade. The world price of vans is 18 units. Find the domestic quantities demanded and supplied, and the quantity of imports or exports. Who will favour the opening of the van market to trade, and who will oppose it?

c) The government imposes a tariff of one unit per van. Find the effects on domestic quantities demanded and supplied, and on the quantity of imports or exports. Also find the revenue raised by the tariff. Who will favour the imposition of the tariff, and who will oppose it?

d) Can the government obtain the same results as you found in part (c) by imposing a quota on van imports? Explain.

3. Suppose the domestic demand and supply for vans is as given by Problem 2. The world price of vans is 16 units. Foreign van firms have a production cost of 15 units per van, so they earn a profit of one unit per van. LO 16.7 **MEDIUM**

a) How many vans will be imported, assuming this country trades freely?

b) Now suppose foreign van producers are asked 'voluntarily' to limit their exports to the home country to half of free trade levels. What will be the equilibrium price of vans in the domestic market if foreign producers comply? Find domestic quantities of vans supplied and demanded.

c) How will the 'voluntary' export restriction affect the profits of foreign van producers?

4. Can the government always obtain more revenue by increasing the tariff rate on imported commodities? Explain. LO 16.6 **MEDIUM**

5. Suppose there was a massive increase in the price of oil. As a result, the cost of shipping commodities between countries significantly increases. Compare and contrast the effects of this scenario with one where the rate of tariff protection is increased. Who wins and who loses under both scenarios? LO 16.6 **HARD**

6. Suppose Australia is a country that has a relative abundance of capital and India is a country that has a relative abundance of labour. At the moment Australia and India are not party to a free trade agreement. LO 16.2 **HARD**
   a) In which country is the ratio of the return to capital relative to the wage paid to labour likely to be highest?
   b) Suppose both countries have the ability to produce two commodities, cars and clothing. Predict the commodity in which each country is most likely to have a comparative advantage.
   c) Suppose Australia and India enter into a free trade agreement. What is likely to happen to the relative returns to capital and labour? Explain.
7. What are the advantages of a country entering into a free trade agreement? What are the disadvantages? Do regional trade agreements have any advantages over multilateral reductions in trade protection such as those negotiated by the World Trade Organization? Discuss. LO 16.5 **HARD**

REFERENCES

Australian Government Department of Foreign Affairs and Trade 2018, 'Australia's free trade agreements (FTAs)', https://dfat.gov.au/trade/agreements/Pages/trade-agreements.aspx.

Autor D, Dorn D and Hanson G 2016, 'The China shock: Learning from labor market adjustment to large changes in trade', *Annual Review of Economics*, vol. 8, October 2016, pp. 205–40.

Centre for International Economics 2017, 'Australian trade liberalisation: Analysis of the economic impacts', Report prepared for Australian Department of Foreign Affairs and Trade, October, https://dfat.gov.au/about-us/publications/trade-investment/Pages/cie-report-on-australian-trade-liberalisation.aspx.

CIA 2017, 'The world factbook', https://www.cia.gov/library/publications/the-world-factbook/index.html.

Garnaut R 2002, 'Effects of a free trade agreement with the United States on Australia's multilateral and regional interests', Paper presented to the Conference on an Australia-United States Free Trade Agreement, Canberra, 30 August, www.apec.org.au/docs/fta2gar.pdf.

Shrestha S 2017, 'Nepal yet to cash in on global demand for herbs', *My Republica*, 5 January, https://myrepublica.nagariknetwork.com/news/nepal-yet-to-cash-in-on-global-demand-for-herbs/.

Van der Mensbrugghe D 2018, 'Estimating the benefits of trade reform: Why numbers change', http://siteresources.worldbank.org/INTRANETTRADE/Resources/239054-1126812419270/4.EstimatingThe.pdf.

CHAPTER 17

Exchange rates and the open economy

After reading this chapter, you should be able to answer the following questions.

17.1 What is a nominal exchange rate?

a) How is the nominal exchange rate related to the trade weighted index?

17.2 What is the difference between fixed and floating exchange rates?

17.3 What is the difference between a nominal and a real exchange rate?

17.4 What assumptions underlie the purchasing power parity theory of exchange rates?

a) Given purchasing power parity, what should happen to a country's exchange rate if its inflation rate is higher than that of its neighbours?

b) Outline the limitations of the purchasing power parity theory of exchange rates.

17.5 What factors determine the supply of dollars/demand for dollars in the international currency market?

17.6 Under a flexible exchange rate:

a) What is the significance of the equilibrium value of the currency?

b) How does monetary policy impact on the exchange rate?

17.7 Under a fixed exchange rate:

a) What is meant by a speculative attack on a currency?

b) How effective is monetary policy?

17.8 What factors influence a country's choice of fixed or flexible exchange rates?

SETTING THE SCENE

In earlier chapters, we outlined the challenges faced by policymakers dealing with high rates of inflation. Bringing the rate of inflation down can be a difficult task and requires a very disciplined approach to macroeconomic policy, particularly monetary policy. Moreover, as discussed in Chapter 12, policy credibility is an important component of an anti-inflation monetary policy. Unless the central bank is believed to be serious about running the required tight monetary policy, attempts to bring the rate of inflation down are unlikely to succeed.

One way that some countries have used to ensure policy credibility is through exchange rate policies. Consider the case of Argentina. In 1989, Argentina's rate of inflation was 5000 per cent and the inefficiencies associated with this high rate of inflation were contributing to real gross domestic product (GDP) falling. Excessive growth in the money supply was held responsible for the high inflation rate. In response, what became known as the 'convertibility plan' was introduced in April 1991. Under this plan, an Argentinian peso became convertible into one US dollar, no matter what the circumstances. To make this work, Argentina's Central Bank committed to holding one US dollar for every peso that was in circulation.

This is an example of a fixed exchange rate system. By guaranteeing that one peso would always convert into one US dollar, Argentina committed to an exchange rate with respect to the United States that was always 1:1. With this system in place, the freedom to run an independent monetary policy, or to use the Central Bank's ability to print money to finance a budget deficit (which had previously been an often-used practice in Argentina) was removed. Monetary policy was severely restricted, being directed to maintain the parity with the US dollar. The hope was that the monetary discipline this imposed would enable a credible anti-inflation policy to be implemented.

The results were, initially, as hoped. Inflation fell to single digits by 1994 and real GDP began to grow. However, by the end of 2001, the convertibility plan was abandoned, and Argentina defaulted on its debt to the rest of the world.

What went wrong? One factor was a strengthening of the US dollar over the second half of the 1990s. As Argentina had tied its currency to the US dollar, this meant the peso also strengthened. As you will see in this chapter, a consequence of this is to make domestic goods less competitive in world markets, reducing the demand for exports, and at the same time, enabling easier purchases of imports—both reduce aggregate demand. To make matters worse, Argentina's government continued to be quite profligate with its fiscal policy, borrowing heavily on international capital markets to cover its large budget deficits.

A worsening in economic performance led to the abandonment of the convertibility system, thus allowing the peso to weaken as a way of boosting exports and discouraging imports. However, as much of the debt had been borrowed in US dollars, the effect of allowing the peso to weaken was to massively increase the burden of debt repayments—a great many more pesos were needed to repay the debt. Rather than risk the reoccurrence of high inflation if the pesos were provided by the Central Bank, the Argentinian Government took the dramatic step of defaulting, that is, not honouring its debts.

Argentina’s experience shows the key role exchange rate arrangements can have in affecting macroeconomic performance. This is a theme we explore in this chapter.

17.1 NOMINAL EXCHANGE RATES

LO 17.1, 17.2

As explained in Chapter 16, trade between nations in goods and services permits greater specialisation and efficiency brought about by shifting resources into productive activities in which a nation has a comparative advantage. However, trade between nations usually involves dealing in different currencies, a reality we did not consider in Chapter 16. So, for example, if an Australian resident wants to purchase a car manufactured in the Republic of Korea, they (or, more likely, the car dealer) must first trade dollars for the Korean currency, the won. The Korean car manufacturer is then paid in won. Similarly, an Argentine who wants to purchase shares in an Australian company (an Australian financial asset) must first trade their Argentinian pesos for dollars and then use the dollars to purchase the shares.

Because international transactions generally require that one currency be traded for another, the relative values of different currencies are an important factor in international economic relations. The rate at which two currencies can be traded for each other is called the **nominal exchange rate**, or more simply the *exchange rate*, between the two currencies. For example, if one Australian dollar can be exchanged for 200 Japanese yen, the nominal exchange rate between the Australian and Japanese currencies is 200 yen per dollar. Each country has many nominal exchange rates, one corresponding to each currency against which its own currency is traded. Thus the Australian dollar's value can be quoted in terms of US dollars, English pounds, Swedish krona, Israeli shekels, Russian rubles or dozens of other currencies. Table 17.1 gives exchange rates between the Australian dollar and selected currencies as at 4 pm on 14 November 2018.

TABLE 17.1 Nominal exchange rates for the Australian dollar (4pm, 14 November 2018)

	FOREIGN CURRENCY PER AUSTRALIAN $	AUSTRALIAN $ PER UNIT OF FOREIGN CURRENCY
United States dollar	0.7217	1.3856
Chinese renminbi	5.0164	0.1993
Japanese yen	82.22	0.0122
European euro	0.6394	1.5640
South Korean won	818.83	0.0012
Singapore	0.9959	1.0041

Singapore dollar	0.9959	1.0041
New Zealand dollar	1.0656	0.9384
UK pound sterling	0.5558	1.7992
Malaysian ringgit	3.0239	0.3307
Thai baht	23.76	0.0421
Indonesian rupiah	10652	0.0001
Indian rupee	52.07	0.0192
New Taiwan dollar	22.29	0.0449
Vietnamese dong	16819	0.0001
Hong Kong dollar	5.6524	0.1769
Papua New	2.43	0.4115

Guinea kina		
Swiss franc	0.727	1.3755
United Arab Emirates dir	2.6504	0.3773
Canadian dollar	0.9559	1.0461
Trade-weighted Index	62.7	0.0159

Source: ©Reserve Bank of Australia 2018, 'Exchange rates', https://www.rba.gov.au/statistics/frequency/exchange-rates.html.

As Table 17.1 shows, exchange rates can be expressed either as the amount of foreign currency needed to purchase one dollar (left column) or as the number of dollars needed to purchase one unit of the foreign currency (right column). These two ways of expressing the exchange rate are equivalent: each is the reciprocal of the other. For example, at 4 pm on 14 November 2018, the Australian–US dollar exchange rate could have been expressed either as 0.7217 US dollars per Australian dollar or as 1.3856 Australian dollars per US dollar, where 0.7217 = 1/1.3856.

EXAMPLE 17.1 – NOMINAL EXCHANGE RATES

Based on Table 17.1, find the exchange rate between the UK and US currencies. Express the exchange rate in both US dollars per pound and pounds per US dollar.

From Table 17.1 we see that 0.5558 UK pounds will buy an Australian dollar, and that 0.7217 US dollars will buy an Australian dollar. Therefore 0.5558 UK pounds and 0.7217 US dollars are equal in value:

$$\textbf{0.5558 UK pounds} = \textbf{0.7217 US dollars}$$

Dividing both sides of this equation by 0.7217, we get:

$$\textbf{0.7701 UK pounds} = \textbf{1 US dollar}$$

In other words, the United Kingdom–United States exchange rate can be expressed as 0.7701 UK pounds per US dollar. Alternatively, the exchange rate can be expressed as 1/0.7701 = 1.2984 US dollars per pound.

CONCEPT CHECK 17.1

From the business section of the newspaper or an online source (try the Reserve Bank of Australia's website at www.rba.gov.au), find recent quotations of the value of the Australian dollar against the British pound, the Singapore dollar and the Japanese yen. Based on these data, find the exchange rate:

a) between the pound and the Singapore dollar

b) between the Singapore dollar and the yen.

Express the exchange rates you derive in two ways (e.g. both as pounds per Singapore dollar and as Singapore dollars per pound).

In this chapter we will use the symbol e to stand for a country's nominal exchange rate. Although the exchange rate can be expressed either as foreign currency units per unit of domestic currency, or vice versa, as we saw in Table 17.1, let us agree to define e as *the number of units of the foreign currency that the domestic currency will buy*. For example, if we treat Australia as the 'home' or 'domestic' country and Japan as the 'foreign' country, e will be defined as the number of Japanese yen that one dollar will buy. Defining the nominal exchange rate this way implies that an *increase* in e corresponds to an *appreciation*, or a strengthening, of the home currency, while a *decrease* in *e* implies a *depreciation*, or weakening, of the home currency.

Figure 17.1 shows the nominal exchange rate for the Australian dollar for the period from 12 December 1983 to14 November 2018. Rather than showing the value of the dollar relative to that of an individual foreign currency, such as the Japanese yen or the British pound, the figure expresses the value of the dollar as an *average* of its values against other major currencies. This is known as the *trade weighted index* since countries with which Australia does a lot of international trade are given a relatively higher weight in the calculation of the index than countries with which Australia does little trade.

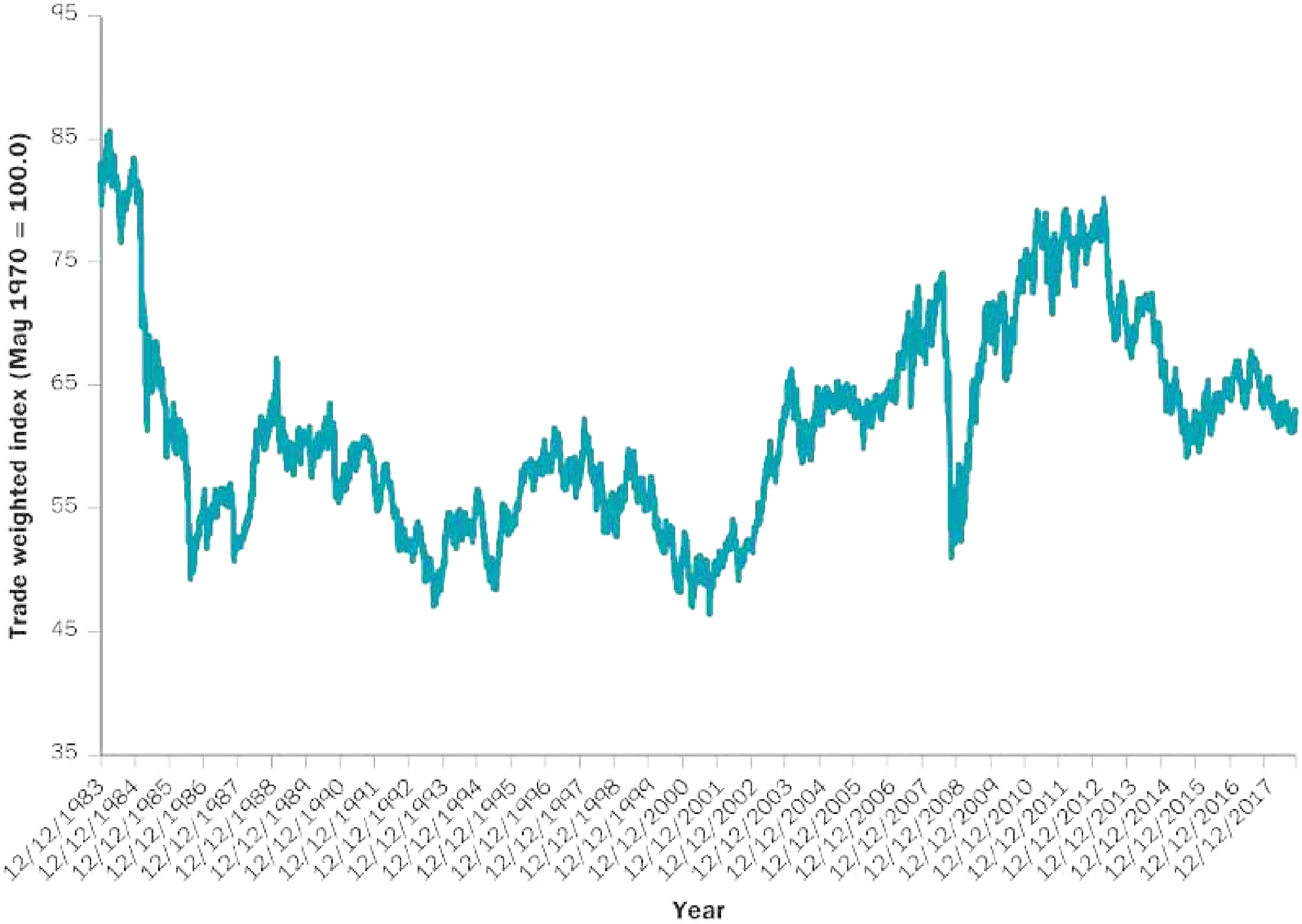

Figure 17.1 **Australia's trade weighted nominal exchange rate**

Note: The trade weighted exchange rate is an index of Australia's exchange rates with all of its trading partner countries. Those countries with which Australia does a lot of trade receive a relatively higher weight in the calculation of the index.

Source: Based on Reserve Bank of Australia 2018, 'Historical data', https://www.rba.gov.au/statistics/historical-data.html#exchange-rates.

The choice of beginning date for this graph is very significant. On that day the Australian dollar was floated. This meant that, from that day, market forces became the main determinant of Australia's exchange rate. Prior to that date the Reserve Bank of Australia intervened on a regular basis in foreign exchange markets to influence the value of the dollar. We will discuss these issues in more detail later in the next section of the chapter.

You can see from Figure 17.1 that, since its float, the dollar's value has fluctuated over time, sometimes decreasing (as in the period 1983 to 1986), sometimes increasing (as in 2003–04) and sometimes changing quite dramatically (as in the second half of 2008 during the Global Financial Crisis). An increase in the value of a currency relative to other currencies is known as an **appreciation** ; a decline in the value of a currency relative to other currencies is called a **depreciation** . So we can say that the dollar depreciated in 1983–86 and appreciated in 2003–04. We will discuss the reasons a currency may appreciate or depreciate later in this chapter.

17.1.1 FLEXIBLE VERSUS FIXED EXCHANGE RATES

As we saw in Figure 17.1 , the exchange rate between the Australian dollar and other currencies is not constant but varies continually. Indeed, changes in the value of the dollar occur daily, hourly, even minute by minute. Such fluctuations in the value of a currency are normal for countries like Australia, which have a *flexible* or *floating exchange rate*. The value of a **flexible exchange rate** is not officially fixed but varies according to the supply and demand for the currency in the **foreign exchange market**—the market on which currencies of various nations are traded for one another. We will discuss the factors that determine the supply and demand for currencies shortly.

Some countries do not allow their currency values to vary with market conditions but instead maintain a *fixed exchange rate*. The value of a **fixed exchange rate** is set by official government policy. (A government that establishes a fixed exchange rate typically determines the exchange rate's value independently, but sometimes exchange rates are set according to an agreement among a number of governments.) Some countries or regions fix their exchange rates in terms of the US dollar (e.g. Hong Kong) but there are other possibilities. Some French-speaking African countries have traditionally fixed the value of their currencies in terms of the French franc. Under the gold standard, which many countries used until its collapse during the Great Depression, currency values were fixed in terms of ounces of gold. In the next section we will focus on flexible exchange rates but we will return later to the case of fixed rates. We will also discuss the costs and benefits of each type of exchange rate system.

▹▹ RECAP

The nominal exchange rate is the price of one currency in terms of another currency. The trade weighted exchange rate is an average of one country's exchange rates with all of its trading partners, where relatively important trading partners are accorded a relatively larger weight. If the nominal exchange rate is defined as the amount of foreign currency required to purchase one unit of domestic currency, an increase in the numerical value of the exchange rate is an appreciation, while a decrease in the numerical value of the exchange rate is a depreciation.

Exchange rates can be either flexible or fixed. In a flexible exchange rate system, the supply and demand for a nation's currency determines the value of the exchange rate. In a fixed exchange rate, interventions in the internal currency market by the government or central bank are used to influence the level of the exchange rate.

17.2 THE REAL EXCHANGE RATE

LO 17.3

FIND ONLINE

The nominal exchange rate tells us the price of the domestic currency in terms of a foreign currency. As we will see in this section, the *real exchange rate* tells us the price of the average domestic *good or service* in terms of the average foreign *good or service*. We will also see that a country's real exchange rate has important implications for its ability to sell its exports abroad and to purchase imports from other countries.

To provide background for discussing the real exchange rate, imagine you are in charge of purchasing for a company that is planning to acquire a large number of new computers. The company's computer specialist has identified two models, one Japanese-made and one Australian-made, that meet the necessary specifications. Since the two models are essentially equivalent, the company will buy the one with the lower price. However, since the computers are priced in the currencies of the countries of manufacture, the price comparison is not so straightforward. Your mission is to determine which of the two models is cheaper.

To complete your assignment you will need two pieces of information: the nominal exchange rate between the dollar and the yen, and the prices of the two models in terms of the currencies of their countries of manufacture. Example 17.2 shows how you can use this information to determine which model is cheaper.

EXAMPLE 17.2 – COMPARING PRICES EXPRESSED IN DIFFERENT CURRENCIES

An Australian-made computer costs $2400 and a similar Japanese-made computer costs 242 000 yen. If the nominal exchange rate is 110 yen per dollar, which computer is the better buy?

To make this price comparison we must measure the prices of both computers in terms of the same currency. To make the comparison in dollars, we first convert the Japanese computer's price into dollars. The price in terms of Japanese yen is ¥242 000 (the symbol ¥ means 'yen'), and we are told that ¥110 = $1. To find the dollar price of the computer, then, we observe that for any good or service:

$$\textbf{Price in yen} = \textbf{price in dollars} \times \textbf{value of dollar in terms of yen}$$

Note that the value of a dollar in terms of yen is just the yen–dollar exchange rate. Making this substitution and solving, we get:

$$\textbf{Price in dollars} = \frac{\textbf{Price in yen}}{\textbf{Yen:dollar exchange rate}} = \frac{242\,000}{110} = 2200$$

Our conclusion is that the Japanese computer is cheaper than the Australian computer at $2200, or $200 less than the price of the Australian computer, $2400. The Japanese computer is the better deal.

CONCEPT CHECK 17.2

Continuing Example 17.2, compare the prices of the Japanese and Australian computers by expressing both prices in terms of yen.

In Example 17.2 the fact that the Japanese computer was cheaper implied that your firm would choose it over the Australian-made computer. In general, a country's ability to compete in international markets depends in part on the prices of its goods and services *relative* to the prices of foreign goods and services, when the prices are measured in a common currency. In the hypothetical example of the Japanese and Australian computers, the price of the domestic (Australian) good relative to the price of the foreign (Japanese) good is $2400/$2200, or 1.09. So the Australian computer is 9 per cent more expensive than the Japanese computer, putting the Australian product at a competitive disadvantage.

More generally, economists ask whether *on average* the goods and services produced by a particular country are expensive relative to the goods and services produced by other countries. This question can be answered by the country's *real exchange rate*. Specifically, a country's **real exchange rate** is the price of the average domestic good or service relative to the price of the average foreign good or service, when prices are expressed in terms of a common currency.

To obtain an equation for the real exchange rate, recall that e equals the nominal exchange rate (the number of units of foreign currency per dollar) and that P equals the domestic price level, as measured, for example, by the consumer price index. We will use P as a measure of the price of the 'average' domestic good or service. Similarly, let P^f equal the foreign price level. We will use P^f as the measure of the price of the 'average' foreign good or service.

The real exchange rate equals the price of the average domestic good or service relative to the price of the average foreign good or service. It would not be correct, however, to define the real exchange rate as the ratio P/P^f because the two price levels are expressed in different currencies. As we saw in Example 17.2, to convert foreign prices into dollars we must divide the foreign price by the exchange rate. By this rule, the price in dollars of the average foreign good or service equals P^f/e. Now we can write the real exchange rate as:

$$\text{Real exchange rate} = \frac{\text{Price of domestic good}}{\text{Price of foreign good in dollars}} = \frac{P}{\frac{P^f}{e}}$$

To simplify this expression, multiply the numerator and denominator by e to get:

$$\text{Real exchange rate} = \frac{eP}{P^f} \qquad \textbf{Equation 17.1}$$

which is the equation for the real exchange rate.

To check this equation let us use it to re-solve the computer example, Example 17.2. (For this exercise we imagine that computers are the only good produced by Australia and Japan, so the real exchange rate becomes just the price of Australian computers relative to Japanese computers.) In that example the nominal exchange rate, e, was ¥110/$1, the domestic price, P (of a computer), was $2400 and the foreign price, P^f, was ¥242 000. Applying Equation 17.1, we get:

$$\begin{aligned}\text{Real exchange rate for computers} &= \frac{(¥110/\$1) \times 2400}{¥242\ 000} \\ &= \frac{¥264\ 000}{¥242\ 000} \\ &= 1.09\end{aligned}$$

which is the same answer we derived earlier.

The real exchange rate, an overall measure of the price of domestic goods relative to foreign goods, is an important economic variable. As

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Example 17.2 suggests, when the real exchange rate is high, domestic goods are on average more expensive than foreign goods (when priced in the same currency). A high real exchange rate implies that domestic producers will have difficulty exporting to other countries (domestic goods will be 'overpriced'), while foreign goods will sell well in the home country (because imported goods are cheap relative to goods produced at home). Since a high real exchange rate tends to reduce exports and increase imports, we conclude that *net exports will tend to be low when the real exchange rate is high, all else being equal*. Conversely, if the real exchange rate is low then the home country will find it easier to export (because its goods are priced below those of foreign competitors), while domestic residents will buy fewer imports (because imports are expensive relative to domestic goods). *Thus net exports will tend to be high when the real exchange rate is low, all else being equal*.

Equation 17.1 also shows that the real exchange rate tends to move in the same direction as the nominal exchange rate, e (since e appears in the numerator of the equation for the real exchange rate). This is especially the case over relatively short periods of time when average price levels in the respective economies are likely to change very little, if at all. To the extent that real and nominal exchange rates move in the same direction, we can conclude that net exports will be hurt by a high nominal exchange rate and helped by a low nominal exchange rate.

THINKING AS AN ECONOMIST 17.1

Does a strong currency imply a strong economy?

Politicians and the public sometimes take pride in the fact that their national currency is 'strong', meaning that its value in terms of other currencies is high or rising. Likewise, policymakers sometimes view a depreciating ('weak') currency as a sign of economic failure. Does a strong currency necessarily imply a strong economy?

Contrary to popular impression, there is no simple connection between the strength of a country's currency and the strength of its economy. For example, Figure 17.1 shows that the value of the Australian dollar relative to other major currencies was greater in the year 1983 than in the year 2004, though Australia's economic performance was considerably better in 2004 than in 1983, a period of recession and high inflation.

One reason a strong currency does not necessarily imply a strong economy is that an appreciating currency (an increase in e) tends to raise the real exchange rate (equal to eP/P^f), which may hurt a country's net exports. For example, if the dollar strengthens against the yen (i.e. if a dollar buys more yen than before), Japanese goods will become cheaper in terms of dollars. The result may be that Australians prefer to buy Japanese goods rather than goods produced at home. Likewise, a stronger dollar implies that each yen buys fewer dollars, so exported Australian goods become more expensive to Japanese consumers. As Australian goods become more expensive in terms of yen, the willingness of Japanese consumers to buy Australian exports declines. A strong dollar may therefore imply lower sales and profits for Australian industries that export, as well as for Australian industries (like car manufacturers) that compete with foreign firms for the domestic Australian market.

REVIEW

The real exchange rate is the price of the average domestic good or service relative to the price of the average foreign good or service, when prices are expressed in terms of a common currency. A formula for the real exchange rate is eP/P^f, where e is the nominal exchange rate, P is the domestic price level and P^f is the foreign price level.

An increase in the real exchange rate implies that domestic goods are becoming more expensive relative to foreign goods, which tends to reduce exports and stimulate imports. Conversely, a decline in the real exchange rate tends to increase net exports.

17.3 THE DETERMINATION OF THE EXCHANGE RATE

LO 17.4

Countries that have flexible exchange rates, such as Australia and New Zealand, see the international values of their currencies change continually. What determines the value of the nominal exchange rate at any point in time? In this section we will try to answer this basic economic question. Again, our focus for the moment is on flexible exchange rates, whose values are determined by the foreign exchange market. Later in the chapter we discuss the case of fixed exchange rates.

17.3.1 A SIMPLE THEORY OF EXCHANGE RATES: PURCHASING POWER PARITY

The most basic theory of how nominal exchange rates are determined is called *purchasing power parity*, or PPP. To understand this theory we must first discuss a fundamental economic concept, called *the law of one price*. The **law of one price** states that if transport costs are relatively small, the price of an internationally traded commodity must be the same in all locations. For example, if transport costs are not too large, the price of a bushel of wheat ought to be the same in Mumbai and Sydney. Suppose that were not the case—that the price of wheat in Sydney was only half the price in Mumbai. In that case, grain merchants would have a strong incentive to buy wheat in Sydney and ship it to Mumbai, where it could be sold at double the price of purchase. As wheat left Sydney, reducing the local supply, the price of wheat in Sydney would rise, while the inflow of wheat into Mumbai would reduce the price in Mumbai.

If the law of one price were to hold for all goods and services (which is not a realistic assumption, as we will see shortly), then the value of the nominal exchange rate would be determined, as Example 17.3 illustrates.

EXAMPLE 17.3 – HOW MANY INDIAN RUPEES EQUAL ONE AUSTRALIAN DOLLAR?

Suppose that a bushel of grain costs 5 Australian dollars in Sydney and 150 rupees in Mumbai. If the law of one price holds for grain, what is the nominal exchange rate between Australia and India?

Because the market value of a bushel of grain must be the same in both locations, we know that the Australian price of wheat must equal the Indian price of wheat, so that:

$$\text{5 Australian dollars} = \text{150 Indian rupees}$$

Dividing by 5, we get:

$$\text{1 Australian dollar} = \text{30 Indian rupees}$$

Thus the nominal exchange rate between Australia and India should be 30 rupees per Australian dollar.

CONCEPT CHECK 17.3

The price of gold is $US300 per ounce in New York and 2500 Swedish krona per ounce in Stockholm. If the law of one price holds for gold, what is the nominal exchange rate between the US dollar and the Swedish krona?

Example 17.3 and Concept Check 17.3 illustrate the application of the purchasing power parity theory. According to the **purchasing power parity (PPP)** theory, nominal exchange rates are determined as necessary for the law of one price to hold.

A particularly useful prediction of the PPP theory is that, in the long run, the *currencies of countries that experience significant inflation will tend to depreciate*. To see why, we will extend the analysis in Example 17.4.

EXAMPLE 17.4 – HOW MANY INDIAN RUPEES EQUAL ONE AUSTRALIAN DOLLAR?

Suppose India experiences significant inflation, so that the price of a bushel of grain in Mumbai rises from 150 to 300 rupees. Australia has no inflation, so the price of grain in Sydney remains unchanged at 5 Australian dollars. If the law of one price holds for grain, what will happen to the nominal exchange rate between Australia

and India?

As in Example 17.3, we know that the market value of a bushel of grain must be the same in both locations. Therefore:

$$5 \text{ Australian dollars} = 300 \text{ rupees}$$

Equivalently:

$$1 \text{ Australian dollar} = 60 \text{ rupees}$$

The nominal exchange rate is now 60 rupees per Australian dollar. Before India's inflation the nominal exchange rate was 30 rupees per Australian dollar (Example 17.3). So in this example, inflation has caused the rupee to depreciate against the Australian dollar. Conversely, Australia, with no inflation, has seen its currency appreciate against the rupee.

The link between inflation and depreciation makes economic sense. Inflation implies that a nation's currency is losing purchasing power in the domestic market. Analogously, exchange rate depreciation implies that the nation's currency is losing purchasing power in international markets.

Figure 17.2 shows average annual rates of inflation and nominal exchange rate depreciation for some South and Central American countries from 1995 to 2013. Inflation is measured as the annual rate of change in the country's consumer price index; depreciation is measured relative to the US dollar. Figure 17.2 shows that, as the PPP theory implies, countries with higher inflation relative to the United States during the 1995–2013 period tended to experience the most rapid depreciation of their currencies.

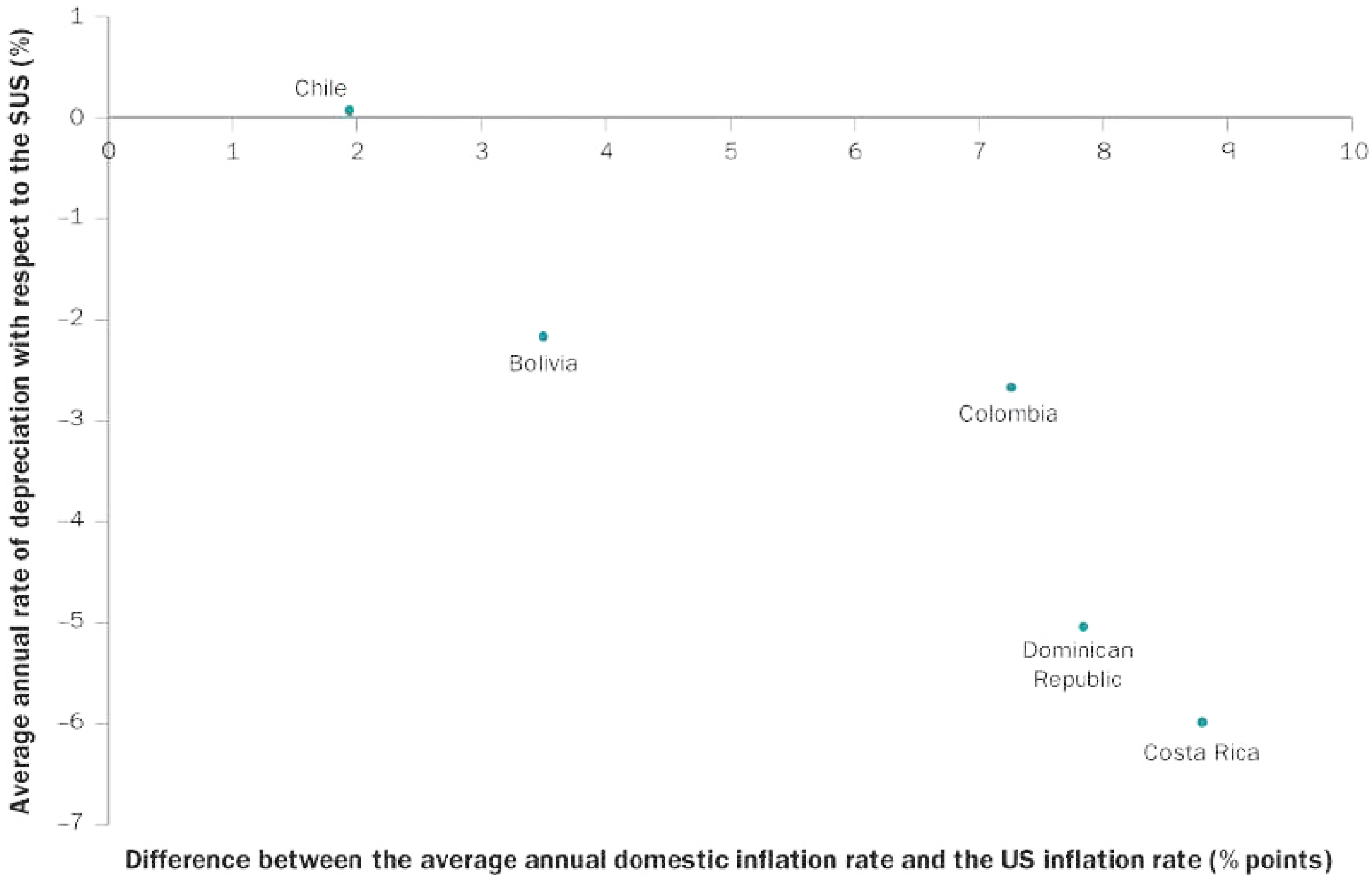

Figure 17.2 **Inflation and currency depreciation in some South and Central American countries, 1995–2013**

Note: High inflation relative to the US over this period was associated with rapid depreciation of the nominal exchange rate.

Source: Authors' calculations based on International Monetary Fund 2018, 'IMF data: Access to macroeconomic and financial data', http://data.imf.org/?sk=388DFA60-1D26-4ADE-B505-A05A558D9A42, accessed November 2018.

17.3.2 SHORTCOMINGS OF THE PPP

THEORY

Empirical studies have found that the PPP theory is useful for predicting changes in nominal exchange rates over the relatively long run. In particular, this theory helps to explain the tendency of countries with high inflation to experience depreciation of their exchange rates, as shown in Figure 17.2 . However, the theory is less successful in predicting short-run movements in exchange rates.

An example of a dramatic failure of the PPP theory occurred in Australia over the course of 2003. As Figure 17.1 indicates, during 2003 the value of the Australian dollar rose over 20 per cent relative to the currencies of Australia's trading partners. This strong appreciation was followed in April and May 2004 by a depreciation. PPP theory could explain this roller-coaster behaviour only if inflation were far lower in Australia than in its trading partners in 2003 and far higher in April and May of 2004. In fact, inflation was similar in Australia and its trading partners throughout both periods.

Why does the PPP theory not always work well? Recall that this theory relies on the law of one price, which says that the price of an internationally traded commodity must be the same in all locations. The law of one price works well for goods such as grain or gold, which are standardised commodities that are traded widely. However, *not all goods and services are traded internationally, and not all goods are standardised commodities*.

Many goods and services are not traded internationally because the assumption underlying the law of one price—that transport costs are relatively small—does not hold for them. For example, for Indians to export haircuts to Australia they would need to transport an Indian barber to Australia every time an Australian resident desired a trim. Because transport costs prevent haircuts from being traded internationally, the law of one price does not apply to them. Thus, even if the price of haircuts in Australia were double the price of haircuts in India, market forces would not necessarily force prices towards equality in the short run. (Over the long run, some Indian barbers might emigrate to Australia.) Other examples of non-traded goods and services are agricultural land, buildings, heavy construction materials (whose value is low relative to their transportation costs) and highly perishable foods. In addition, some products use non-traded goods and services as inputs: a McDonald's hamburger served in Moscow has both a tradable component (frozen hamburger patties) and a non-tradable component (the labour of counter workers). In general, the greater the share of non-traded goods and services in a nation's output, the less precisely the PPP theory will apply to the country's exchange rate. (Trade barriers, such as tariffs and quotas, also increase the costs associated with shipping goods from one country to another. Thus, trade barriers reduce the applicability of the law of one price in much the same way that physical transportation costs do.)

The second reason the law of one price and the PPP theory sometimes fail to apply is that not all internationally traded goods and services are perfectly standardised commodities, like grain or gold. For example, Australian-made cars and Japanese-made cars are not identical: they differ in styling, horsepower, reliability and other features. As a result, some people strongly prefer one nation's cars to the other's. Thus, if Japanese cars cost 10 per cent more than Australian cars, Australian car exports will not necessarily flood the Japanese market, since many Japanese will still prefer Japanese-made cars even at a 10 per cent premium. Of course, there are limits to how far prices can diverge before people will switch to the cheaper product. But the law of one price, and hence the PPP theory, will not apply exactly to non-standardised goods.

To summarise, the PPP theory works reasonably well as an explanation of exchange rate behaviour over the long run but not in the short run. Because transportation costs limit international trade in many goods and services, and because not all goods that are traded are standardised commodities, the law of one price (on which the PPP theory is based) works only imperfectly in the short run. To understand the short-run movements of exchange rates we need to incorporate some additional factors. In the next section we will study a supply and demand framework for the determination of exchange rates.

▹▹ RECAP

Purchasing power parity implies that the exchange rate between two countries adjusts so that the respective price levels in the two countries are equal when measured in units of a common currency. A further implication of PPP is that the rate of depreciation of the exchange rate between two countries reflects the difference in the inflation rates of the two countries.

Purchasing power parity does a reasonable job of describing long-run movements in exchange rates; it does less well as an explanation of short-run movements in exchange rates. Economists believe this is because transportation costs and the fact that not all commodities are traded means that PPP works only imperfectly in the short run.

17.4 THE DETERMINATION OF THE EXCHANGE RATE: A SUPPLY AND DEMAND ANALYSIS

LO 17.5, 17.6

Although the PPP theory helps to explain the long-run behaviour of the exchange rate, supply and demand analysis is more useful for studying its short-run behaviour. As we will see, dollars are demanded in the foreign exchange market by foreigners who seek to purchase Australian goods and assets and are supplied by Australian residents who need foreign currencies to buy foreign goods and assets. The equilibrium exchange rate is the value of the dollar that equates the number of dollars supplied and demanded in the foreign exchange market. In this section we discuss the factors that affect the supply and demand for dollars, and thus Australia's exchange rate.

17.4.1 THE SUPPLY OF DOLLARS

FIND ONLINE

The principal suppliers of Australian dollars to the foreign exchange market are Australian households and firms. Why would an Australian household or firm want to supply dollars in exchange for foreign currency? There are two major reasons. First, an Australian household or firm may need foreign currency *to purchase foreign goods or services*. For example, an Australian car importer may need yen to purchase Japanese cars, or an Australian tourist may need yen to make purchases in Tokyo. Second, an Australian household or firm may need foreign currency *to purchase foreign assets*. For example, an Australian superannuation fund may wish to acquire shares issued by Japanese companies, or an individual Australian saver may want to purchase Japanese government bonds. Because Japanese assets are priced in yen, the Australian household or firm will need to trade dollars for yen to acquire these assets.

The supply of dollars to the foreign exchange market is illustrated in Figure 17.3. We will focus on the market in which dollars are traded for Japanese yen, but bear in mind that similar markets exist for every other pair of traded currencies. The vertical axis of Figure 17.3 shows the Australian–Japanese exchange rate as measured by the number of yen that can be purchased with each dollar. The horizontal axis shows the number of dollars being traded in the yen–dollar market.

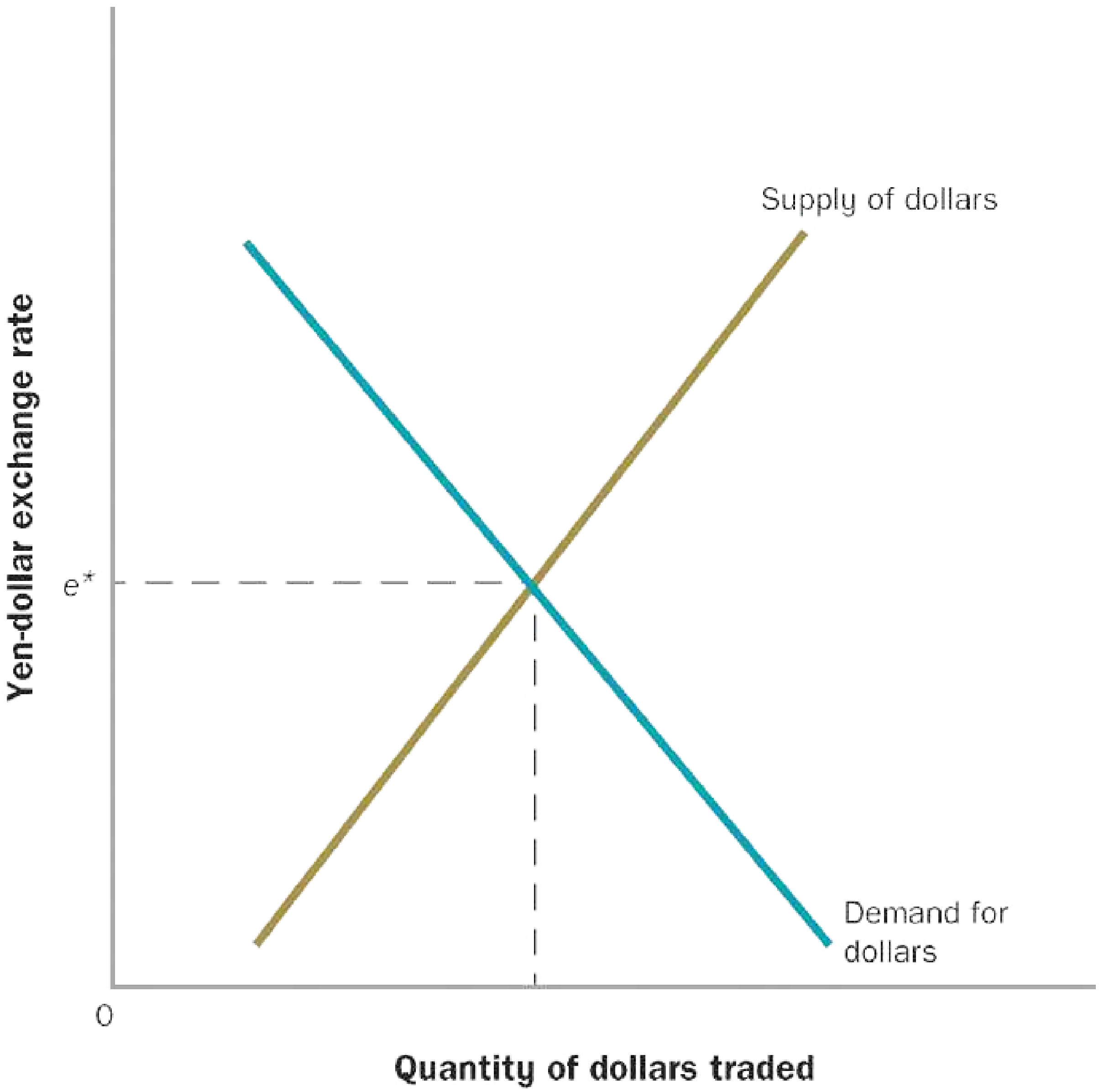

Figure 17.3 **The supply and demand for dollars in the yen–dollar market**

Note: The supply of dollars to the foreign exchange market is upward sloping, because an increase in the number of yen offered for each dollar makes Japanese goods, services and assets more attractive to Australian buyers. Similarly, the demand for dollars is downward sloping, because holders of yen will be less willing to buy dollars the more expensive they are in terms of yen. The equilibrium exchange rate, *e**, also called the fundamental value of the exchange rate, equates the quantities of dollars supplied and demanded.

Note that the supply curve for dollars is upward sloping. In other words, the more yen each dollar can buy, the more dollars people are willing to supply to the foreign exchange market. Why? At given prices for Japanese goods, services and assets, the more yen a dollar can buy, the cheaper those goods, services and assets will be in dollar terms. For example, if a video game costs 5000 yen in Japan, and a dollar can buy 100 yen, the dollar price of the video game will be $50. However, if a dollar can buy 200 yen, then the dollar price of the same video game will be $25. Assuming that lower dollar prices will induce Australians to increase their expenditures on Japanese goods, services and assets, a higher yen–dollar exchange rate will increase the supply of dollars to the foreign exchange market. Thus the supply curve for dollars is upward sloping.

17.4.2 THE DEMAND FOR DOLLARS

In the yen–dollar foreign exchange market, demanders of dollars are those who wish to acquire dollars in exchange for yen. Most demanders of dollars in the yen–dollar market are Japanese households and firms, although anyone who happens to hold yen is free to trade them for dollars. Why demand dollars? The reasons for acquiring dollars are analogous to those for acquiring yen. First, households and firms that hold yen will demand dollars *so that they can purchase Australian goods and services*. For example, a Japanese firm that wants to license Australian-produced software needs dollars to pay the required fees, and a Japanese student studying in an Australian university must pay tuition in dollars. The firm or the student can acquire the necessary dollars only by offering yen in exchange. Second, households and firms demand dollars *in order to purchase Australian assets*. The purchase of Gold Coast real estate by a Japanese company or the acquisition of Telstra shares by a Japanese pension fund are two examples.

The demand for dollars is represented by the downward-sloping curve in Figure 17.3. The curve slopes downwards because the more yen a Japanese citizen must pay to acquire a dollar, the less attractive Australian goods, services and assets will be. Hence the demand for dollars will be low when dollars are expensive in terms of yen and high when dollars are cheap in terms of yen.

17.4.3 EQUILIBRIUM VALUE OF THE DOLLAR

FIND ONLINE

As mentioned earlier, Australia, like many countries, maintains a flexible, or floating, exchange rate, which means that the value of the dollar is determined by the forces of supply and demand in the foreign exchange market. In Figure 17.3 the equilibrium value of the dollar is e^*, the yen–dollar exchange rate at which the quantity of dollars supplied equals the quantity of dollars demanded. The equilibrium value of the exchange rate is also called the **fundamental value of the exchange rate**. In general, the equilibrium value of the dollar is not constant but changes with shifts in the supply of and demand for dollars in the foreign exchange market.

17.4.4 CHANGES IN THE SUPPLY OF DOLLARS

Recall that people supply dollars to the yen–dollar foreign exchange market in order to purchase Japanese goods, services and assets. Factors that affect the desire of Australian households and firms to acquire Japanese goods, services and assets will therefore affect the supply of dollars to the foreign exchange market. Some factors that will *increase* the supply of dollars, shifting the supply curve for dollars to the right, include:

1. An increased preference for Japanese goods. For example, suppose that Japanese firms produce some popular new consumer electronics. To acquire the yen needed to buy these goods, Australian importers will increase their supply of dollars to the foreign exchange market.
2. An increase in Australia's real GDP. This will raise the incomes of Australians, allowing them to consume more goods and services. Some part of this increase in consumption will take the form of goods imported from Japan. To buy more Japanese goods, Australians will supply more dollars to acquire the necessary yen.
3. An increase in the real interest rate on Japanese assets. Recall that Australian households and firms acquire yen in order to purchase Japanese assets as well as goods and services. Other factors, such as risk, being held constant, the higher the real interest rate paid by Japanese assets, the more Japanese assets Australians will choose to hold. To purchase additional Japanese assets, Australian households and firms will

supply more dollars to the foreign exchange market. There is an important caveat here concerning the likelihood of future exchange rate movements. If there is an expectation that the Australian dollar will appreciate in value against the Japanese yen, then it need not be the case that an increase in the real interest rate on Japanese financial assets translates into increased demand by holders of Australian currency for those Japanese assets. Australian dollars are expected to be worth more yen, or equivalently yen are expected to be worth fewer Australian dollars. Financial investors will understand that the apparent higher returns from Japanese assets may be illusory once those returns are converted into dollars. To guarantee that an increase in the real interest rate in Japan increases the supply of Australian dollars, therefore, requires an assumption that no change in the exchange rate is expected.

Conversely, with all else being unchanged, reduced demand for Japanese goods, a lower Australian GDP or a lower real interest rate on Japanese assets will *reduce* the number of yen Australians need, in turn reducing their supply of dollars to the foreign exchange market and shifting the supply curve for dollars to the left. Of course, any shift in the supply curve for dollars will affect the equilibrium exchange rate, as Example 17.5 shows.

EXAMPLE 17.5 – VIDEO GAMES, THE YEN AND THE DOLLAR

Suppose Japanese firms come to dominate the video

game market, with games that are more exciting and realistic than those produced in Australia. All else being equal, how will this change affect the relative value of the yen and the dollar?

The increased quality of Japanese video games will increase the demand for the games in Australia. To acquire the yen necessary to buy more Japanese video games Australian importers will supply more dollars to the foreign exchange market. As Figure 17.4 shows, the increased supply of dollars will reduce the value of the dollar. In other words, a dollar will buy fewer yen than it did before. At the same time, the yen will increase in value: a given number of yen will buy more dollars than it did before.

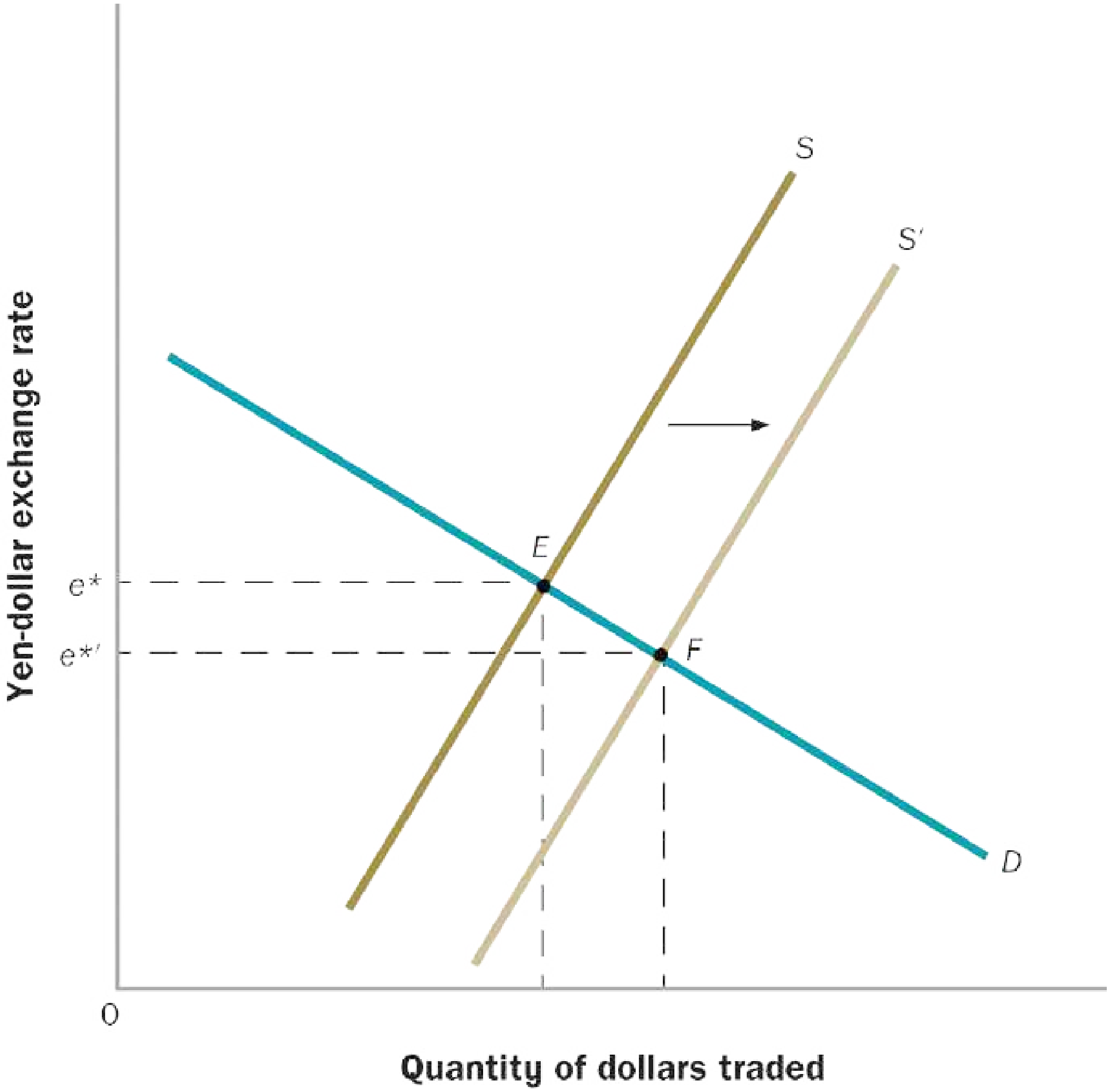

Figure 17.4 **An increase in the supply of dollars lowers the value of the dollar**

Note: Increased Australian demand for Japanese video games forces Australians to supply more dollars to the foreign exchange market to acquire the yen they need to buy the games. The supply curve for dollars shifts from *S* to *S′*, lowering the value of the dollar in terms of yen. The **fundamental value of the exchange rate falls from *e** to *e*′***.

CONCEPT CHECK 17.4

Suppose Australia goes into a recession and real GDP falls. All else being equal, how is this economic weakness likely to affect the value of the dollar?

17.4.5 CHANGES IN THE DEMAND FOR DOLLARS

The factors that can cause a change in the demand for dollars in the foreign exchange market, and thus a shift of the dollar demand curve, are analogous to the factors that affect the supply of dollars. Factors that will *increase* the demand for dollars include:

- An increased preference for Australian goods. For example, Japanese firms might find that Australian-built trucks are superior to others and decide to expand the number of Australian-made trucks in their fleets. To buy the Australian trucks, Japanese firms would demand more dollars on the foreign exchange market.
- An increase in real GDP abroad, which implies higher incomes abroad and thus more demand for imports from Australia.

- An increase in the real interest rate on Australian assets, which would make those assets more attractive to foreign savers. To acquire Australian assets, Japanese savers would demand more dollars. As in Section 17.4.4, when we discussed the effect of an increase in Japan's real interest rate on the supply of dollars, here we assume no expected change in the exchange rate.

▹▹ RECAP

Australian dollars are supplied to the international currency market because of Australians acquiring foreign currency to pay for imports or for purchases of foreign financial assets. As the exchange rate becomes stronger, the supply of Australian dollars to the international currency market will increase.

Australian dollars are demanded in the international currency market as a result of foreigners acquiring Australian currency to pay for exports or for purchases of Australian financial assets. As the exchange rate becomes weaker, the demand for Australian dollars in the international currency market will increase.

The exchange rate will adjust until the supply of and demand for Australian dollars in the international currency market is equalised.

All else being unchanged, the supply of Australian dollars will increase in the international currency market if an increase in the level of real GDP in Australia increases the demand for imports or if Australian interest rates are lower relative to the rest of the world. The supply of Australian dollars will decrease in the international currency market if a decrease in the level of real GDP in Australia decreases the demand for imports, or if Australian interest rates are higher relative to the rest of the world.

All else being unchanged, the demand for Australian dollars will increase in the international currency market if an increase in the level of real GDP in other countries increases the demand for exports or if Australian interest rates are higher relative to the rest of the world. The demand for Australian dollars will decrease in the international currency market if a decrease in the level of real GDP in other countries decreases the demand for exports or if Australian interest rates are lower relative to the rest of the world. Changes in the preference for Australian-made commodities can also affect the demand for Australian currency.

17.5 MONETARY POLICY AND THE EXCHANGE RATE

LO 17.6

FIND ONLINE

Of the many factors that could influence a country's exchange rate, among the most important is the monetary policy of the country's central bank. As we will see, monetary policy affects the exchange rate primarily through its effect on the real interest rate.

Suppose the Reserve Bank is concerned about inflation and tightens Australian monetary policy in response. The effects of this policy change on the value of the dollar are shown in Figure 17.5. Before the policy change, the equilibrium value of the exchange rate is e^*, at the intersection of the supply curve, S, and the demand curve, D (point E in the figure). The tightening of monetary policy raises the domestic Australian real interest rate, r, making Australian assets more attractive to foreign financial investors. The increased willingness of foreign investors to buy Australian assets increases the demand for dollars, shifting the demand curve rightwards from D to D'. At the same time foreign financial assets look less attractive to Australian financial investors, thus decreasing the supply of dollars, shifting the supply curve leftwards from S to S'. As you can see from Figure 17.5, the equilibrium point shifts from E to F and the equilibrium value of the dollar rises from e^* to $e^{*\prime}$. However, the caveats from Sections 17.4.4 and 17.4.5 still apply; to guarantee that these curves move in this way we assume no anticipated change in the exchange rate.

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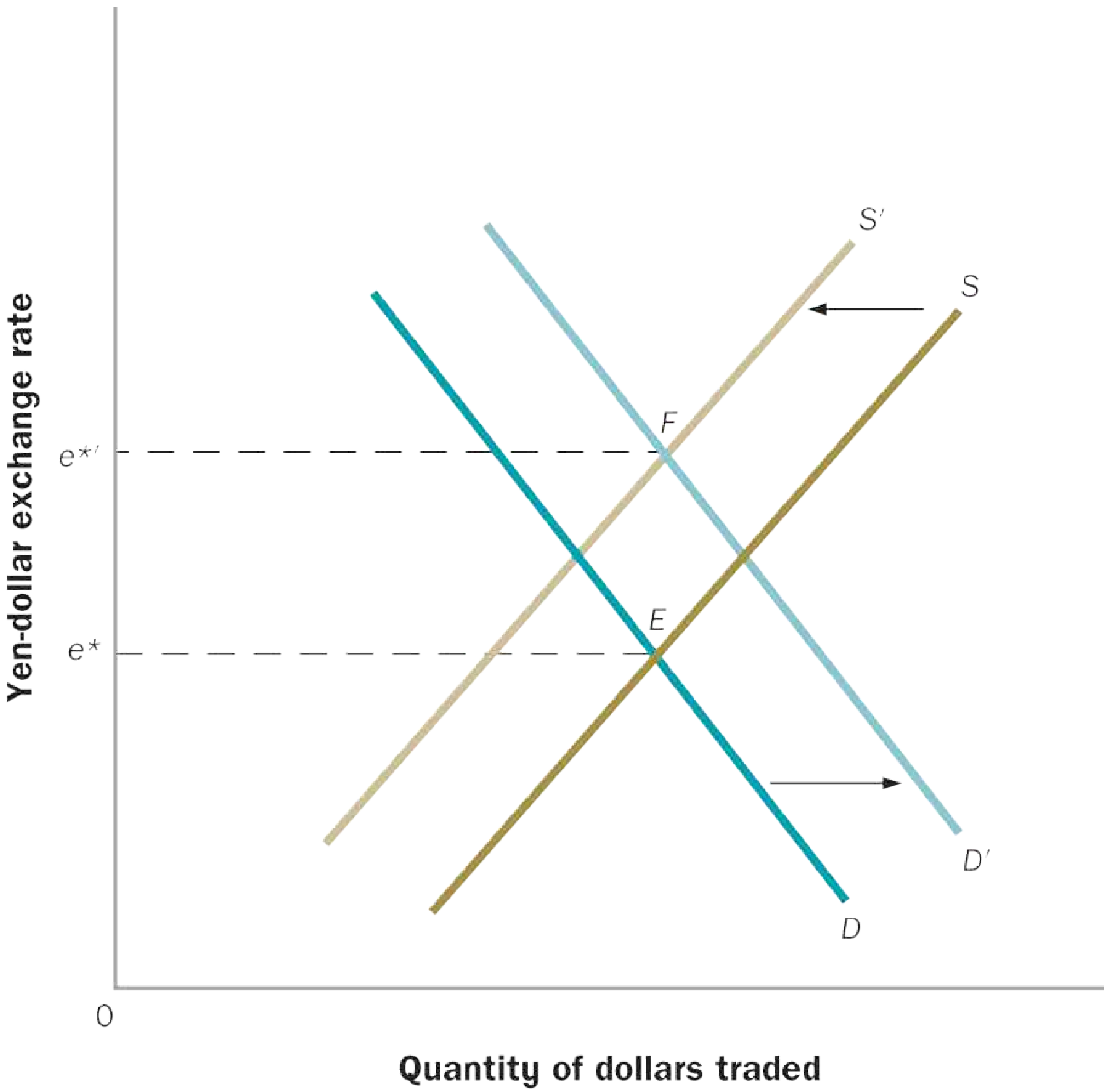

Figure 17.5 **A tightening of monetary policy strengthens the dollar**

Note: Tighter monetary policy in Australia raises the domestic real interest rate, increasing the demand for Australian assets by foreign savers and reducing the demand for foreign assets by Australian savers. The demand curve shifts from *D* to *D′* and the supply curve shifts from *S* to *S′*, leading the exchange rate to appreciate from *e** to *e*′*.

In short, all else remaining unchanged, a tightening of monetary policy by the

Reserve Bank raises the demand for dollars and decreases the supply of dollars, causing the dollar to appreciate. By similar logic, an easing of monetary policy, which reduces the real interest rate, would reduce the demand for the dollar and increase its supply, causing it to depreciate.

THINKING AS AN ECONOMIST 17.2

Why did the dollar depreciate by 12 per cent over 2018?

Over the period from 25 January 2018 to 23 October 2018, the value of the Australian dollar relative to the US dollar decreased from 0.8094 to 0.7063. What can explain this change?

Moves towards a relatively tighter monetary policy in the United States, and the associated high real interest rate, at a time when the interest rate in Australia was on hold, was an important cause of the Australian dollar's depreciation during this period. The federal funds rate, which is the interest rate targeted by the US Federal Reserve, increased three times. The target cash interest rate in Australia over this period was left unchanged—see Figure 17.6. This meant that US assets became relatively more attractive to both foreign and domestic asset holders compared with Australian assets.

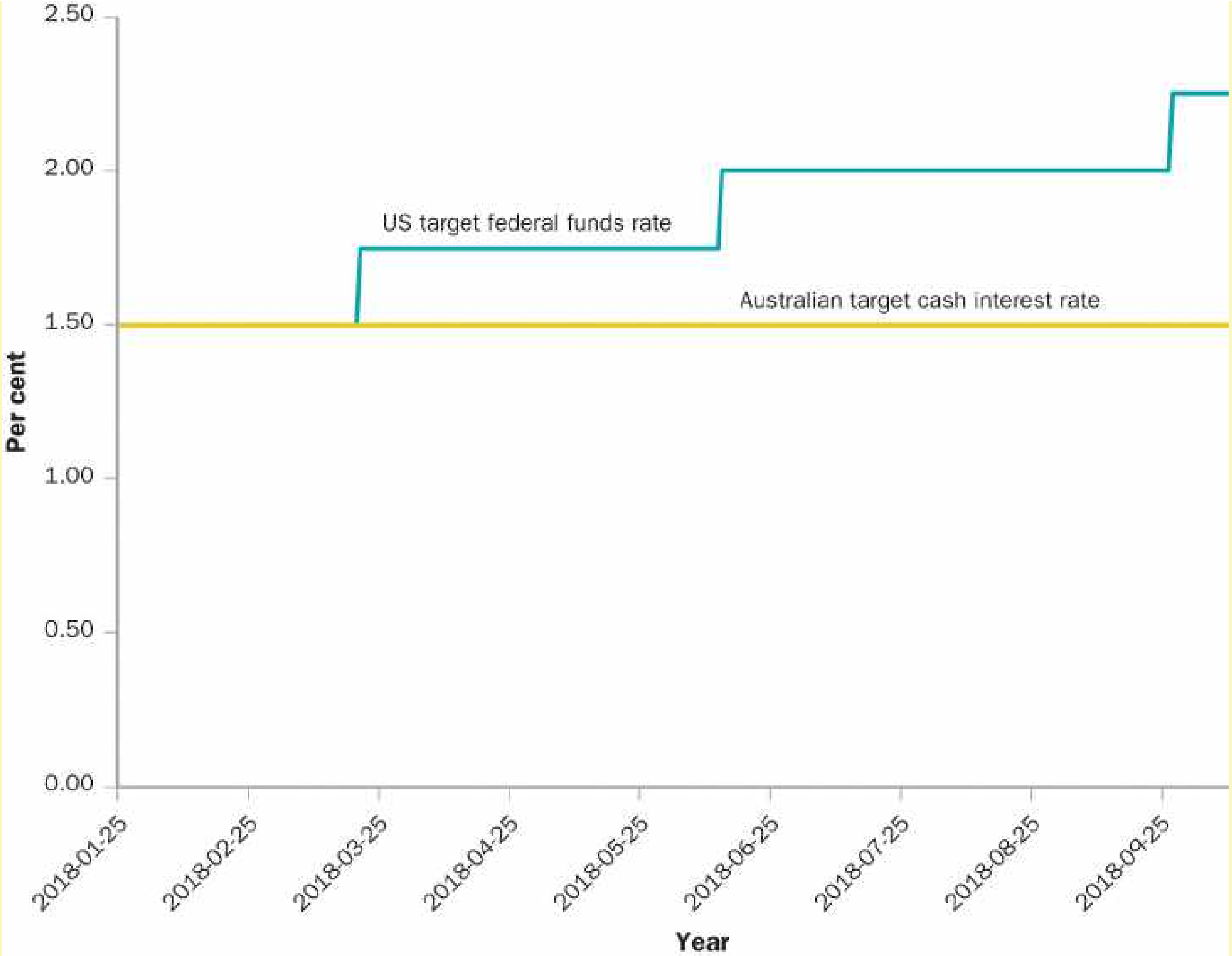

Figure 17.6 **Official interest rates in Australia and the United States**

Note: Higher interest rates in the United States relative to Australia meant that Australian assets were relatively less attractive to both foreign and domestic asset holders, weakening the Australian dollar.

Source: Based on Federal Reserve Bank of St Louis 2018, ‘Federal funds target range: upper limit’, https://fred.stlouisfed.org/series/DFEDTARU; Reserve Bank of Australia 2018, ‘Statistical tables’, https://www.rba.gov.au/statistics/tables/#interest-rates; Federal Reserve Bank of St Louis 2018, ‘Federal Reserve economic data’, https://fred.stlouisfed.org.

17.5.1 THE EXCHANGE RATE AS A TOOL OF MONETARY POLICY

In a closed economy, monetary policy affects aggregate demand solely through the real interest rate. For example, by raising the real interest rate, a tight monetary policy reduces consumption and investment spending. We will see next that in an open economy with a flexible exchange rate, the exchange rate serves as another channel for monetary policy, one that reinforces the effects of the real interest rate.

To illustrate, suppose that policymakers are concerned about inflation and decide to restrain aggregate demand. To do so they increase the real interest rate, reducing consumption and investment spending. But, as Figure 17.5 shows, the higher real interest rate may also increase the demand for dollars and decrease the supply, causing the dollar to appreciate. The stronger dollar, in turn, further reduces aggregate demand. Why? As we saw in discussing the real exchange rate, a stronger dollar reduces the cost of imported goods, increasing imports at the expense of some expenditure on domestically produced goods and services. It also makes exports more costly to foreign buyers, which tends to reduce exports—recall that exports is one of the components of aggregate demand. Thus, by reducing exports and increasing imports, a stronger dollar (more precisely, a higher real exchange rate) reduces aggregate demand.

In sum, when the exchange rate is flexible, a tighter monetary policy reduces exports and increases imports (through a stronger dollar) as well as consumption and investment spending (through a higher real interest rate). Conversely, an easier monetary policy weakens the dollar, stimulates exports and discourages imports, reinforcing the effect of the lower real interest rate on consumption and investment spending. Thus, relative to the case of a closed economy we studied earlier, *monetary policy is more effective in an open economy with a flexible exchange rate*.

▹▹ RECAP

As monetary policy affects the level of interest rates, it can have an impact on the exchange rate. All else being unchanged, a tightening of monetary policy, which pushes up interest rates, is likely to strengthen the domestic currency; a loosening of monetary policy, which pushes down interest rates, is likely to weaken the currency.

17.6 FIXED EXCHANGE RATES

LO 17.7

So far we have focused on the case of flexible exchange rates, the relevant case for most industrial countries like Australia. However, the alternative approach, fixing the exchange rate, has been quite important historically and is still used in many countries, especially small or developing nations. In this section we will see how our conclusions change when the nominal exchange rate is fixed rather than flexible. One important difference is that when a country maintains a fixed exchange rate, its ability to use monetary policy as a stabilisation tool is greatly reduced.

17.6.1 HOW TO FIX AN EXCHANGE RATE

In contrast to a flexible exchange rate, whose value is determined solely by supply and demand in the foreign exchange market, the value of a fixed exchange rate is determined by the government (in practice, usually the finance ministry or treasury department, with the cooperation of the central bank). Today, the value of a fixed exchange rate is usually set in terms of a major currency (e.g. Hong Kong pegs its currency one-for-one to the US dollar), or relative to a 'basket' of currencies, typically those of the country's trading partners. Historically, currency values were often fixed in terms of gold or other precious metals, but in recent years precious metals have rarely if ever been used for that purpose.

Once an exchange rate has been fixed, the government usually attempts to keep it unchanged for some time. (There are exceptions to this statement. Some countries employ a *crawling peg* system, under which the exchange rate is fixed at a value that changes in a gradual way over time. For example, the government may ensure that the value of the fixed exchange rate will fall 2 per cent each year. Other countries use a *target zone* system, in which the exchange rate is allowed to deviate by a small amount from its fixed value. To focus on the key issues, we will assume that the exchange rate is fixed at a single value for a protracted period.) However, sometimes economic circumstances force the government to change the value of the exchange rate. A reduction in the official value of a currency is called a **devaluation** ; an increase in the official value is called a **revaluation** . The devaluation of a fixed exchange rate is analogous to the depreciation of a flexible exchange rate; both involve a reduction in the currency's value. Conversely, a revaluation is analogous to an appreciation.

The supply and demand diagram we used to study flexible exchange rates can be adapted to analyse fixed exchange rates. Let us consider the case of a country called Latinia, whose currency is called the peso. Figure 17.7 shows the supply and demand for the Latinian peso in the foreign exchange market. Pesos are *supplied* to the foreign exchange market by Latinian households and firms who want to acquire foreign currencies to purchase foreign goods and assets. Pesos are *demanded* by holders of foreign currencies who need pesos to purchase Latinian goods and assets.

Figure 17.7 shows that the quantities of pesos supplied and demanded in the foreign exchange market are equal when a peso equals 0.1 dollars (10 pesos to the dollar). Hence 0.1 dollars per peso is the *fundamental value* of the peso. If Latinia had a flexible exchange rate system, the peso would trade at 10 pesos to the dollar in the foreign exchange market.

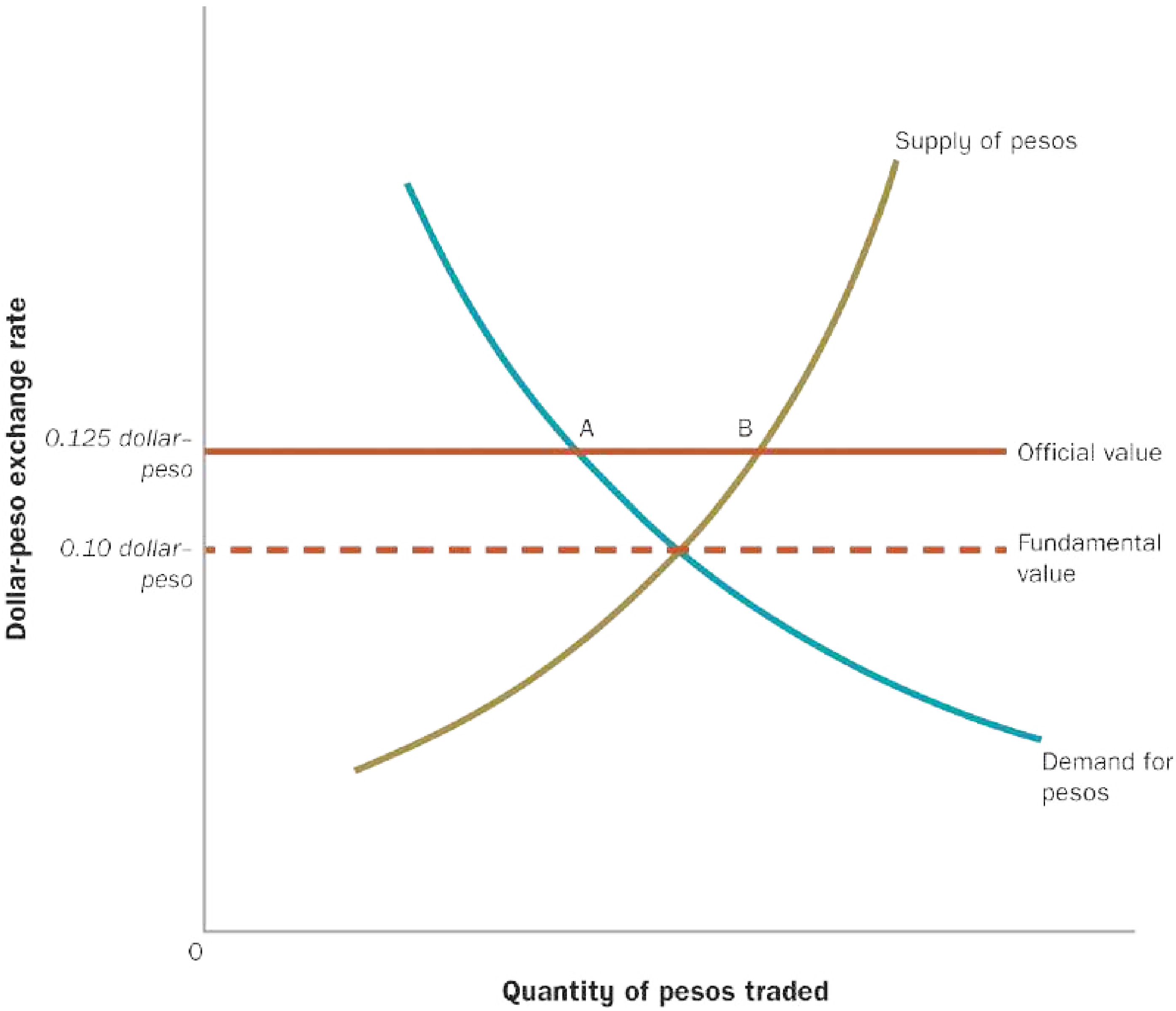

Figure 17.7 **An overvalued exchange rate**

Note: The peso's official value ($0.125) is shown as greater than its fundamental value ($0.10), as determined by supply and demand in the foreign exchange market. Thus the peso is overvalued. To maintain the fixed value, the government must purchase pesos in the quantity *AB* each period.

But let us suppose that Latinia has a fixed exchange rate and that the government has decreed the value of the Latinian peso to be 8 pesos to the dollar, or 0.125 dollars per peso. This official value of the peso, 0.125 dollars, is indicated by the solid horizontal line in Figure 17.7. Notice that it is greater than the equilibrium value, corresponding to the intersection of the supply and demand curves. When the officially fixed value of an exchange rate is greater than its fundamental value, the exchange rate is said to be **overvalued**. The official value of an exchange rate can also be lower than its fundamental value, in which case the exchange rate is said to be **undervalued**.

In this example, Latinia's commitment to hold the peso at 8 to the dollar is inconsistent with the fundamental value of 10 to the dollar, as determined by supply and demand in the foreign exchange market (the Latinian peso is overvalued). How could the Latinian Government deal with this inconsistency?

The most widely used approach to maintaining an overvalued exchange rate is for the government to become a demander of its own currency in the foreign exchange market. Figure 17.7 shows that at the official exchange rate of 0.125 dollars per peso, the private sector supply of pesos (point *B*) exceeds the private sector demand for pesos (point *A*). To keep the peso from falling below its official value, in each period the Latinian Government could purchase a quantity of pesos in the foreign exchange market equal to the length of the line segment *AB* in Figure 17.7. If the government followed this strategy then at the official exchange rate of 0.125 dollars per peso, the total demand for pesos (private demand at point *A* plus government demand *AB*) would equal the private supply of pesos (point *B*). This situation is analogous to government attempts to keep the price of a commodity, like grain or milk, above its market level. To maintain an official price of grain that is above the market-clearing price, the government must stand ready to purchase the excess supply of grain forthcoming at the official price. In the same way, to keep the 'price' of its currency above the market-clearing level, the government must buy the excess pesos supplied at the official price.

To be able to purchase its own currency and maintain an overvalued exchange rate, the government (usually the central bank) must hold foreign currency assets, called **international reserves**, or simply *reserves*. For example, the Latinian central bank may hold US dollar deposits in US banks or US Government debt, which it can trade for pesos in the foreign exchange market as needed. In the situation shown in Figure 17.7, to keep the peso at its official value, in each period the Latinian central bank will have to spend an amount of international reserves equal to the length of the line segment *AB*.

Because a country with an overvalued exchange rate must use part of its reserves to support the value of its currency in each period, over time its available reserves will decline. The net decline in a country's stock of international reserves over a year is called its **balance of payments deficit**. Conversely, if a country experiences a net increase in its international reserves over the year, the increase is called its **balance of payments surplus**. The balance of payments will be discussed in more detail in Chapter 18.

EXAMPLE 17.6 – LATINIA'S BALANCE OF PAYMENTS DEFICIT

The demand for and supply of Latinian pesos in the foreign exchange market are:

$$\textbf{Demand} = \mathbf{25\ 000 - 50\ 000}\boldsymbol{e}$$

$$\textbf{Supply} = \mathbf{17\ 600 + 24\ 000}\boldsymbol{e}$$

where the Latinian exchange rate, *e*, is measured in dollars per peso. Officially, the value of the peso is 0.125 dollars. Find the fundamental value of the peso and the Latinian balance of payments deficit, measured in both pesos and dollars.

To find the fundamental value of the peso, equate the demand and supply for pesos:

$$\mathbf{25\ 000 - 50\ 000}\boldsymbol{e} = \mathbf{17\ 600 + 24\ 000}\boldsymbol{e}$$

Solving for *e*, we get:

$$7400 = 74\ 000e$$
$$e = 0.10$$

So the fundamental value of the exchange rate is 0.10 dollars per peso, as in Figure 17.7.

At the official exchange rate, 0.125 dollars per peso, the demand for pesos is 25 000 − 50 000 (0.125) = 18 750, and the supply of pesos is 17 600 + 24 000 (0.125) = 20 600. Thus the quantity of pesos supplied to the foreign exchange market exceeds the quantity of pesos demanded by 20 600 − 18 750 = 1850 pesos. To maintain the fixed rate the Latinian government must purchase 1850 pesos per period, which is the Latinian balance of payments deficit. Since pesos are purchased at the official rate of 8 pesos to the dollar, the balance of payments deficit in dollars is (1850 pesos) × (0.125 $/peso) = $(1850/8) = $231.25.

CONCEPT CHECK 17.5

Repeat Example 17.6 under the assumption that the fixed value of the peso is 0.15 dollars per peso. What do you conclude about the relationship between the degree of currency overvaluation and the resulting balance of payments deficit?

Although a government can maintain an overvalued exchange rate for a time by offering to buy back its own currency at the official price, there is a limit to this strategy, since no government's stock of international reserves is infinite. Eventually the government will run out of reserves, and the fixed exchange rate will collapse. As we will see, the collapse of a fixed exchange rate can be quite sudden and dramatic.

CONCEPT CHECK 17.6

Diagram a case in which a fixed exchange rate is *undervalued* rather than overvalued. Show that to maintain the fixed exchange rate the central bank must use domestic currency to purchase foreign currency in the foreign exchange market. With an undervalued exchange rate, is the country's central bank in danger of running out of international reserves?

As an alternative, Latinia could try to maintain its overvalued exchange rate by restricting international transactions. Indeed, when foreign reserves begin to run low, this may be the only alternative left. Imposing quotas on imports and prohibiting domestic households and firms from acquiring foreign assets would effectively reduce the supply of pesos to the foreign exchange market, raising the fundamental value of the currency. An even more extreme action would be to prohibit Latinians from exchanging the peso for other currencies without government approval, a policy that would effectively allow the government to determine directly the supply of pesos to the foreign exchange market. Such measures might help to maintain the official value of the peso. However, restrictions on trade and capital flows are extremely costly to the economy because they reduce the gains from specialisation and trade and deny domestic households and firms access to foreign capital markets. Thus, a policy of restricting international transactions to maintain a fixed exchange rate is likely to do more harm than good.

17.6.2 SPECULATIVE ATTACKS

A government's attempt to maintain an overvalued exchange rate can be ended quickly and unexpectedly by the onset of a *speculative attack*. A **speculative attack** involves massive selling of domestic currency assets by both domestic and foreign financial investors. For example, in a speculative attack on the Latinian peso, financial investors would attempt to get rid of any financial assets—shares, bonds, deposits in banks—denominated in pesos. A speculative attack is most likely to occur when financial investors fear that an overvalued currency will soon be devalued, since in a devaluation financial assets denominated in the domestic currency suddenly become worth much less in terms of other currencies. Ironically, speculative attacks, which are usually prompted by *fear* of devaluation, may turn out to be the *cause* of devaluation. Thus, a speculative attack may actually be a self-fulfilling prophecy.

BACKGROUND BRIEFING 17.1

The Mundell–Fleming model

The most famous analytical framework for analysing the implications of different exchange rate systems for macroeconomic policy is the Mundell–Fleming model. This model was developed in the early 1960s by two economists, Nobel Laureate Robert Mundell of Columbia University, and Marcus Fleming, who was an economist at the International Monetary Fund. Their work was remarkably far-sighted. They were interested in the implications for macroeconomic policy of a world in which financial capital flowed very quickly between countries, far quicker than the flow of goods and services. Today, of course, this view of the world is remarkably accurate—thanks to the IT revolution, huge sums of money can be transferred virtually instantaneously between almost any two countries. But this was not the case in the 1960s; Mundell and Fleming's intellectual foresight has served them very well.

The Mundell–Fleming model is based on the concept of *perfect capital mobility.* This is an assumption that the search for profits will lead to financial capital flowing to countries that have relatively higher interest rates than the rest of the world. For example, suppose the Reserve Bank of Australia is concerned about mounting inflationary pressure and therefore runs a relatively tight monetary policy when compared to all other countries. International financial investors would immediately buy Australian financial assets to take advantage of the relatively attractive interest rate return. As a result, there would be a massive increase in the demand for Australian dollars. What happens next depends on the nature of the exchange rate system. If the exchange rate is flexible we would see a rapid appreciation of the Australian dollar, reflecting the higher demand for Australian currency. Suppose, however, that Australia was trying to run a fixed exchange rate policy (in the 1960s, when Mundell and Fleming first presented their work, this was the situation for Australia and for most other countries). The Reserve Bank would have to lower the overnight cash interest rate—that is, run a looser monetary policy—to bring Australian interest rates back into line with interest rates elsewhere. Only then would the pressure on the currency abate. This means that the Reserve Bank would have lost the ability to run an *independent monetary policy.* No matter what the state of the domestic economy, the Reserve Bank would have to adjust its monetary policy in line with the monetary policies of other countries in order to prevent capital flows creating pressure for an exchange rate adjustment. This is the central message of the Mundell–Fleming model: a fixed exchange rate comes at a cost—the loss of independent monetary policy.

A dramatic illustration of the Mundell–Fleming model

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in operation was the European Monetary System (EMS). This was a system of fixed exchange rates between European countries. In 1992 the EMS faced a crisis. The key currency in the EMS was the German deutschmark, with most European countries aligning their currency with that of Germany. Germany, however, was undergoing a unique experience: the unification of West Germany with the former communist East Germany. In the wake of unification the German Government launched a massive fiscal expansion to bring the former East Germany's infrastructure up to the same level as the West. Fear of the inflationary consequences of such a large fiscal expansion led Germany's central bank, the Bundesbank, to implement a very tight monetary policy. Although a sensible policy for Germany, this caused tremendous problems for other countries in the EMS, since they were forced to match the high German interest rates, even though their economic circumstances were vastly different from those of Germany. In other words, a commitment to a fixed exchange rate system, and the subsequent loss of independence in the making of monetary policy, can cause countries to have monetary policies that are not at all appropriate for their particular circumstances. What happened next in the EMS is the subject of Background briefing 17.2.

The effects of a speculative attack on the market for pesos are shown in Figure 17.8. At first, the situation is the same as in Figure 17.7: the supply and demand for Latinian pesos are indicated by the curves marked *S* and *D,* implying a fundamental value of the peso of 0.10 dollars per peso. As before, the official value of the peso is 0.125 dollars per peso—greater than the fundamental value—so the peso is overvalued. To maintain the fixed value of the peso each period the Latinian central bank must use its international reserves to buy back pesos, in the amount corresponding to the line segment *AB* in the figure.

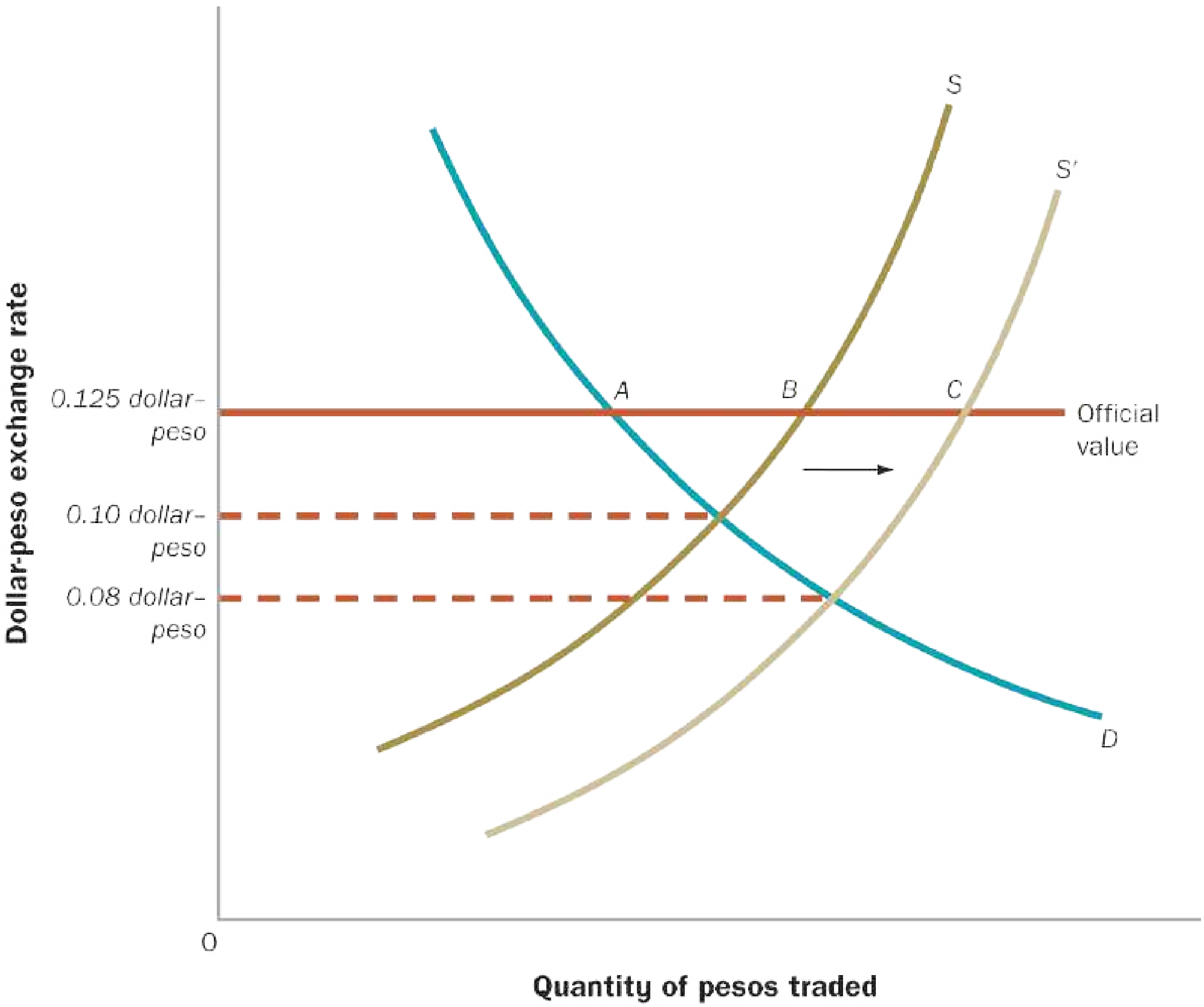

Figure 17.8 **A speculative attack on the peso**

Note: Initially, the peso is overvalued at 0.125 dollars per peso. To maintain the official rate, the central bank must buy pesos in the amount *AB* each period. Fearful of possible devaluation, financial investors launch a speculative attack, selling peso-denominated assets and supplying pesos to the foreign exchange market. As a result, the supply of pesos shifts from *S* to *S′*, lowering the fundamental value of the currency still further and forcing the central bank to buy pesos in the amount *AC* to maintain the official exchange rate. This more rapid loss of reserves may lead the central bank to devalue the peso, confirming financial investors' fears.

Suppose, though, that financial investors fear that Latinia may soon devalue its currency, perhaps because the central bank's reserves are getting low. If the peso were to be devalued from its official value of 8 pesos to the dollar to its fundamental value of 10 pesos per dollar, then a one-million peso investment, worth \$125 000 at the fixed exchange rate, would suddenly be worth only \$100 000. To try to avoid these losses, financial investors will sell their peso-denominated assets and offer pesos on the foreign exchange market. The resulting flood of pesos into the market will shift the supply curve of pesos to the right, from *S* to *S′* in Figure 17.8.

This speculative attack creates a serious problem for the Latinian central bank. Prior to the attack, maintaining the value of the peso required the central bank to spend each period an amount of international reserves corresponding to the line segment *AB*. Now suddenly the central bank must spend a larger quantity of reserves, equal to the distance *AC* in Figure 17.8, to maintain the fixed exchange rate. These extra reserves are needed to purchase the pesos being sold by panicky financial investors. In practice, such speculative attacks often force a devaluation by reducing the central bank's reserves to the point where further defence of the fixed exchange rate is considered hopeless. Thus a speculative attack ignited by fears of devaluation may actually end up producing the very devaluation that was feared.

BACKGROUND BRIEFING 17.2

How did the European monetary system break down?

In Background briefing 17.1, we outlined the operation of the European exchange rate mechanism. We discussed the problems that member countries had with maintaining a fixed exchange rate with the German deutschmark at a time when Germany was running a tight monetary policy. In September 1992 things came to a head. Currency speculators, who make a living by selling currencies when their price is high and buying them back when the price is low, reasoned that countries like the United Kingdom, Italy and Sweden would not maintain the tight monetary policies forced on them by the EMS for much longer. They reasoned that these countries would soon leave the EMS, in the process allowing their currencies to depreciate. Consequently, large-scale speculative attacks were mounted on the European currencies. The initial response was to raise interest rates further; Sweden, for example, raised interest rates to 500 per cent in an effort to maintain support for the krona. But it all came to nothing with Italy and the United Kingdom formally leaving the EMS and other countries undergoing substantial devaluations. Partly as a response to the EMS crisis, moves were accelerated to introduce a common European currency, the euro.

17.6.3 MONETARY POLICY AND FIXED EXCHANGE RATES

We have seen that there is no really satisfactory way of maintaining a fixed exchange rate above its fundamental value for an extended period. A central bank can maintain an overvalued exchange rate for a time by using international reserves to buy up the excess supply of its currency in the foreign exchange market. But a country's international reserves are limited, and may eventually be exhausted by the attempt to keep the exchange rate artificially high. Moreover, speculative attacks often hasten the collapse of an overvalued exchange rate.

An alternative to trying to maintain an overvalued exchange rate is to take actions that increase the equilibrium value of the exchange rate. If the exchange rate's equilibrium value can be raised enough to equal its official value, then the overvaluation problem will be eliminated. The most effective way to change the exchange rate's fundamental value may be through monetary policy. As we saw earlier in the chapter, a tight monetary policy that raises the real interest rate will increase demand (and decrease supply) for the domestic currency, as domestic assets become more attractive to financial investors.

The use of monetary policy to support a fixed exchange rate is shown in Figure 17.9. At first, the demand and supply of the Latinian peso in the foreign exchange market are given by the curves *D* and *S,* so the fundamental value of the peso equals 0.10 dollars per peso—less than the official value of

0.125 dollars per peso. Just as before, the peso is overvalued. This time, however, the Latinian central bank uses monetary policy to eliminate the overvaluation problem. To do so, the central bank increases the domestic real interest rate, making Latinian assets more attractive to foreign and domestic financial investors, raising the demand for pesos from D to D' and lowering the supply from S to S'. After this increase in the demand for pesos, the fundamental value of the peso equals the officially fixed value, as can be seen in Figure 17.9 . Because the peso is no longer overvalued it can be maintained at its fixed value without loss of international reserves or fear of speculative attack. Conversely, an easing of monetary policy (a lower real interest rate) could be used to remedy an undervaluation, in which the official exchange rate is below the fundamental value.

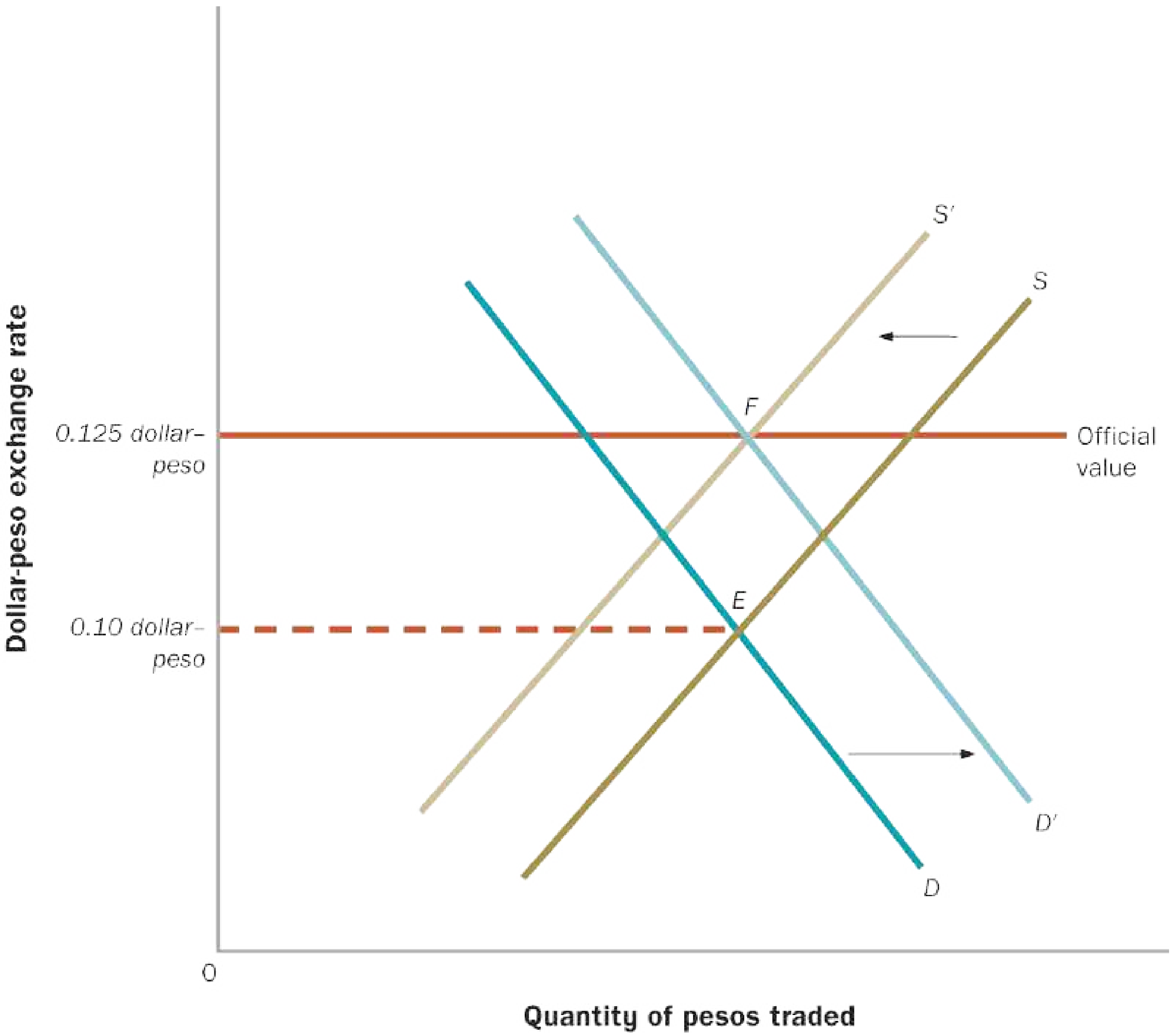

Figure 17.9 **A tightening of monetary policy eliminates an overvaluation**

Note: With the demand for the peso given by *D* and the supply given by *S,* equilibrium occurs at point *E* and the fundamental value of the peso equals 0.10 dollars per peso—below the official value of 0.125 dollars per peso. The overvaluation of the peso can be eliminated by tighter monetary policy, which raises the domestic real interest rate, making domestic assets more attractive to foreign and domestic financial investors. The resulting increase in demand for the peso and fall in supply, from respectively D to D' and S to S', raises the peso's fundamental value to 0.125 dollars per peso, the official value. The peso is no longer overvalued.

Although monetary policy can be used to keep the fundamental value of the exchange rate equal to the official value, using monetary policy in this way has some drawbacks. In particular, if monetary policy is used to set the fundamental value of the exchange rate equal to the official value, it is no longer available for stabilising the domestic economy. Suppose that the Latinian economy were suffering a recession due to insufficient aggregate demand at the same time that its exchange rate is overvalued. The Latinian central bank could lower the real interest rate to increase spending and output, or it could raise the real interest rate to eliminate overvaluation of the exchange rate, but it cannot do both. Hence, if Latinian officials decide to maintain the fixed exchange rate, they must give up any hope of fighting the recession using monetary policy. The fact that a fixed exchange rate limits or eliminates the use of monetary policy for the purpose of stabilising aggregate demand is one of the most important drawbacks of a fixed exchange rate system.

The conflict monetary policymakers face, between stabilising the exchange rate and stabilising the domestic economy, is most severe when the exchange rate is under a speculative attack. A speculative attack lowers the fundamental value of the exchange rate still further, by increasing the supply of the currency in the foreign exchange market (see Figure 17.8). To stop a speculative attack the central bank must raise the fundamental value of the currency a great deal, which requires a large increase in the real interest rate.

(As we noted in Background briefing 17.2, the Swedish central bank responded to an attack on its currency by raising the short-term interest rate to 500 per cent!) However, because the increase in the real interest rate that is necessary to stop a speculative attack reduces aggregate demand, it can cause a severe economic slowdown. Thinking as an economist 17.3 describes a real-world example of this phenomenon.

THINKING AS AN ECONOMIST 17.3

What were the causes and consequences of the East Asian crisis of 1997–98?

For three decades the countries of East Asia enjoyed impressive economic growth and stability. But the 'East Asian miracle' seemed to end in 1997, when a wave of speculative attacks hit the region's currencies. Thailand, which had kept a constant value for its currency in terms of the US dollar for more than a decade, was the first to come under attack, but the crisis spread to other countries, including the Republic of Korea, Indonesia and Malaysia. Each of these countries was ultimately forced to devalue its currency. What caused this crisis, and what were its consequences?

Because of the impressive economic record of the East Asian countries, the speculative attacks on their currencies were not expected by most policymakers, economists and financial investors. With the benefit of hindsight, we can identify some problems in the East Asian economies that contributed to the crisis. Perhaps the most serious problems concerned their banking systems. In the decade prior to the crisis East Asian banks received large inflows of capital from foreign financial investors hoping to profit from the East Asian miracle. Those inflows would have been a boon if they had been well invested, but unfortunately many bankers used the funds to make loans to family members, friends or the politically well connected—a phenomenon that became known as *crony capitalism.* The results were poor returns on investment and defaults by many borrowers. Ultimately, foreign investors realised that the returns to investing in East Asia would be much lower than expected. When they began to sell off their assets the process snowballed into a fully-fledged speculative attack on the East Asian currencies.

Despite assistance by international lenders such as the IMF (see Background briefing 17.3) the effects of the speculative attacks on the East Asian economies were severe. The prices of assets such as shares and land plummeted, and there was a dramatic loss of confidence in the banking system in several nations. In an attempt to raise the fundamental values of their exchange rates and stave off additional devaluation, several of the countries increased their real interest rates sharply. However, the rise in real interest rates depressed aggregate demand, contributing to sharp declines in output and rising unemployment. Eventually, most countries in the region bowed to the inevitable and allowed their currencies to devalue. The magnitude of the depreciations can be gauged from the data in Table 17.2.

TABLE 17.2 **Nominal exchange rates (US price of domest**

	1990	1991	1992	1993	1994	1995
Korea	0.0014	0.0013	0.0013	0.0012	0.0013	0.001
Indonesia	0.0005	0.0005	0.0005	0.0005	0.0005	0.000
Malaysia	0.3702	0.3671	0.3828	0.3702	0.3906	0.393
Philippines	0.0357	0.0375	0.0398	0.0361	0.0410	0.038
Thailand	0.0395	0.0396	0.0392	0.0392	0.0399	0.039
Taiwan	0.0369	0.0388	0.0394	0.0376	0.0381	0.036

Source: International Monetary Fund

Fortunately, by 1999 most East Asian economies had begun to recover. Still, the crisis impressed the potential dangers of fixed exchange rates quite sharply in the minds of policy makers in developing countries. Another lesson from the crisis is that banking regulations need to be structured so as to promote economically sound lending rather than crony capitalism.

BACKGROUND BRIEFING 17.3

What is the IMF, and how has its mission evolved over the years?

The International Monetary Fund (IMF) was established after World War II. An international agency, the IMF is controlled by a 24-member executive board. Eight executive board members represent individual countries (China, France, Germany, Japan, Russia, Saudi Arabia, the United Kingdom and the United States); the other 16 members each represent a group of countries. A managing director oversees the IMF’s operations and its approximately 2700 staff (half of whom are economists).

The original purpose of the IMF was to help manage the system of fixed exchange rates, called the Bretton Woods system, put in place after the war. Under Bretton Woods, the IMF's principal role was to lend international reserves to member countries that needed them so that those countries could maintain their exchange rates at the official values. However, by 1973 the United States, the United Kingdom, Germany and most other industrial nations had abandoned fixed exchange rates for flexible rates, leaving the IMF to find a new mission. Since 1973, the IMF has been involved primarily in lending to developing countries. For example, during the currency crises of the 1990s, it lent to Mexico, Russia, Brazil and several East Asian countries. During the 2008 crisis, it again made loans to countries that saw their currencies under pressure. More recently, the IMF joined European countries in making loans to Greece—a developed country—with the Europeans providing two-thirds of the money Greece needs to pay its government debts, and the IMF providing one-third.

THINKING AS AN ECONOMIST 17.4

How did policy mistakes contribute to the Great Depression?

We introduced the study of macroeconomics with the claim that policy mistakes played a major role in causing the Great

Depression. Now we can be more specific about that claim. We will focus on the policy mistakes that led to the onset of the Depression in the United States. Economists agree that it was here that the Depression began.

Many policy mistakes (as well as a great deal of bad luck) contributed to the severity of the Depression. For example, US policymakers, in an attempt to protect domestic industries, imposed the infamous Hawley–Smoot tariff in 1930. Other countries quickly retaliated with their own tariffs, leading to the virtual collapse of international trade.

However, the most serious mistakes by far were in the realm of monetary policy, where the Federal Reserve allowed the US money supply to contract by one-third between 1929 and 1933. (A classic book by Milton Friedman and Anna Schwartz (1963) was the first to provide detailed support for the view that poor monetary policy helped cause the Depression.) Associated with this unprecedented decline in the money supply were sharply falling output and prices and surging unemployment.

At least three separate policy errors were responsible for the collapse of the US money supply between 1929 and 1933. First, the Federal Reserve tightened monetary policy significantly in 1928 and 1929, despite the absence of inflation. Fed officials took this action primarily in an attempt to 'rein in' the booming stock market, which they feared was rising too quickly. Their 'success' in dampening stock market speculation was more than they bargained for, however, as rising interest rates and a slowing economy contributed to a crash in stock prices that began in October 1929.

The second critical policy error was allowing thousands of US banks to fail during the banking panics of 1930 to 1933. Apparently, officials believed that the failures would eliminate only the weakest banks, strengthening the banking system overall. However, the banking panics sharply reduced bank deposits and the overall money supply.

The third policy error, related to the subject of this chapter, arose from the US Government's exchange rate policies. When the Depression began, the United States, like most other major countries, was on the gold standard, with the value of the dollar officially set in terms of gold. By establishing a fixed value for the dollar, the United States effectively created a fixed exchange rate between the dollar and other currencies whose values were set in terms of gold. As the Depression worsened, Fed officials were urged by Congress to ease monetary policy to stop the fall in output and prices. However, as we saw earlier, under a fixed exchange rate, monetary policy cannot be used to stabilise the domestic economy.

Specifically, policymakers of the early 1930s feared that if they eased monetary policy, foreign financial investors might perceive the dollar to be overvalued and launch a speculative attack, forcing a devaluation of the dollar or even the abandonment of the gold standard altogether. The Fed therefore made no serious attempt to arrest the collapse of the money supply.

With hindsight, we can see that the Fed's decision to put a higher priority on remaining on the gold standard than on stimulating the economy was a major error. Indeed, countries that abandoned the gold standard in favour of a floating exchange rate, such as Australia, Great Britain and Sweden, or that had never been on the gold standard (Spain and China) were able to increase their money supplies and to recover much more quickly from the Depression than the United States did. The Fed evidently believed, erroneously as it turned out, that stability of the exchange rate would somehow translate into overall economic stability.

Upon taking office in March 1933, Franklin D Roosevelt reversed several of these policy errors. He took active measures to restore the health of the banking system, and he suspended the gold standard. The money supply stopped falling and began to grow rapidly. Output, prices and stock prices recovered rapidly during 1933 to 1937, although unemployment remained high. However, ultimate recovery from the Depression was interrupted by another recession in 1937–38.

▹▹ RECAP

The value of a fixed exchange rate is set by the government. The official value of a fixed exchange rate may differ from its fundamental value, as determined by supply and demand in the foreign exchange market. An exchange rate whose officially fixed value exceeds its fundamental value is overvalued; an exchange rate whose officially fixed value is below its fundamental value is undervalued.

For an overvalued exchange rate, the quantity of the currency supplied to the foreign exchange market at the official exchange rate exceeds the quantity demanded. The government can maintain an overvalued exchange rate for a time by using its international reserves (foreign currency assets) to purchase the excess supply of its currency.

Because a country's international reserves are limited, it cannot maintain an overvalued exchange rate indefinitely. Moreover, if financial investors fear an impending devaluation of the exchange rate, they may launch a speculative attack, selling domestic currency assets and supplying large amounts of the country's currency to the foreign exchange market—an action that exhausts the country's reserves even more quickly. Because rapid loss of reserves may force a devaluation, financial investors' fear of devaluation may prove to be a self-fulfilling prophecy.

A tight monetary policy that increases the real interest rate, raises the demand for the currency and lowers its supply increases its fundamental value. By raising a currency's fundamental value to its official value, tight monetary policies can eliminate the problem of overvaluation and stabilise the exchange rate. However, if monetary policy is used to set the fundamental value of the exchange rate, it is no longer available for stabilising the domestic economy.

17.7 SHOULD EXCHANGE RATES BE FIXED OR FLEXIBLE?

LO 17.8

Should countries adopt fixed or flexible exchange rates? In briefly comparing the two systems, we will focus on two major issues:

1. the effects of the exchange rate system on monetary policy
2. the effects of the exchange rate system on trade and economic integration.

On the issue of monetary policy, we have seen that the type of exchange rate a country has strongly affects the central bank's ability to use monetary policy to stabilise the economy. A flexible exchange rate actually strengthens the impact of monetary policy on aggregate demand. But a fixed exchange rate prevents policymakers from using monetary policy to stabilise the economy, because they must instead use it to keep the exchange rate's fundamental value at its official value (or else risk speculative attack). For some inflation-prone countries, it is precisely this feature of a fixed exchange rate that is appealing. A fixed exchange rate limits the extent to which expansionary, and possibly inflationary, monetary policies can be used. A country that has suffered from inflation might find this lack of freedom in the setting of monetary policy a means of avoiding inflationary expansions. An interesting case is that of Argentina, which for the period 1991–2001 maintained a one-to-one exchange rate between its peso and the US dollar. Although prior to

1991 Argentina had suffered periods of hyperinflation, while the peso was pegged to the dollar Argentina's inflation rate was not very different from that of the United States. By tying its currency to the dollar and giving up the freedom to set its monetary policy, Argentina attempted to commit itself to avoiding the inflationary policies of the past, and instead placed itself under the 'umbrella' of the Federal Reserve. Unfortunately, early in 2002, investors' fears that Argentina would not be able to repay its international debts led to a speculative attack on the Argentinian peso. The fixed exchange rate collapsed, the peso depreciated and Argentina experienced an economic crisis. The lesson is that a fixed exchange rate alone cannot stop inflation in a small economy if other policies are not sound as well. Large fiscal deficits, which were financed by foreign borrowing, ultimately pushed Argentina into crisis.

However, in industrialised economies like those of Australia or the United States, giving up the power to stabilise the domestic economy via monetary policy makes little sense; these economies should nearly always employ a flexible exchange rate.

The second important issue is the effect of the exchange rate on trade and economic integration. Proponents of fixed exchange rates argue that fixed rates promote international trade and cross-border economic cooperation by reducing uncertainty about future exchange rates. For example, a firm that is considering building up its export business knows that its potential profits will depend on the future value of its own country's currency relative to the currencies of the countries to which it exports. Under a flexible exchange rate regime, the value of the home currency fluctuates with changes in supply and demand, and is therefore difficult to predict far in advance. Such uncertainty may make the firm reluctant to expand its export business. Supporters of fixed exchange rates argue that if the exchange rate is officially fixed, uncertainty about the future exchange rate is reduced or eliminated.

One problem with this argument, which has been underscored by episodes like the East Asian crisis and the Argentinian crisis, is that fixed exchange rates are not guaranteed to remain fixed forever. Although they do not fluctuate from day to day as flexible rates do, a speculative attack on a fixed exchange rate may lead suddenly and unpredictably to a large devaluation. Thus, a firm that is trying to forecast the exchange rate 10 years into the future may face as much uncertainty if the exchange rate is fixed as if it is flexible.

The potential instability of fixed exchange rates caused by speculative attacks has led some countries to try a more radical solution to the problem of uncertainty about exchange rates: the adoption of a common currency. Thinking as an economist 17.5 describes an important instance of this strategy.

THINKING AS AN ECONOMIST 17.5

Why have western European countries adopted a common currency?

Effective 1 January 1999, 11 western European nations, including France, Germany and Italy, adopted a common currency, called the euro. In several stages, the euro replaced the French franc, the German mark, the Italian lira and other national currencies. The process was completed in early 2002 when the old currencies were completely eliminated and replaced by euros. Since then, more European nations, including eastern European ones, have joined the common currency. As of 2017, the last nation to join was Lithuania, which on 1 January 2015 became the 19th member of the *euro area* (or *eurozone*). Why have these nations adopted a common currency?

Since the end of World War II, the nations of western Europe have worked to increase economic cooperation and trade among themselves. European leaders recognised that a unified and integrated European economy would be more productive and perhaps more competitive with the US economy than a fragmented one. As part of this effort, these countries established fixed exchange rates under the auspices of a system called the European Monetary System (EMS). Unfortunately, the EMS did not prove stable. Numerous devaluations of the various currencies occurred, and in 1992, severe speculative attacks forced several nations, including Great Britain, to abandon the fixed exchange rate system (see Background briefing 17.2).

In December 1991, in Maastricht in the Netherlands, the member countries of the European Community (EC) adopted a treaty popularly known as the Maastricht Treaty. One of the major provisions of the treaty, which took effect in November 1993, was that member countries would strive to adopt a common currency. This common currency, known as the euro, was formally adopted on 1 January 1999. The advent of the euro means that Europeans from eurozone countries no longer have to change currencies when trading with other eurozone countries, much as Australians from different states can trade with each other without worrying that a ‘New South Wales dollar’ will change in value relative to a ‘South Australia dollar’. The euro has helped to promote European trade and cooperation while eliminating the problem of speculative attacks on the currencies of individual countries.

Because 19 European nations now have a single currency, they also must have a common monetary policy. The EC members agreed that European monetary policy would be put under the control of the new European Central Bank (ECB), a multinational institution located in Frankfurt, Germany. The ECB has in effect become Europe’s reserve bank. One potential problem with having a single monetary policy for so many different countries is that different countries may face different economic conditions, so a single monetary policy cannot respond to all of them. Indeed, in recent years countries in southern Europe like Spain and Italy have been in serious recessions (which requires an easing of monetary policy), while Germany has been close to full employment. With such a wide variation in economic conditions, the requirement of a single monetary policy has been creating conflicts of interest among the EC member nations.

▹▹ RECAP

Flexible exchange rates have a number of advantages, including the facts that:

1. they enable countries to run independent monetary policies
2. they automatically adjust to equilibrate the demand and supply for currency in the international currency market.

Fixed exchange rates, however, are sometimes used by countries seeking to create a climate of certainty or to impose some discipline in monetary policy. There is a risk to using a fixed exchange rate and that is the possibility of speculative attacks. In that sense, the stability associated with fixed exchange rates could well be illusory.

SUMMARY

- The *nominal exchange rate* between two currencies is the rate at which the currencies can be traded for each other. A rise in the value of a currency relative to other currencies is called an *appreciation;* a decline in the value of a currency is called a *depreciation*.
- Exchange rates can be flexible or fixed. The value of a *flexible exchange rate* is determined by the supply and demand for the currency in the *foreign exchange market,* the market on which currencies of various nations are traded for one another. The government sets the value of a *fixed exchange rate*.
- The *real exchange rate* is the price of the average domestic good or service *relative* to the price of the average foreign good or service, when prices are expressed in terms of a common currency. An increase in the real exchange rate implies that domestic goods and services are becoming more expensive relative to foreign goods and services, which tends to reduce exports and increase imports. Conversely, a decline in the real exchange rate tends to increase net exports.
- A basic theory of nominal exchange rate determination, the *purchasing power parity* (PPP) theory, is based on the law of one price. The *law of one price* states that if transportation costs are relatively small the price of an internationally traded commodity

must be the same in all locations. According to the PPP theory, we can find the nominal exchange rate between two currencies by setting the price of a commodity in one of the currencies equal to the price of the commodity in the second currency. The PPP theory correctly predicts that the currencies of countries that experience significant inflation will tend to depreciate in the long run. However, the fact that many goods and services are not traded internationally, and that not all traded goods are standardised, makes the PPP theory less useful for explaining short-run changes in exchange rates.

- Supply and demand analysis is a useful tool for studying the determination of exchange rates in the short run. The equilibrium exchange rate, also called the *fundamental value of the exchange rate,* equates the quantities of the currency supplied and demanded in the foreign exchange market. A currency is supplied by domestic residents who wish to acquire foreign currencies to purchase foreign goods, services and assets. An increased preference for foreign goods, an increase in the domestic GDP or an increase in the real interest rate on foreign assets will all increase the supply of a currency on the foreign exchange market and thus lower its value. A currency is demanded by foreigners who wish to purchase domestic goods, services and assets. An increased preference for domestic goods by foreigners, an increase in real GDP abroad or an increase in the domestic real interest rate will all increase the demand for the currency on the foreign exchange market and thus increase its value.

- All else being equal, and if the exchange rate is flexible, a tight monetary policy (by raising the real interest rate) increases the demand for the currency and causes it to appreciate. The stronger currency reinforces the effects of the tight monetary policy on aggregate demand by reducing net exports; easing monetary policy lowers the real interest rate and weakens the currency, which in turn stimulates net exports.
- The value of a fixed exchange rate is officially established by the government. A fixed exchange rate whose official value exceeds its fundamental value in the foreign exchange market is said to be *overvalued*. An exchange rate whose official value is below its fundamental value is *undervalued*. A reduction in the official value of a fixed exchange rate is called a *devaluation;* an increase in its official value is called a *revaluation*.
- For an overvalued exchange rate, the quantity of the currency supplied at the official exchange rate exceeds the quantity demanded. To maintain the official rate the country's central bank must use its *international reserves* (foreign currency assets) to purchase the excess supply of its currency in the foreign exchange market. Because a country's international reserves are limited, it cannot maintain an overvalued exchange rate indefinitely. Moreover, if financial investors fear an impending devaluation of the exchange rate they may launch a *speculative attack,* selling their domestic currency assets and supplying large quantities of the currency to the foreign exchange market. Because speculative attacks cause a country's central bank to spend its international

reserves even more quickly, they often force a devaluation.

- A tight monetary policy, by raising the fundamental value of the exchange rate, can eliminate the problem of overvaluation. However, if monetary policy is used to set the fundamental value of the exchange rate equal to the official value, it is no longer available for stabilising the domestic economy. Thus, under fixed exchange rates monetary policy has little or no power to affect domestic output and employment.

- Because a fixed exchange rate implies that monetary policy can no longer be used for domestic stabilisation, most large countries employ a flexible exchange rate. A fixed exchange rate may benefit a small country by forcing its central bank to follow the monetary policies of the country to which it has tied its rate. Advocates of fixed exchange rates argue that they increase trade and economic integration by making the exchange rate more predictable. However, the threat of speculative attacks greatly reduces the long-term predictability of a fixed exchange rate.

KEY TERMS

appreciation 434

balance of payments deficit 450

balance of payments surplus 450

depreciation 434

devaluation 448

fixed exchange rate 435

flexible exchange rate 435

foreign exchange market 435

fundamental value of the exchange rate (or equilibrium exchange rate) 443

international reserves 449

law of one price 439

nominal exchange rate 432

overvalued exchange rate 448

purchasing power parity (PPP) 439

real exchange rate 437

revaluation 448

speculative attack 451

undervalued exchange rate 448

REVIEW QUESTIONS

1. Japanese yen trade at 110 yen per dollar and Mexican pesos trade at 10 pesos per dollar. What is the nominal exchange rate between the yen and the peso? Express in two ways. LO 17.1 **EASY**
2. Define *nominal exchange rate* and *real exchange rate*. How are the two concepts related? Which type of exchange rate most directly affects a country's ability to export its goods and services? LO 17.3 **EASY**
3. Would you expect the law of one price to apply to crude oil? To fresh milk? To taxi rides? To compact discs produced in different countries by local recording artists? Explain your answer in each case. LO 17.4 **MEDIUM**
4. Why do Australian households and firms supply dollars to the foreign exchange market? Why do foreigners demand dollars in the foreign exchange market? LO 17.5 **EASY**
5. Under a flexible exchange rate, how does an easing of monetary policy (a lower real interest rate) affect the value of the exchange rate? Does this change in the exchange rate tend to weaken or strengthen the effect of the monetary ease on output and employment? Explain. LO 17.6 **MEDIUM**
6. Define *overvalued exchange rate*. Discuss four ways in which government policymakers can respond to overvaluation. What are the drawbacks of each approach? LO 17.7 **MEDIUM**

7. Use a supply and demand diagram to illustrate the effects of a speculative attack on an overvalued exchange rate. Why do speculative attacks often result in devaluation? LO 17.7
MEDIUM

8. Contrast fixed and flexible exchange rates in terms of how they affect (a) the ability of monetary policy to stabilise domestic output and (b) the predictability of future exchange rates. LO 17.8
MEDIUM

PROBLEMS

1. Using the data provided, find the nominal exchange rate between the Mexican peso and the Japanese yen. Express in two ways. How do your answers change if the peso appreciates by 20 per cent against the Australian dollar while the value of the yen against the Australian dollar remains unchanged? LO 17.1 **MEDIUM**

Country	Foreign currency/Australian dollar	Australian dollar/Foreign currency
United Kingdom (pound)	0.619	1.616
Canada (Canadian dollar)	0.955	1.047
Mexico (peso)	11.674	0.086
European Union (euro)	0.701	1.427
Japan (yen)	79.242	0.013

2. A British-made car is priced at £20 000 (20 000 British pounds). A comparable Australian-made car costs $26 400. One British pound trades for $1.50 in the foreign exchange market. Find the real exchange rate for cars from the perspective of Australia and from the perspective of the United Kingdom. Which country's cars are more competitively priced? LO 17.4 **MEDIUM**

3. Between last year and this year, the CPI in Blueland rose from 100 to 108 and the CPI in Redland rose from 100 to 105. Blueland's currency unit, the blue, was worth $1 last year and is worth 80 cents this year. Redland's currency unit, the red, was worth 40 cents last year and is worth 32 cents this year.

   Find the percentage change from last year to this year in Blueland's *nominal* exchange rate with Redland and in Blueland's *real* exchange rate with Redland. (Treat Blueland as the home country.) Relative to Redland, do you expect Blueland's exports to be helped or hurt by these changes in exchange rates? LO 17.4 **HARD**

4. The demand for Australian-made motorcycles in Japan is given by:

   > Japanese demand = 10 000 – 0.001(price of Australian motorcycles in yen)

   Similarly, the demand for Japanese-made motorcycles in Australia is:

   > Australian demand = 30 000 – 0.2(price of Japanese motorcycles in dollars)

The domestic price of an Australian-made motorcycle is $20 000, and the domestic price of a Japanese-made motorcycle is ¥2 500 000. From the perspective of Australia, find the real exchange rate in terms of motorcycles and net exports of motorcycles to Japan, if:

a) the nominal exchange rate is 100 yen per dollar

b) the nominal exchange rate is 125 yen per dollar.

How does an appreciation of the dollar affect Australian net exports of motorcycles (considering only the Japanese market)? LO 17.3 **MEDIUM**

5.

a) Gold is $350 per ounce in Australia and 2800 pesos per ounce in Mexico. What nominal exchange rate between Australian dollars and Mexican pesos is implied by the PPP theory? LO 17.4 **EASY**

b) Mexico experiences inflation so that the price of gold rises to 4200 pesos per ounce. Gold remains at $350 per ounce in Australia. According to the PPP theory, what happens to the exchange rate? What general principle does this example illustrate? LO 17.4 **EASY**

c) Gold is $350 per ounce in Australia and 4200 pesos per ounce in Mexico. Crude oil (excluding taxes and transportation costs) is $30 per barrel in Australia. According to the PPP theory, what should a barrel of crude oil cost in Mexico? LO 17.4 **EASY**

d) Gold is $350 per ounce in Australia. The exchange rate between

Australia and Canada is 0.70 US dollars per Canadian dollar. How much does an ounce of gold cost in Canada? LO 17.4 **MEDIUM**

6. How would each of the following be likely to affect the value of the dollar, all else being equal? Explain. LO 17.5 **MEDIUM**
   a) Australian shares are perceived as having become much riskier financial investments.
   b) European computer firms switch from Australian-produced software to software produced in India, China and other nations.
   c) International financial investors become aware of many new, high-return investment opportunities in East Asia.
   d) The Australian Government imposes a large tariff on imported cars.
   e) The Reserve Bank reports that it is less concerned about inflation and more concerned about an impending recession in Australia.
   f) Australian consumers increase their spending on imported goods.

7. The demand for and supply of shekels in the foreign exchange market is:

   Demand = 30 000 – 8000e

   Supply = 25 000 + 12 000e

   where the nominal exchange rate is expressed as dollars per shekel. LO 17.5 **MEDIUM**

a) What is the fundamental value of the shekel?

b) The shekel is fixed at 0.30 dollars. Is the shekel overvalued, undervalued or neither? Find the balance of payments deficit or surplus in both shekels and dollars. What happens to the country's international reserves over time?

c) Repeat part (b) for the case in which the shekel is fixed at 0.20 dollars.

8. The annual demand for and supply of shekels in the foreign exchange market is as given in Problem 7. The shekel is fixed at 0.30 dollars per shekel. The country's international reserves are \$600. Foreign financial investors hold financial assets in the country in the amount of 5000 shekels. LO 17.7 **MEDIUM**

a) Suppose that foreign financial investors do not fear a devaluation of the shekel, and thus do not convert their shekel financial assets into dollars. Can the shekel be maintained at its fixed value of 0.30 dollars for the next year?

b) Now suppose that foreign financial investors come to expect a possible devaluation of the shekel to 0.25 dollars. Why should this possibility worry them?

c) In response to their concern about devaluation, foreign financial investors sell their financial assets and attempt to convert those shekels into dollars. What happens?

d) Discuss why the foreign investors' forecast of devaluation can be considered a 'self-fulfilling prophecy'.

9. Eastland's currency is called the eastmark, and Westland's currency is called the westmark. In the market in which eastmarks and westmarks are traded for each other, the supply of and demand for eastmarks is given by:

$$\text{Demand} = 25\ 000 - 5000e + 50\ 000(r_E - r_W)$$

$$\text{Supply} = 18\ 500 + 8000e - 50\ 000(r_E - r_W)$$

The nominal exchange rate, *e,* is measured as westmarks per eastmark, and r_E and r_W are the real interest rates prevailing in Eastland and Westland, respectively. LO 17.6 **HARD**

a) Explain why it makes economic sense for the two real interest rates to appear in the demand and supply equations in the way they do.

b) Initially, $r_E = r_W = 0.10$, or 10 per cent. Find the fundamental value of the eastmark.

c) The Westlandian central bank grows concerned about inflation and raises Westland's real interest rate to 12 per cent. What happens to the fundamental value of the eastmark?

d) Assume that the exchange rate is flexible and that Eastland does not change its real interest rate following the increase in Westland's real interest rate. Is the action of the Westlandian central bank likely to increase or reduce aggregate demand in Eastland? Discuss.

e) Now suppose that the exchange rate is fixed at the value you found in part (b). After the action by the Westlandian central bank, what will the Eastlandian central bank have to do to keep its exchange rate from being overvalued? What effect will this action have on the Eastlandian economy?

f) In the context of this example, discuss the effect of fixed exchange rates on the ability of a country to run an independent monetary policy.

REFERENCES

Federal Reserve Bank of St Louis 2018, 'Federal funds target range: upper limit', https://fred.stlouisfed.org/series/DFEDTARU

Federal Reserve Bank of St Louis 2018, 'Federal Reserve economic data', https://fred.stlouisfed.org

Friedman M and Schwartz A 1963, *A Monetary History of the United States: 1867–1960*, Princeton University Press, Princeton, NJ.

International Monetary Fund 2018, 'IMF data: Access to macroeconomic and financial data', http://data.imf.org/?sk=388DFA60-1D26-4ADE-B505-A05A558D9A42, accessed November 2018.

Reserve Bank of Australia 2018, 'Exchange rates', https://www.rba.gov.au/statistics/frequency/exchange-rates.html.

Reserve Bank of Australia 2018, 'Historical data', https://www.rba.gov.au/statistics/historical-data.html#exchange-rates.

Reserve Bank of Australia 2018, 'Statistical tables', https://www.rba.gov.au/statistics/tables/#interest-rates

CHAPTER 18

The balance of payments: Net exports and international capital flows

After reading this chapter, you should be able to answer the following questions.

18.1 What types of transactions are recorded in the current account of the balance of payments?

a) What are the separate components of the current account?

18.2 What types of transactions are recorded in the capital account of the balance of payments?

a) What are the separate components of the capital account?

18.3 How do capital flows relate to the current and capital account balances?

a) What is the relationship between the capital and current account balances? Why does this relationship hold?

18.4 What factors influence the international flows of capital?

18.5 What is the effect that international capital flows have on the relation between national savings and investment?

18.6 How are a country's savings, trade imbalance and current account balance related?

SETTING THE SCENE

… The US has a trade deficit. It imports more than it exports and Mr Trump wants to change that. He wants to reduce the deficit with individual trade partners and with the rest of the world as a whole, or preferably eliminate these imbalances altogether.

He sees those imbalances as the result of unfair trade practices by other countries—notably China—and of trade agreements that are unfair to the US.

That has been behind many of his trade initiatives: pulling out of the Trans-Pacific Partnership; new tariffs on aluminum and *steel imports; and tariffs on a wide range of imports from China.*

… But the approach begs a fundamental question: are trade imbalances the result of trade policies? It seems obvious that they would be, but that is not the view of most economists.

A report from the Congressional Research Service puts it like this: "The Trump Administration's approach contrasts with the views of most economists, who argue that the overall US trade deficit stems from US macroeconomic policies that create a savings and investment imbalance in which domestic sources of capital are not sufficient to meet domestic capital demands." Page 466

Or to put it another way, the counterpart to the trade deficit is that the US saves less than it invests.

Yet another way of putting it would be a country that spends more than it produces will have a trade deficit.

One way that a country can spend more (or save less) is if the government reduces taxes, or increases spending. If there is no offsetting change in private sector spending or investment, then lower tax revenue would mean a larger trade deficit.

Another way of looking at it: if people have more money to spend because they are taxed less, they will spend some of it on imported goods.

President Trump has cut tax rates on incomes and company profits. He expects the move to strengthen economic growth so much that it will generate more tax revenue. Views are divided on how realistic that hope is, but many economists doubt that it will work.

If he does end up increasing government borrowing, it would tend to boost the trade deficit. That is exactly the opposite of what he is trying to do with his assertive approach to trade policy.

The economic relationships—the questions of what causes what—are complex. So it is not necessarily the case that what he is doing is counterproductive by his own objectives. But it might turn out to be.

Reference

Walker A 2018, 'Can Trump really cut the US trade deficit?', BBC News, 2 October, https://www.bbc.com/news/business-45712062.

The trade balance (the difference between a nation's exports and imports) has moved to the centre of economic and political debate in recent years. This is particularly so in the United States where debate about the causes and consequences of its trade deficit intensified after the election of President Trump. This is an area of economics where complexity can hide important fundamental reasons for why particular outcomes occur. It is perhaps not obvious why the trade balance relates to saving and investment decisions, as argued in the news report in Setting the scene. However, unless this fundamental link is understood, policies designed to affect the trade balance may prove to be ineffectual at best and perhaps even quite harmful to the economy.

18.1 THE BALANCE OF PAYMENTS

LO 18.1, 18.2

Policymakers and economic commentators pay a lot of attention to the **balance of payments**. Every time a new set of balance of payments figures are released, there is a great deal of discussion about what the figures imply for the state of the economy.

But what is the balance of payments and why is so much attention paid to it? The balance of payments is a bookkeeping exercise; it is a series of accounts that record all economic transactions between the residents of one country and the rest of the world. What sorts of transactions are recorded in the balance of payments? Here are some examples:

- A firm that imports components to make cars would have those imports recorded in the balance of payments.
- A sale of Australian wool to Chinese consumers would be recorded in the balance of payments.
- A monetary gift sent to an Australian student from a relative living overseas would be recorded in the balance of payments.
- Australian firms borrowing money from overseas financiers would have that loan recorded in the balance of payments.

To understand the economic significance of the balance of payments we need first to look closely at how the balance of payments accounts are constructed. We begin with that part of the balance of payments that records trade in commodities, the **current account**. We follow this with an outline of the **capital account**, that part of the balance of payments that records transactions involving the purchase and sale of assets.

18.1.1 THE CURRENT ACCOUNT

The current account records all transactions that take place between domestic and foreign residents that involve a transfer of ownership of goods and services or a direct transfer of income. The most significant items in the current account are usually exports and imports. These are measured *free on board (f.o.b.),* which means that any freight and insurance charges are assumed to be incurred by the country purchasing the commodities (these charges are recorded as *services*). The difference between exports and imports is known as the **balance on merchandise trade**. Should this be a negative number, the f.o.b. value of imports exceeds the f.o.b. value of exports; a positive number would indicate that exports exceed imports.

The current account also includes **net services** where the freight, insurance and other charges associated with countries buying and selling commodities are recorded. The balance on net services is the difference between what the domestic country spends on these services in other countries and what foreign residents spend on these services domestically.

Also recorded in the current account is **net income**, which comprises various direct income payments such as interest, dividend and royalty payments, as well as labour and property income, between the domestic country and the rest of the world. An Australian, for example, who received dividend payments from a portfolio of shares on the Hong Kong Stock Exchange, would have those payments recorded in the net income account (as a credit item). Likewise, an author of a novel that is popular in Australia living overseas would find that the royalties from their Australian sales would be recorded in the net income account (this time, the payment would be recorded as a debit). The net income account is also where any interest payments made by domestic residents because of loans were taken out with foreign lenders are recorded.

Current transfers, also known as unrequited transfers, record one-off transactions in the current account that cannot easily be classified elsewhere. For example, the funds brought into the country by newly arrived migrants would be classified as a current transfer (this would be a credit item). The foreign aid that Australia sends to developing countries is also recorded here, as a debit.

Summing the balance of the merchandise trade, net services, net income and current transfers accounts gives the **balance on the current account**. Figure 18.1 provides a schematic diagram of how these various components on the current account fit together. When the balance on the current account is a negative number this is known as a **current account deficit**. A positive value for the current account balance is a **current**

account surplus .

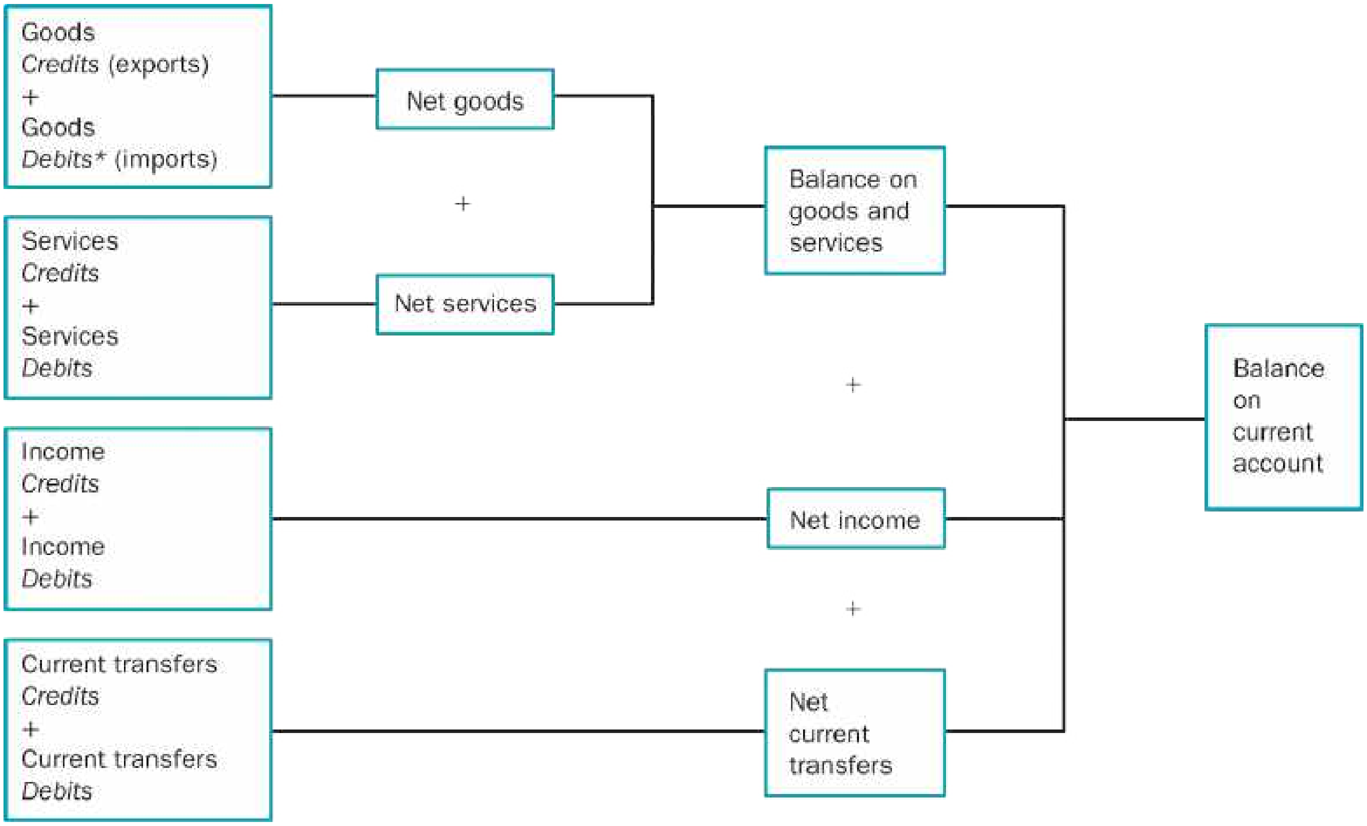

Figure 18.1 **The structure of the current account**

Source: Australian Bureau of Statistics 2003, 'Measuring Australia's economy', Cat. no. 1360.0, Chapter 3, p. 47, www.abs.gov.au.

*Debit entries are shown with a minus sign.

Table 18.1 gives some examples of current account transactions classified as either debits or credits. In the current account statistics, debits are always recorded as negative numbers while credits are always recorded as positive numbers.

TABLE 18.1 Debit and credit items in the current account

	DEBIT	CREDIT
Merchandise trade	Domestic purchase of a Japanese car	Sale of wheat to Russia
Services	Domestic buyer pays freight costs on imports	Overseas buyer pays freight costs on exports
Income	Domestic company pays a foreign employee	Foreign company pays a domestic employee
Transfers	Domestic relative sends a cash gift to overseas resident	Overseas relative sends a cash gift to domestic resident

BACKGROUND BRIEFING 18.1

Australia's current account balance

There is a tendency to think of Australia's balance on the current account purely in terms of the difference between imports and exports. As the above discussion makes clear, however, the balance on merchandise trade is only one part of the current account. Although the balance between imports and exports is an important influence on the overall current account balance, what happens to net services, net income and current transfers is also important. This is apparent from the data in Figure 18.2, which shows a breakdown of Australia’s current account balance since 1960. The data are shown as a proportion of gross domestic product (GDP).

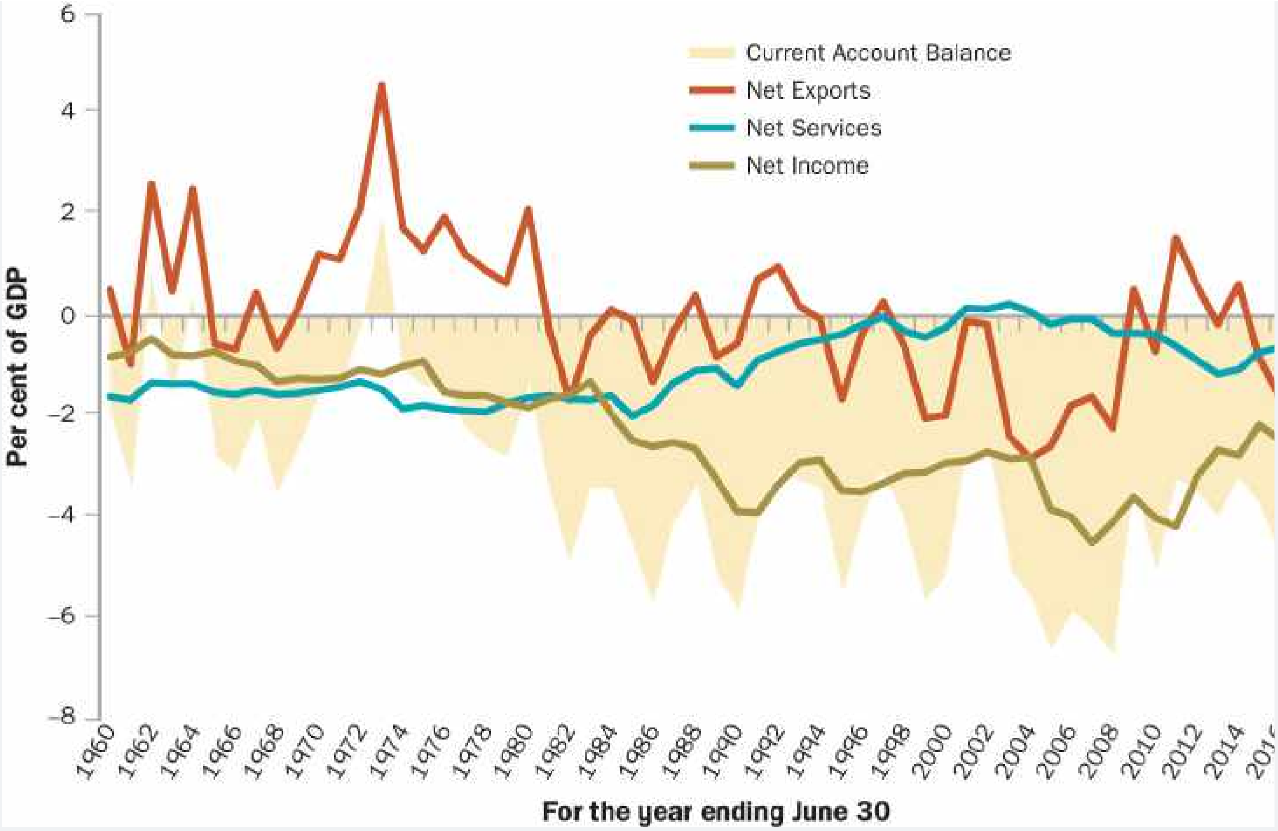

Figure 18.2 **Australia's current account balance and its components**

Note: Although Australia has nearly always had a deficit on the current account balance, net exports have often been in surplus.

Source: Based on data from Australian Bureau of Statistics 2018, 'Balance of payments and international investment position, Australia', Cat. no. 5302.0.

Figure 18.2 shows that Australia has nearly always had a deficit on its current account balance. There have only been a few brief periods where the balance on the current account was in surplus. As you can see from Figure 18.2, net exports have been a significant influence on the current account balance. Nevertheless, net exports have been far more frequently in surplus than has the overall current account balance. The reason for Australia’s *persistent* current account deficits is that the balances on net income and services have almost always been in deficit. Remember that this item includes the interest payments Australians make to foreign lenders on outstanding loans. One possible consequence of current account deficits is that they may imply an increase in domestic indebtedness to the rest of the world. (This occurs if domestic residents finance the current account deficit by borrowing from the rest of the world. In theory, a current account deficit could be financed by other means, such as the sale of assets to foreigners.) This means that past current account deficits can contribute to present and future current account deficits as the interest payments on previous loans show up as debits on the net income and current transfers account.

The other notable feature of the data in Figure 18.2 is the significant change in the balance on net services starting around the mid-1980s. Since that date, Australia’s balance on net services has gradually been moving from quite a significant deficit to a situation of surplus, albeit with a return to deficit recently. This reflects a change in the Australian economy; a much larger amount of insurance and other business associated with international trade is now transacted within Australia's borders than was previously the case.

CONCEPT CHECK 18.1

For each of the following, state whether the transaction would be recorded as a debit or credit on the current account:

a) foreign tourists buying souvenirs in the Northern Territory
b) a purchase of books over the internet from an online store located in the United States
c) a donation of $100 to a charity located in the United Kingdom.

18.1.2 THE CAPITAL ACCOUNT

The capital account, which is the other main component of the balance of payments, records all transactions that take place between domestic and foreign residents that involve the acquisition of either an asset or a liability. The convention is to record new liabilities as credit items in the capital account, while acquisitions of assets are recorded as debits. The logic behind this is to be consistent with the structure of the current account, whereby transactions that bring in foreign exchange are recorded as credits while transactions that lead to an outflow of foreign exchange are recorded as debits. As liabilities in the capital account, such as taking out a loan from a foreign lender, imply an inflow of foreign exchange, they are recorded as credit items. The acquisition of financial assets means that domestic residents have given up foreign exchange and hence these are recorded as debit items in the capital account.

An example will help to clarify things. Suppose a domestic company borrows money from an overseas financial institution. This means that a liability has been incurred; the domestic company must repay the loan at some time in the future. The value of this loan will be recorded in the capital account as a credit. On the other hand, suppose that a domestic financial institution has lent money to an overseas resident. This means that the financial institution has acquired an asset equivalent in value to the amount of the loan. This would be recorded in the capital account as a debit.

The capital account figures are usually divided between the official and non-official sectors. The official sector comprises the government sector and, in Australia's case, the Reserve Bank of Australia. Any borrowing that is done by Australian governments from overseas sources is recorded here. Changes to the Reserve Bank's holdings of gold and foreign exchange reserves are also recorded in the official sector of the capital account. The non-official sector comprises private financial institutions, firms and households. Items such as foreign direct investment are recorded here (an example of foreign direct investment would be an overseas firm buying an Australian firm or setting up a new operation in Australia). Any trading of shares between Australians and overseas residents is also recorded in the capital account, as are any loans or borrowings.

Analogous to Figure 18.1, we present in Figure 18.3 a diagram outlining the structure of the capital account.

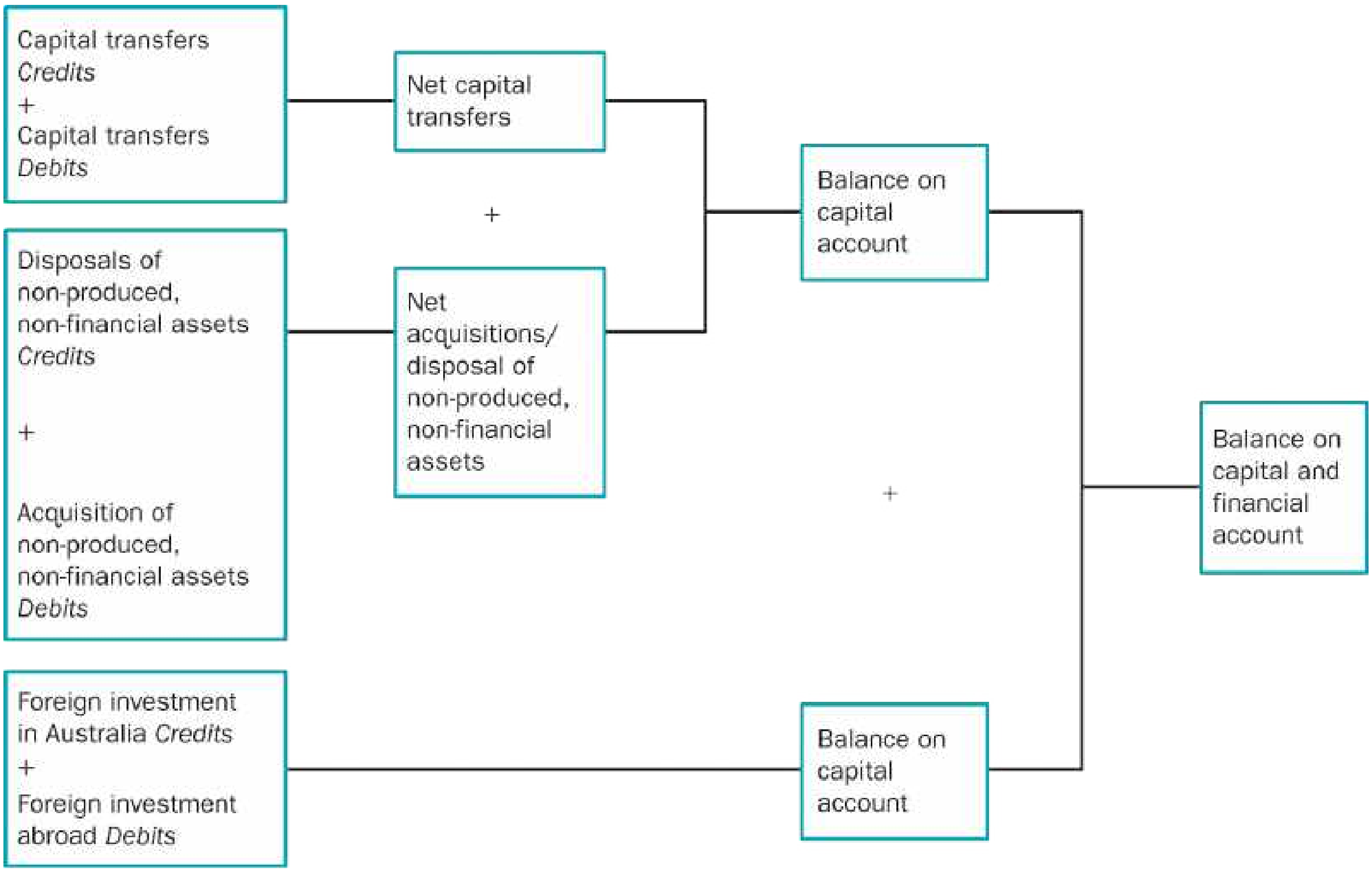

Figure 18.3 **The structure of the capital account**

Source: Australian Bureau of Statistics 2003, 'Measuring Australia's economy', Cat. no. 1360.0, Chapter 3, p. 47, www.abs.gov.au.

Unlike in our section on the current account, we will not show you a graph of the **balance on the capital account**. There is an important reason for this: if the exchange rate is determined by market forces, the balance on the capital account will be the same value as the balance on the current account, other than having the opposite sign. In other words, a current account deficit of 2 per cent of GDP will be associated with a capital account surplus of 2 per cent of GDP. This means that you need only look at the current account balance displayed in Figure 18.2 to get an idea of what has happened to the balance on Australia's capital account. In the next section we will show why the capital account balance mirrors the current account balance by discussing the important topic of international capital flows.

CONCEPT CHECK 18.2

Suppose you buy some shares on the London Stock Exchange. How would this be recorded in the Australian and UK balance of payments statistics? Suppose, in one year's time, the shares pay a dividend. How would this be recorded in the Australian and UK balance of payments statistics?

▹▹ RECAP

The balance of payments is a set of accounting statements recording all transactions between one country and the rest of the world.

The current account records all transactions that involve a transfer of ownership of commodities between the domestic country and the rest of the world or a direct flow of income between the domestic country and the rest of the world. Transactions that lead to a sale of domestic currency are recorded as debits. Transactions that lead to a purchase of domestic currency are recorded as credits.

The capital account records all transactions between the domestic country and the rest of the world that involve the sale and purchase of assets. This includes borrowing and lending and direct foreign investment. Transactions that lead to an inflow of capital are recorded as credits. Transactions that lead to an outflow of capital are recorded as debits.

18.2 CAPITAL FLOWS AND THE RELATIONSHIP BETWEEN THE CAPITAL AND THE CURRENT ACCOUNTS

LO 18.3

In thinking about international financial markets and the relationship between the current and capital accounts, it is useful to remember that lending is economically equivalent to acquiring a real or financial asset, and borrowing is economically equivalent to selling a real or financial asset. For example, savers lend to companies by purchasing shares or bonds, which are financial assets for the lender and financial liabilities for the borrowing firms. Similarly, lending to a government is accomplished in practice by acquiring a government bond—a financial asset for the lender and a financial liability for the borrower, in this case, the government. Savers can also provide funds by acquiring real assets such as land; if I purchase a parcel of land from you, though I am not making a loan in the usual sense I am providing you with funds that you can use for consuming or investing. In lieu of interest or dividends from a bond or a share, I receive the rental value of the land that I purchased.

Purchases or sales of real and financial assets across international borders (which are economically equivalent to lending and borrowing across international borders) are known as **international capital flows**. From the perspective of a country, say, Australia, purchases of domestic

(Australian) assets by foreigners are called **capital inflows** ; purchases of foreign assets by domestic (Australian) households and firms are called **capital outflows** . To remember these terms, it may help to keep in mind that capital inflows represent funds 'flowing in' to the country (foreign savers buying domestic assets), while capital outflows are funds 'flowing out' of the country (domestic savers buying foreign assets). The difference between the two flows is expressed as *net capital inflows*—capital inflows minus capital outflows—or *net capital outflows*—capital outflows minus capital inflows. Note that capital inflows and outflows are not counted as exports or imports because they refer to the purchase of existing real and financial assets rather than currently produced goods and services; as the name suggests, they relate to the capital account of the balance of payments.

International capital flows allow countries whose productive investment opportunities are greater than domestic saving to fill in the gap by borrowing from abroad (recall that in Chapter 15 , Section 15.1.1 , we showed that for a closed economy, national saving and investment are equal. In an open economy where international capital flows are possible, saving from other countries can be used to finance investment—this breaks the close nexus between a country's own saving and the amount of investment that is possible; we return to this important point later in the chapter). A closely related point, as we will see in Section 18.2.1 , is that capital flows allow countries to run trade imbalances—situations in which a country's exports of goods and services do not equal its imports of goods and services.

18.2.1 CAPITAL FLOWS AND THE

CURRENT ACCOUNT BALANCE

Previously, we introduced the concept of the balance on the current account, the difference between the debit and credit items generated by transactions relating to real goods and services and direct income flows. We saw that the current account balance comprises separate balances between imports and exports (the balance on merchandise trade); credit and debit items on the services account; and income flows between the domestic country and the rest of the world. Because exports need not equal imports in each quarter or year, or credits equal debits on, respectively, the services and income accounts, the current account balance need not always equal zero. As we saw in Figure 18.2, for Australia the current account has almost always been in deficit, meaning that the total of debit items in the current account exceeds the total of the credit items.

Net capital inflows, on the other hand, represent the difference between purchases of domestic assets by foreigners and purchases of foreign assets by domestic residents. When combined with changes in the Reserve Bank's holdings of foreign exchange and gold reserves, we have the balance on the capital account.

There is a precise and very important link between these two imbalances for economies with a flexible exchange rate, which is that, in any given period, the current account balance and the balance on the capital account sum to zero. For future reference let us write this relationship as an equation:

$$CAB + KAB = 0 \quad \textbf{Equation 18.1}$$

where *CAB* is the current account balance and *KAB* stands for the capital account balance. The relationship given by Equation 18.1 is an identity, meaning that it is true by definition. (In practice, because of errors of measurement and the non-reporting of some transactions, the figures for the current and capital account balances rarely line up exactly as is suggested by Equation 18.1. In the balance of payments statistics reported by the Australian Bureau of Statistics, this is handled by the inclusion of an extra term called the ‘balancing item’ to the left-hand side of Equation 18.1. The balancing item takes whatever value is necessary to make the capital and current account balances sum to zero. We will ignore the balancing item for the remainder of this chapter.)

To see why Equation 18.1 holds, consider what happens when, for example, an Australian resident purchases an imported good, say, a Japanese car priced at $40 000. Suppose the Australian buyer pays through a bank transfer so that the Japanese car manufacturer now holds $40 000 in an account in an Australian bank. What will the Japanese manufacturer do with this $40 000? Basically, there are two possibilities.

First, the Japanese company may use the $40000 to buy Australian-produced goods and services, such as Australian manufactured car parts or Gold Coast holidays for its executives. In this case, Australia has $40 000 in exports to balance the $40 000 car import. Because exports equal imports, in this case, Australia's trade balance is unaffected by these transactions and there are no implications for the balance on the current account (i.e. for these transactions *CAB* = 0). And because no assets are bought or sold there are no capital inflows or outflows (*KAB* = 0). So, under this scenario the condition that the current account balance plus the capital account balance equals zero, as stated in Equation 18.1, is satisfied.

Alternatively, the Japanese car producer might use the $40 000 to acquire Australian assets, such as an Australian government bond or some land in Adelaide. In this case, Australia compiles a trade deficit of $40 000, because the $40 000 car import is not offset by an export (*CAB* = −$40 000). But there is a corresponding capital inflow of $40 000, reflecting the purchase of an Australian asset by the Japanese firm (*KAB* = $40 000). So, once again, the current and capital account balances sum to zero, and Equation 18.1 is satisfied. (If the Japanese company simply left the $40 000 in the Australian bank it would still count as a capital inflow since the deposit would still be an Australian asset acquired by foreigners.) In fact, there is a third possibility, which is that the Japanese car company might swap its dollars for some other currency. For example, the company might trade its dollars to another Japanese firm or individual in exchange for Japanese yen. However, the acquirer of the dollars would then have the same two options as the car company—to buy Australian goods and services or acquire Australian assets—so that the equality of the current account balance and the capital account balance would continue to hold.

The essential point is that domestic currency held by a foreigner must, at some point, be used to purchase a good, service or asset from Australian residents. This is true even if the currency is simply deposited in a bank (which would be recorded as a credit in the capital account).

There is one final point that needs to be noted when discussing the link between the capital account and current account balances. As mentioned above, Equation 18.1 will always hold for an economy with a flexible exchange rate. However, it need not hold exactly if a country has a fixed exchange rate. The reason is that transactions on the capital and current account have implications for the demand and supply of domestic currency on the international currency market. As explained in Chapter 17, the supply of Australian currency is related to Australian residents' demand for either foreign goods (a debit on the current account) or foreign financial assets (a debit on the capital account). The demand for Australian currency depends on the demand for Australian goods (a credit on the current account) or the demand for Australian financial assets (a credit on the capital account). An excess demand for Australian currency, therefore, equates to credits in the balance of payments exceeding debits. This is a situation known as the balance of payments disequilibrium and where Equation 18.1 will not hold. Similarly, an excess supply of Australian currency implies a greater value of debits recorded in the balance of payments than credits; again, there is a balance of payments disequilibrium and Equation 18.1 will not hold.

Neither of these disequilibrium circumstances can persist if the country concerned has a flexible exchange rate. This is because the exchange rate will adjust quickly to equate the demand and supply of Australian currency. As a result, the total debits and credits in the balance of payments will themselves be brought into balance; Equation 18.1 will hold.

The situation is different if the country concerned has a fixed exchange rate. As explained in Chapter 17, a fixed exchange rate is associated with either excess demand for the domestic currency (an undervalued exchange rate) or excess supply (an overvalued exchange rate). To maintain the fixed exchange rate requires the central bank to either use its reserves of foreign currency to purchase domestic currency (as would be the case for an overvalued exchange rate) or to sell domestic currency and acquire reserves of foreign currency (needed to maintain an undervalued exchange rate). This means that any imbalance in the current and capital accounts (reflecting an imbalance between the demand and supply of domestic currency) will be associated with changes to the central bank's holdings of foreign reserves.

To illustrate this, suppose the exchange rate is undervalued, meaning that there is excess demand for domestic currency. Following on from the discussion above, credits in the current and capital accounts will exceed debits and so $CAB + KAB > 0$. To maintain the undervalued exchange rate the central bank sells its own currency, acquiring foreign reserves in the process. Writing the change in the value of the central bank's holdings of foreign currency as *CHFOREX*, Equation 18.1 needs to be modified for a country with an undervalued fixed exchange rate in the following way:

$$CAB + KAB = CHFOREX$$

Equation 18.2

Equation 18.2 shows that with a fixed exchange rate it is possible to have a surplus on both the current and the capital accounts. Similar reasoning applies if the exchange rate is overvalued. Now there will be an excess supply of domestic currency, debits in the current and capital accounts will exceed credits and $CAB + KAB < 0$. As the overvaluation of the exchange rate implies that the central bank must be using its foreign exchange reserves to buy domestic currency, $CHFOREX$ will be a negative number. Hence, Equation 18.2 will still hold.

CONCEPT CHECK 18.3

An Australian saver purchases a $20 000 Japanese government bond. Explain why Equation 18.1 is satisfied no matter what the Japanese Government does with the $20 000 it receives for its bond.

▹▹ RECAP

Purchases of domestic assets by foreigners are called *capital inflows;* purchases of foreign assets by domestic households and firms are called *capital outflows.*

The balances on the current and capital accounts, when summed together, equal zero. This is because any imbalance on the current account has an offsetting transaction recorded on the capital account.

18.3 THE DETERMINANTS OF INTERNATIONAL CAPITAL FLOWS

LO 18.4

You may recall that capital inflows are purchases of domestic assets by foreigners, while capital outflows are purchases of foreign assets by domestic residents. For example, capital inflows into Australia include foreign purchases of items such as the shares and bonds of Australian companies, Australian government bonds and real assets such as land or buildings owned by Australian residents. Why would foreigners want to acquire Australian assets and, conversely, why would Australians want to acquire assets abroad?

The basic factors that determine the attractiveness of any asset, either domestic or foreign, are *return* and *risk*. Financial investors seek high real returns; thus, with other factors (such as the degree of risk and the returns available abroad) held constant, a higher real interest rate in the home country promotes capital inflows by making domestic assets more attractive to foreigners. By the same token, a higher real interest rate in the home country reduces capital outflows by inducing domestic residents to invest their savings at home. Thus, all else being equal, a higher real interest rate at home leads to net capital inflows. Conversely, a low real interest rate at home tends to create net capital outflows, as financial investors look abroad for better opportunities. Figure 18.4 shows the relationship between a country’s net capital inflows and the real rate of interest prevailing in that country. When the domestic real interest rate is high, holding all else constant, net capital inflows are positive (foreign purchases of domestic assets exceed domestic purchases of foreign assets). But when the real interest rate is low, net capital inflows are negative (i.e. the country experiences net capital outflows).

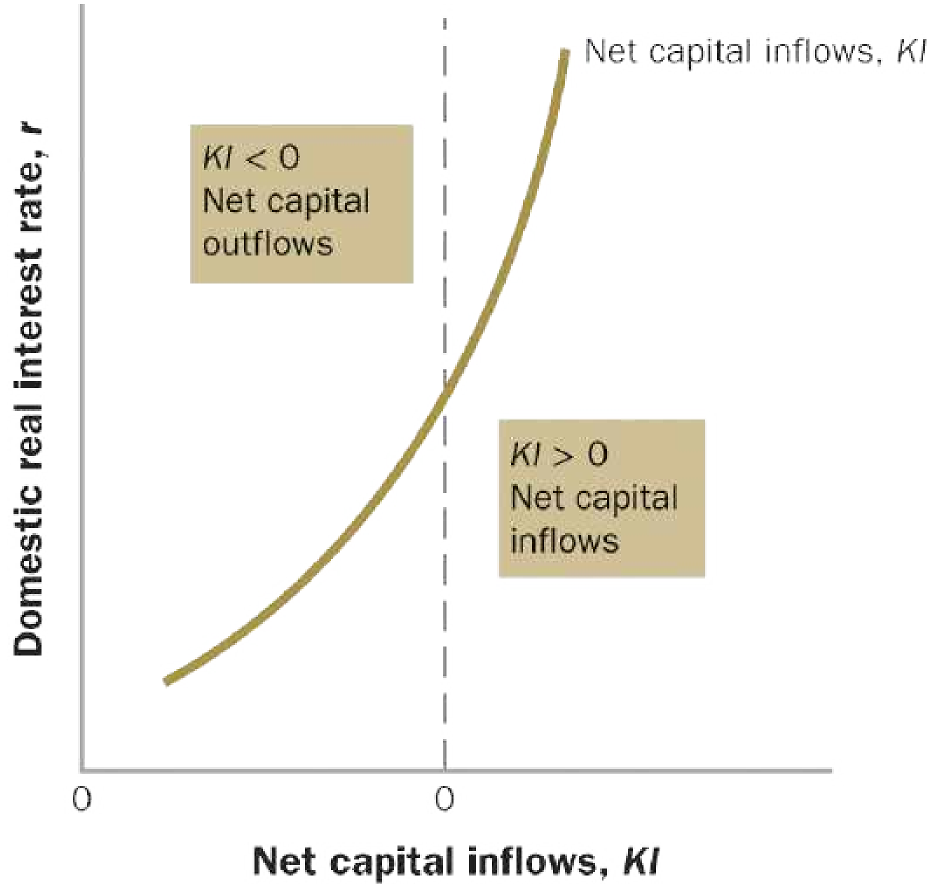

Figure 18.4 **Net capital inflows and the real interest rate**

Note: Holding constant the degree of risk and the real returns available abroad, a high real interest rate in the home country will induce foreigners to buy domestic assets, increasing capital inflows. A high real interest rate in the home country also reduces the incentive for domestic savers to buy foreign assets, reducing capital outflows. Thus, all else being equal, the higher the domestic real interest rate, *r,* the higher will be net capital inflows, *KI.*

It should be noted that, especially in the case of *small open economies,* it is unlikely that the real interest rate will differ significantly from interest rates prevailing in other countries for any lengthy period. This is because the size of the capital flows that would be associated with any divergence of the interest rate available domestically from the rate on offer in other countries is likely to eliminate any differences that exist between these interest rates. For example, suppose a small economy did find itself with an interest rate that was higher than that available elsewhere. The relative attractiveness of the domestic assets would induce a large inflow of capital, raising the demand for these assets and hence their price. From Chapter 9 we know that an increase in the price of a financial asset is equivalent to a fall in its rate of interest. Therefore, the domestic interest rate is likely to be pushed back towards the level of interest rates offered in other countries. Similarly, if the domestic country had an interest rate that was below that of other countries, the size of the capital outflows would imply a significant reduction in the demand for domestic financial assets, and this would put upward pressure on the domestic rate of interest. Once again, the domestic interest rate would tend to move to the same level as interest rates in other countries.

The effect of risk on capital flows is the opposite of the effect of the real interest rate. For a given real interest rate, an increase in the riskiness of domestic assets reduces net capital inflows as foreigners become less willing to buy the home country's assets, and domestic savers become more inclined to buy foreign assets. For example, political instability, which increases the risk of investing in a country, tends to reduce net capital inflows. Figure 18.5 shows the effect of an increase in risk on capital flows: at each value of the domestic real interest rate an increase in risk reduces net capital inflows, shifting the capital inflows curve to the left.

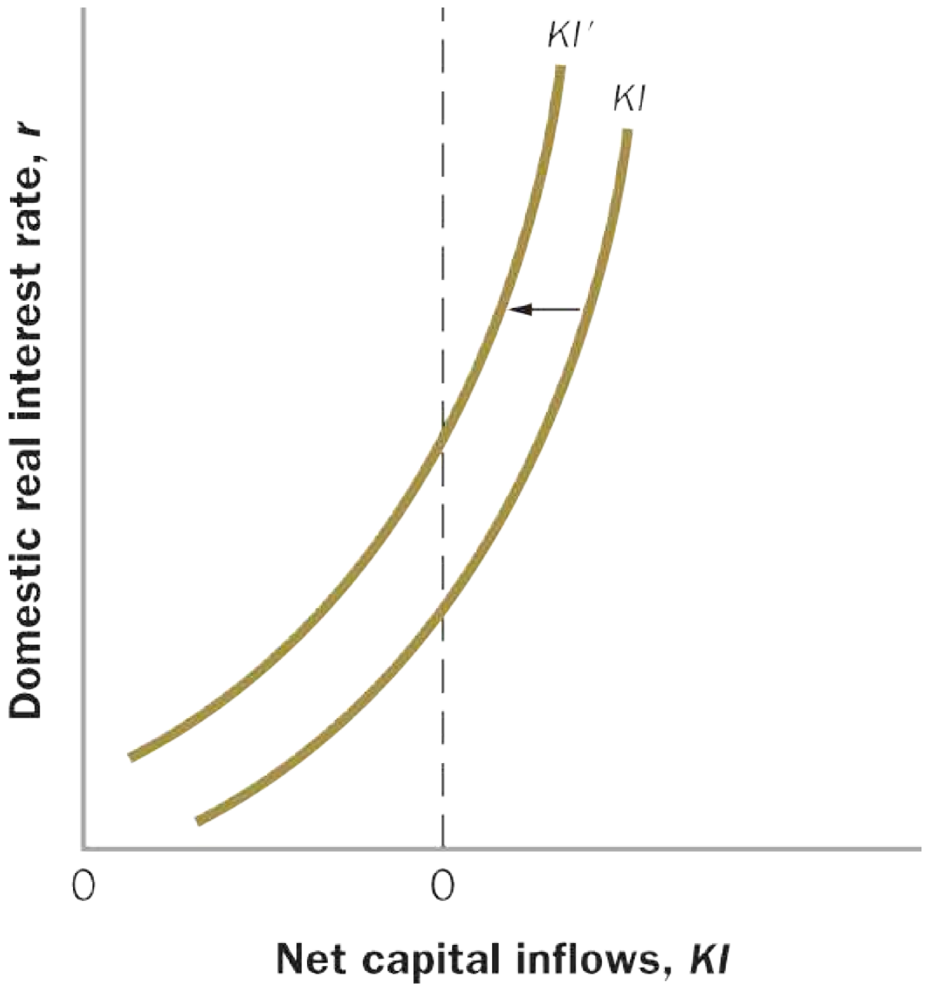

Figure 18.5 **An increase in risk reduces net capital inflows**

Note: An increase in the riskiness of domestic assets—arising, for example, from an increase in political instability—reduces the willingness of foreign and domestic savers to hold domestic assets. The supply of capital inflows declines at each value of the domestic real interest rate, shifting the *KI* curve to the left.

CONCEPT CHECK 18.4

For a given real interest rate and riskiness in the home country, how would you expect net capital inflows to be affected by an increase in real interest rates abroad? Show your answer graphically.

▹▹ RECAP

Financial capital flows between countries are based on a consideration of the relative returns on offer in different countries and the relative riskiness of investing in different countries. For given risk levels, a relatively higher return in one country will lead to capital inflows to that country. For given returns, a relatively higher degree of risk in one country will lead to capital outflows from that country.

18.4 SAVING, INVESTMENT AND CAPITAL INFLOWS

LO 18.5

International capital flows have a close relationship to domestic saving and investment. As we will see next, capital inflows augment the domestic saving pool, increasing the funds available for investment in physical capital, while capital outflows reduce the amount of saving available for investment. Thus, capital inflows can help to promote economic growth within a country and capital outflows to restrain it.

Recall the concept of national saving, introduced in Chapter 4. National saving, which is the sum of private and public sector saving, represents the portion of a nation's income that is not immediately consumed. In Chapter 15 we showed that in a closed economy, national saving and investment are equal. In an open economy, however, it is no longer necessary that investment be restricted solely to the resources freed up by national savings. Through borrowing from abroad (i.e. a capital inflow) it is possible to draw on the saving of other countries to help finance domestic investment. On the other hand, should a country's national saving be larger than what is required to finance its investment, the excess can be lent to other countries.

All of this suggests the following relationship between national saving, capital flows and domestic investment (it may be helpful at this stage to review the material in Chapter 4 on national saving):

$$NS + KI = I \qquad \textbf{Equation 18.3}$$

where *NS* is national saving, *KI* is the net capital inflow and *I* is investment. Equation 18.3, a key result, says that the sum of national saving, *NS,* and capital inflows from abroad, *KI,* must equal domestic investment in new capital goods, *I*. In other words, in an open economy the pool of saving available for domestic investment includes not only national saving (the saving of the domestic private and public sectors) but funds from savers abroad as well. Of course, *KI* could be a negative number, which would mean that the domestic country is a net creditor with respect to the rest of the world (i.e. there is capital outflow from the domestic country). This means that the domestic country is lending money abroad. Looking at Equation 18.3 shows how this makes perfect sense; with *KI* being a negative number, national saving, *NS,* is in excess of investment. The excess saving can be lent out, and earn an interest return, to other countries.

Chapter 4 introduced the saving–investment diagram, which shows that, in a closed economy, the supply of saving must equal the demand for saving. A similar diagram applies to an open economy.

Figure 18.6 shows the open-economy version of the saving–investment diagram. The domestic real interest rate is shown on the vertical axis and saving and investment flows on the horizontal axis. We will deal with the case of a *small open economy,* such as that of Australia. Recall the argument from Section 18.3 that should the domestic interest rate in a small open economy differ from the interest rate in the rest of the world, capital flows will bring the domestic rate back into line with the world interest rate. Suppose, then, that the interest rate in the rest of the world is r_0. Given the relative smallness of the economy, r_0 also defines the domestic rate of interest. (In reality, even in a small open economy, the domestic interest rate might deviate to some extent from the interest rate in the rest of the world, if either (1) the domestic economy is perceived to have a different level of risk from other countries, or (2) there is an expectation that the exchange rate is likely to change at some point in the future. For the sake of simplicity, we will ignore these complications in this discussion.) As in a closed economy, the downward-sloping curve, *I,* shows the demand for funds by firms that want to make capital investments. The solid upward-sloping curve, marked *NS,* shows the total supply of domestic national saving. You can see from Figure 18.6 that with an interest rate of r_0, national saving falls short of the amount required to finance investment. The difference can be made up from capital inflow, that is, from borrowing abroad. Note how this is entirely consistent with Equation 18.3. If, on the other hand, the interest rate was much higher, say, r_1, so that national saving exceeded investment, there would be a positive capital outflow—again this is consistent with Equation 18.3.

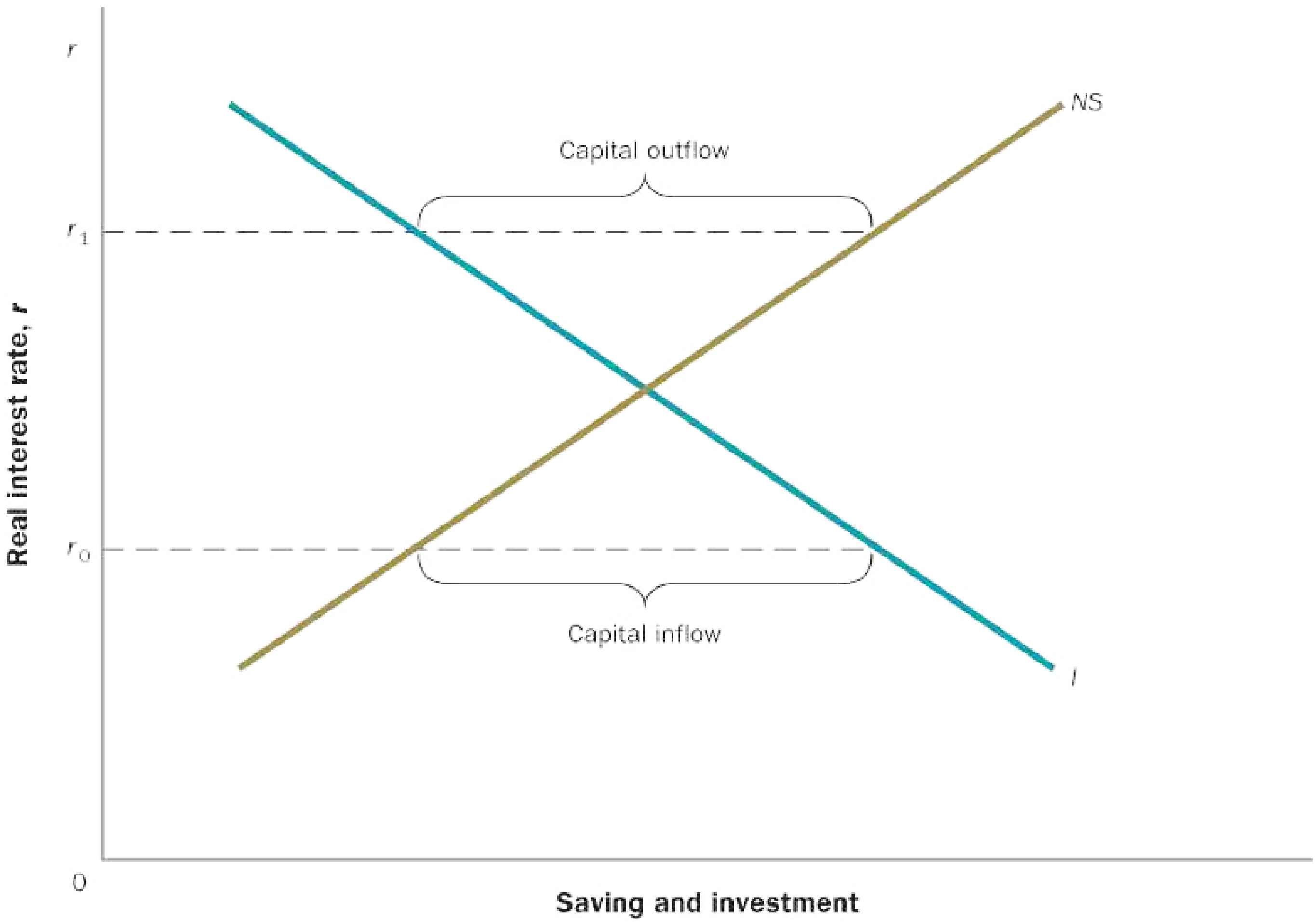

Figure 18.6 **The saving–investment diagram for a small open economy**

Note: The total supply of saving in an open economy is the sum of national saving, *NS,* and net capital inflows, *KI.* The domestic demand for saving for purposes of capital investment is shown by the curve labelled *I.* Given a particular level of world interest rates, the total supply of saving, including capital inflows, will be equal to the domestic demand for saving.

Figure 18.6 also suggests how net capital inflows can benefit an economy. In Chapter 15 we saw the importance of saving for a country's economic growth. The model presented in that chapter, the Solow–Swan model, related to a closed economy. For open economies, saving is still very important for growth, but now a country that attracts significant amounts of foreign capital inflow will have a larger pool of total saving and can finance more investment than if domestic national saving alone was relied upon. Australia, New Zealand, the United States and Canada all benefited from large inflows of capital in the early stages of their economic development, as do many developing countries today. We also note that because capital inflows tend to react very sensitively to risk, an implication is that countries that are politically stable and safeguard the rights of foreign investors will attract more foreign capital and thus grow more quickly than countries without those characteristics.

Although capital inflows are generally beneficial to the countries that receive them, they are not costless. Countries that finance domestic capital formation primarily by capital inflows face the prospect of paying interest and dividends to the foreign financial investors from whom they have borrowed. Several developing countries have experienced *debt crises,* arising because the domestic investments they made with foreign funds turned out poorly, leaving them insufficient income to pay what they owed their foreign creditors. An advantage to financing domestic capital formation primarily with domestic saving is that the returns from the country's capital investments accrue to domestic savers rather than flowing abroad.

THINKING AS AN ECONOMIST 18.1

Why did the Argentine economy collapse in 2001–02?

At the beginning of Chapter 17 (Setting the scene), we described the role Argentina's overvalued exchange rate played in its economic crisis of the early 2000s. Another, albeit related, cause of Argentina's crisis concerned the drying up of capital inflow. The increased government budget deficits that we described in Chapter 17 reduced Argentina's national saving, increasing the need to borrow abroad. But while Argentina's borrowing needs were rising, foreign lenders began to worry that the country—with its slowing economy, high debt burden and worsening government budget deficits—was a much riskier location for investment than they had thought. Increased risk reduces the supply of capital inflows (see Figure 18.5) and thus also reduces the total pool of saving available; the result is a higher domestic interest rate, lower domestic investment and hence a weakening economy. As the economy continued to weaken, and government budgets worsened, foreign lenders became so pessimistic about Argentina that they would lend only at very high interest rates, if at all. Ultimately, Argentina was unable to repay even the interest on its foreign debt and was forced to default (refuse to pay). At that point the country became essentially unable to borrow abroad at any price. Investment in Argentina collapsed, and real interest rates soared. Argentina began to negotiate with public agencies such as the International Monetary Fund (IMF) to try to obtain loans to help rebuild its economy. In September 2003 the IMF agreed to lend Argentina $13.5 billion, to be handed out in stages over three years. A condition attached to the loan was that Argentina would implement substantial reforms to its economy.

▹▹ RECAP

Capital inflows can augment the pool of domestic saving. This means that in an open economy investment need not be confined to the size of the available supply of domestic savings.

18.5 THE SAVING RATE AND THE TRADE AND CURRENT ACCOUNT DEFICITS

LO 18.6

FIND ONLINE

We have seen that a country's exports and imports do not necessarily balance in each period. Indeed, Australia has often run a trade deficit, with its imports exceeding exports. What causes trade deficits? Stories in the media and claims by politicians sometimes assert that trade deficits occur if a country produces inferior goods that no one wants to buy or because other countries impose unfair trade restrictions on imports. Despite the popularity of these explanations, there is little support for them in either economic theory or evidence. For example, Australia currently has large trade deficits with several countries, but no one would claim Australian goods are significantly inferior to goods made elsewhere. And many developing countries have significant trade deficits even though they, rather than their trading partners, tend to impose the more stringent restrictions on trade.

Economists argue that, rather than the quality of a country's exports or the existence of unfair trade restrictions, *a low rate of national saving may be the primary cause of trade deficits*.

To see the link between national saving and the trade deficit, recall the national income accounting identity $Y = C + I + G + NX$. Subtracting $C + I + G$

from both sides of this equation and rearranging we get $Y - C - G - I = NX$. Finally, recognising that national saving, NS, equals $Y - C - G$, we can rewrite the relationship as:

$$NS - I = NX$$ **Equation 18.4**

According to Equation 18.4, if we hold domestic investment, I, constant, a relatively high rate of national saving, NS, implies a high level of net exports, NX, while a relatively low level of national saving implies a low level of net exports. Furthermore, if a country's national saving is less than its investment, or $NS < I$, then Equation 18.4 implies that net exports, NX, will be negative. That is, the country will have a trade deficit. The conclusion from Equation 18.4 is that, holding domestic investment constant, low national saving tends to be associated with a trade deficit ($NX < 0$), and high national saving is associated with a trade surplus ($NX > 0$).

Why does a low rate of national saving tend to be associated with a trade deficit? A country with a low national saving rate is one in which households, firms and the government have high spending rates, relative to domestic income and production. Since part of this spending is devoted to imported goods, we would expect a low-saving, high-spending economy to have a high volume of imports. Furthermore, a low-saving economy consumes a large proportion of its domestic production, reducing the quantity of goods and services available for export. With high imports and low exports, a low-saving economy will experience a trade deficit.

A country with a trade deficit is also likely to be receiving capital inflows. Recall that capital inflow implies a capital account surplus and a current account deficit. (Equation 18.1 tells us that if the current account is in deficit then it must be true that $KI > 0$: net capital inflows are positive, and the capital account is in surplus.) If net income flows and current transfers are negative (as they are most often for Australia—see Figure 18.2), then a trade deficit will also be associated with a current account deficit and hence with net capital inflows. Is a low national saving rate also consistent with the existence of net capital inflows? The answer is yes. A country with a low national saving rate will not have sufficient saving of its own to finance domestic investment. Thus, it is likely that there will be many good investment opportunities in the country available to foreign savers, leading to capital inflows. Equivalently, a shortage of domestic saving will tend to drive up the domestic real interest rate, which attracts capital flows from abroad.

We conclude that a low rate of national saving tends to create a trade deficit, as well as promote the capital inflows that accompany a current account deficit. Thinking as an economist 18.2 illustrates this effect in the case of the United States.

THINKING AS AN ECONOMIST 18.2

What explains the United States' trade balance?

Figure 18.7 summarises data on the trade balance (defined as the net exports of goods and services) for the United States, a country where interrelationships with the rest of the world have been the subject of much public commentary in recent times. The data, which are shown for five yearly averages, highlight the link between the trade balance and trends in national saving and investment. As we would predict from the discussion in Section 18.5, and as confirmed by Figure 18.7, the US trade balance reflects imbalances between national saving and investment. Where national saving in the United States exceeds investment, for example in 1960–64, the trade balance is in surplus. The opposite is true in the period since the early 1980s, where national saving has persistently fallen short of investment; these periods correspond to a deficit on the trade balance.

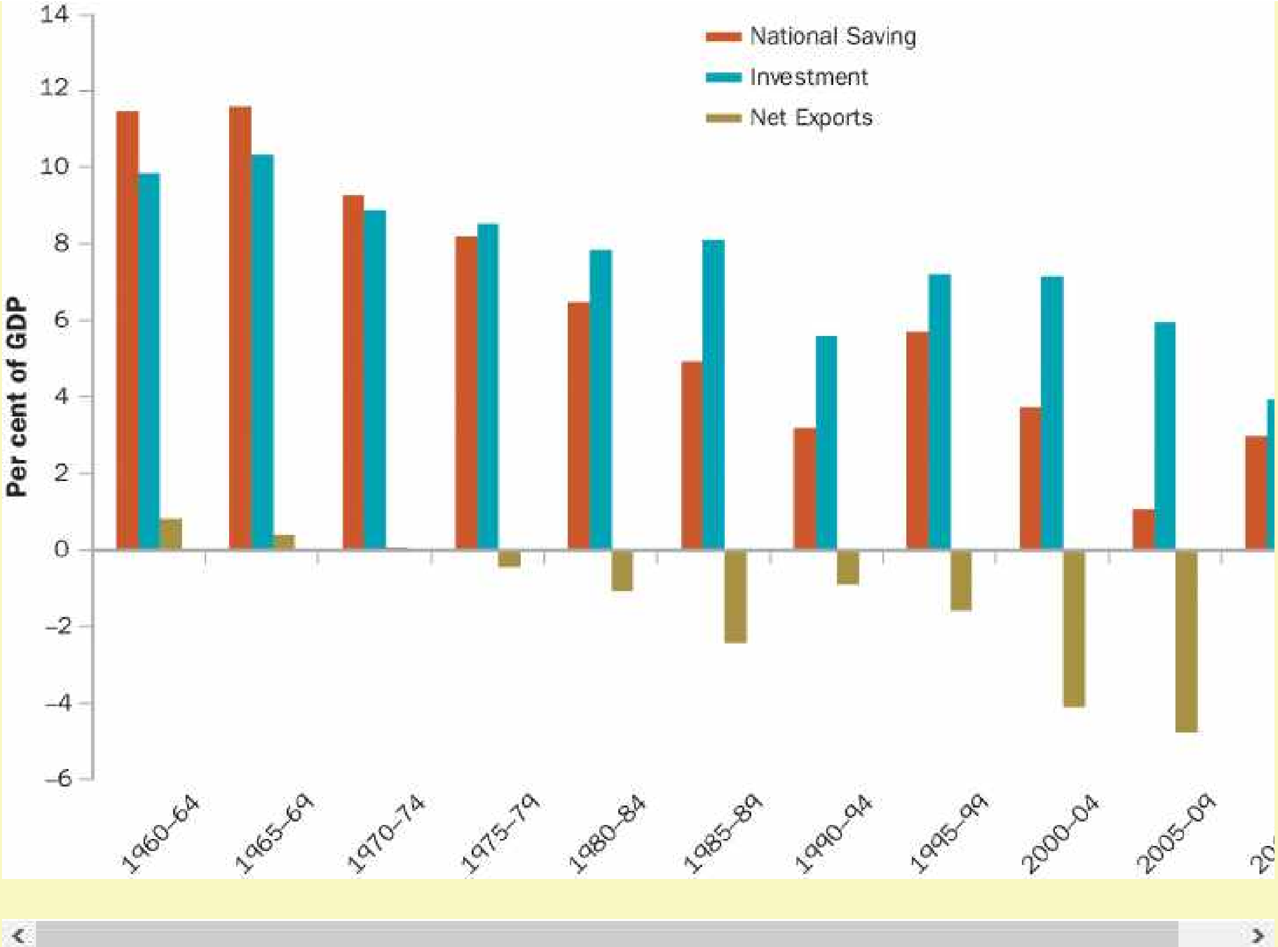

Figure 18.7 **Trends in national saving, investment and net exports (per cent of GDP) in the United States**

Note: When US investment needs are in excess of domestic saving, the result is a deficit on the trade balance. (Also note that the trade balance may not be equal exactly to saving less investment due to statistical discrepancies.)

Source: European Commission Economic and Financial Affairs 2018, 'AMECO', http://ec.europa.eu/economy_finance/ameco/user/serie/SelectSerie.cfm. ©European Union, 1995–2018

Looking at the trade balance through the lens of national saving and investment enables economists to explain what is happening in terms of economic fundamentals. For example, you can see from the figure that when the trade deficit was at its highest in the United States relative to GDP, in 2005–09, national saving was at its lowest. This was a period of aggressive fiscal expansion in response to the Global Financial Crisis. From Chapter 4, we know that a budget deficit reduces the pool of national saving. As a result, US investment needs could be met only through increased borrowing from abroad—capital inflow. From Section 18.2.1, we know that the resultant capital account surplus will be matched by a current account deficit. (Recall what we learned in Chapter 17: foreign lenders will need to acquire US dollars in order to acquire US assets (i.e. to lend to the US). The result will be a stronger US dollar, which increases imports and decrease exports.) Policy decisions taken domestically, therefore, are the key factor explaining the size of the trade deficit during this period.

▹▹ RECAP

From the national income accounting identity, it follows that the size of the trade deficit and the imbalance between national savings and investment are related. Should national savings fall short of investment there will be a trade deficit. If national savings exceed investment there will be a trade surplus.

SUMMARY

- The *current account* on the *balance of payments* records all transactions that involve the transfer of ownership of commodities or a direct transfer of income between the domestic country and the rest of the world. The merchandise trade balance, or net exports, is the value of a country's exports less the value of its imports in a period. Exports need not equal imports in each period. If exports exceed imports the difference is called a *trade surplus,* and if imports exceed exports the difference is called a *trade deficit*. The current account also records trade in services (the net services account), flows of income payments and unrequited transfers.
- Trade takes place in assets as well as goods and services. Purchases of domestic assets (real or financial) by foreigners are called *capital inflows,* and purchases of foreign assets by domestic savers are called *capital outflows*. These transactions, together with any changes in the Reserve Bank of Australia's holdings of gold and foreign exchange, are recorded in the capital account of the balance of payments. Because imports that are not financed by sales of exports must be financed by sales of assets, the trade balance and net capital inflows sum to zero.
- The higher the real interest rate in a country, and the lower the risk of investing there, the higher its capital inflows. The availability of capital inflows expands a country's pool of saving, allowing for more domestic investment and increased growth. A drawback to

using capital inflows to finance domestic capital formation is that the returns to capital (interest and dividends) accrue to foreign financial investors rather than domestic residents.

- A low rate of national saving is the primary cause of trade deficits. A low-saving, high-spending country is likely to import more than a high-saving country. It also consumes more of its domestic production, leaving less for export. Finally, a low-saving country is likely to have a high real interest rate, which attracts net capital inflows. Because the sum of the trade balance, net income flows and capital inflows is zero, a high level of net capital inflows may be consistent with a large trade deficit.

KEY TERMS

balance of payments 466

balance on merchandise trade 467

balance on the capital account 470

balance on the current account 467

capital account 467

capital inflows 471

capital outflows 471

current account 467

current account deficit 468

current account surplus 468

current transfers 467

international capital flows 471

REVIEW QUESTIONS

1. How are capital inflows or outflows related to domestic investment in new capital goods? LO 18.4 **EASY**
2. Explain with examples why, in any period, a country’s net capital inflow equals its trade deficit. LO 18.6 **MEDIUM**
3. How would increased political instability in a country likely affect capital inflows, the domestic real interest rate, and investment in new capital goods? Show graphically. LO 18.6 **MEDIUM**

PROBLEMS

1. How does each of the following transactions affect (i) the current account balance and (ii) the capital account balance for Australia? Show that in each case the identity that the trade balance plus net capital inflows equals zero applies. LO 18.3 **EASY**
   a) An Australian exporter sells software to Israel. She uses the Israeli shekels received to buy stock in an Israeli company.
   Page 481
   b) An East Timorese firm uses proceeds from its sale of oil to Australia to buy Australian government bonds.
   c) An East Timorese firm uses proceeds from its sale of oil to Australia to buy oil-drilling equipment from an Australian firm.
   d) An East Timorese firm receives Australian dollars from selling oil to Australia. A French firm accepts the dollars as payment for drilling equipment. The French firm uses the dollars to buy Australian government bonds.
   e) A British financial investor authorises a bank transfer from his account in New York to purchase shares of AMP (an Australian company).
2. Find data on the components of nominal GDP for the most recent two years (the European Commission Economic and Financial Affairs is a good source: http://ec.europa.eu/economy_finance/ameco/user/serie/SelectSerie.cfm).

Find net exports, national saving (which can be derived from the relationship $S = Y - C - G$) and gross private domestic investment for the period, and verify that they satisfy the relationship $S = I + NX$. How has Australia's trade balance changed over the past two years as a percentage of GDP? Are the changes attributable to changes in the national saving rate, the rate of investment or both? LO 18.6 **HARD**

3. Use a diagram like Figure 18.6 to show the effects of each of the following on the capital investment of a country that is a net borrower from abroad. LO 18.4 **MEDIUM**
   - a) Investment opportunities in the country improve owing to new technologies.
   - b) The government budget deficit rises.
   - c) Domestic citizens decide to save more.
   - d) Foreign investors believe that the riskiness of lending to the country has increased.
4. A country's domestic supply of saving, domestic demand for saving for purposes of capital formation, and supply of net capital inflows are given by the following equations: LO 18.6 **MEDIUM**

$$S = 1500 + 2000r$$
$$I = 2000 - 4000r$$
$$KI = -100 + 6000r$$

   - a) Assuming that the market for saving and investment is in equilibrium, find national saving, capital inflows, domestic investment and the real interest rate.
   - b) Repeat part (a), assuming that desired national saving declines

by 120 at each value of the real interest rate. What effect does a reduction in domestic saving have on capital inflows?

c) Concern about the economy's macroeconomic policies causes capital inflows to fall sharply so that now $KI = -700 + 6000r$. Repeat part (a). What does a reduction in capital inflows do to domestic investment and the real interest rate?

5. In 2013 China recorded a current account surplus of US$148 204 million and a capital account surplus of US$3 052 million (IMF 2018).

What must have happened to China's reserves of foreign exchange in this period? LO 18.1 **MEDIUM**

REFERENCES

Australian Bureau of Statistics 2003, ‘Measuring Australia’s economy’, Cat. no. 1360.0, www.abs.gov.au.

Australian Bureau of Statistics 2018, ‘Australian system of national accounts 2017-18’, Cat. no. 5204.0, www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/5204.02017-18?OpenDocument.

Australian Bureau of Statistics 2018, ‘Balance of payments and international investment position, Australia, Jun 2018’,Cat. no. 5302.0, www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/5302.0Jun%202018?OpenDocument.

European Commission Economic and Financial Affairs 2018, ‘AMECO’, http://ec.europa.eu/economy_finance/ameco/user/serie/SelectSerie.cfm.

International Monetary Fund (IMF) 2018, ‘Balance of payments and international investment position statistics (BOP/IIP)’, http://data.imf.org/?sk=7A51304B-6426-40C0-83DD-CA473CA1FD52&sId=1542635306163.

Walker A 2018, ‘Can Trump really cut the US trade deficit?’, BBC News, 2 October, https://www.bbc.com/news/business-45712062.

PART 5

CONCLUDING THOUGHTS

THIS, THE FINAL PART of the book, takes a brief stocktake of the field of macroeconomics. The theme is the interplay between ideas and events. We look at some of the key macroeconomic events from history that have led economists to develop or refine their ideas. In doing so, we highlight the interplay between theory and practice. We show also how particular events have led, at one time or another, to the development of different schools of thought in macroeconomics. This reminds us that our discipline is constantly evolving, as new and unexpected developments in the economy throw up new challenges requiring analysis and explanation and, at times, new modes of thought.

CHAPTER 19

Macroeconomics: What have we learnt?

After reading this chapter, you should be able to answer the following questions.

- 19.1 What lessons have been learnt from the Great Depression?
- 19.2 What lessons have been learnt from the Great Inflation?
- 19.3 What lessons have been learnt from the Global Financial Crisis?
- 19.4 What challenges remain in the field of economic growth?
- 19.5 How would one distinguish a Keynesian economist?
- 19.6 In what ways did the monetarist school present a challenge to Keynesian economics?
- 19.7 How do new classical macroeconomists differ from (a) Keynesian economists and (b) monetarists?
- 19.8 For what reason or reasons do new Keynesian macroeconomists advocate government management of the economy?
- 19.9 According to real business cycle theorists, from where do business cycle fluctuations in real output originate?

SETTING THE SCENE

Debates among economists with competing views are as old as the discipline itself. One of the most well-known debates in macroeconomics, and one that still resonates today, occurred during the 1930s between John Maynard Keynes, author of *The General Theory,* and Friedrich Hayek, an Austrian-born economist who migrated to Great Britain and joined the London School of Economics. In a long and distinguished career, culminating in the award of the Nobel Prize in Economics in 1974, Hayek became known as a staunch defender of the free market. He disagreed with Keynes's view that the key to economic recovery in a time of contraction (or depression) was increased public spending. In Hayek's view, increased government involvement in the economy created many more problems than it solved.

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Letters to *The Times* in October 1932 saw these competing views put most forcefully, first by Keynes (with some of his colleagues) on 17 October and then a few days later by Hayek, again with colleagues—a complete account of the intellectual debates between Keynes and Hayek, which includes articles, books, reviews, seminars, lectures and personal encounters, is given by Wapshott (2011).

Keynes laid out the case for increased public spending as a means of avoiding unemployment. He did so by appealing to local issues that no doubt would resonate with readers of *The Times*:

> *If the citizens of a town wish to build a swimming-bath, or a library, or a museum, they will not, by refraining from doing this, promote a wider national interest. They will be 'martyrs by mistake,' and, in their martyrdom, will be injuring others as well as themselves. Through their misdirected good will the mounting wave of unemployment be lifted still higher* (MacGregor et al. 1932).

Hayek's rejection of increased government spending was emphatic:

> *We are of the opinion that many of the troubles of the world at the present time are due to imprudent borrowing and spending on the part of the public authorities. We do not desire to see a renewal of such practices. At best they mortgage the Budgets of the future, and they tend to drive up the rate of interest – a process which is surely particularly undesirable at this juncture, where the revival of the supply of capital to private industry is an admittedly urgent necessity* (Gregory et al. 1932).

We will leave it to you to match up the arguments of both scholars with the material we have presented in this book. What we want to highlight is the contemporary relevance of the issue debated by Keynes and Hayek: what steps can be taken to revive a struggling economy? During the Global Financial Crisis, the competing arguments forwarded by Keynes and Hayek came to the fore (though many arguing the point may not have realised they were revisiting a debate that was at least 80 years old). Most governments around the world sided with Keynes and turned to public spending as a means of boosting aggregate demand. Not all economists agreed. And no doubt Hayek would have warned of the dangers he saw in the increases in public debt that would inevitably follow.

As one commentator said in the wake of the Global Financial Crisis, ‘The great debate is still Keynes versus Hayek. All else is footnote’ (Rizzo 2010).

19.1 LESSONS FROM THE PAST

LO 19.1–19.4

Now that we have reached the final chapter of our book it is a good time to step back and reflect on what we have learnt as macroeconomists—along the way, summing up over 80 years of intellectual endeavour since John Maynard Keynes published *The General Theory*. In doing so, we will see that macroeconomics is an evolving discipline, one that by necessity has had to change as new pieces of empirical information and new theoretical developments have caused old ideas to be overturned and new ideas to be evaluated.

We begin in this section by revisiting four calamitous macroeconomic events that occurred in the twentieth and twenty-first centuries, each of which caused a fundamental rethinking about the nature of the forces acting on the macroeconomy and the role of the government in shaping those forces.

The first was the Great Depression. It is perhaps difficult for us to comprehend fully the magnitude of the economic disaster that overtook the world during the 1930s. At a time when government support for the unemployed and disadvantaged was minimal or often non-existent, the Depression created enormous hardship for an unprecedented proportion of the world's population.

Economists of the time were completely unequipped to deal with a disaster on the scale of the Depression. At the beginning of the 1930s the orthodox view of short-term economic fluctuations was that the price system, with its ability to secure efficiency in the use of resources, would ensure that any deviations of output from potential were short lived and probably not of any great consequence. The Depression knocked that complacency out of the water. In the face of such a momentous collapse in the scale of economic activity, not only in terms of the depth of the recession but also its longevity, it became clear that price adjustments alone could not quickly restore the economy to its long-run potential level of output. But to understand why this was the case, an explanation for the economy's tendency to undergo periodic bouts of contraction and expansion was required.

John Maynard Keynes provided such an explanation. As we saw in Chapter 7, Keynes's explanation for short-run economic fluctuations centred on the role of aggregate demand. Should aggregate demand be relatively high, the economy would perform well, with output close to and perhaps even exceeding its potential level, and with consequent high employment and low unemployment. Should, however, aggregate demand fall—this could be caused by a variety of factors, including pessimistic expectations about future prosperity—output would fall below its potential: employment would be low and unemployment high. The government, through skilful manipulation of either its own spending or tax collections (fiscal policy), or the central bank through its influence over interest rates (monetary policy), could ensure that aggregate demand was stabilised at a level that would keep the economy close to or at its potential level of output.

The second great macroeconomic event of the twentieth century was the Great Inflation of the 1970s and 1980s. As discussed in Chapter 11, the inflation that stemmed from the oil price shocks and policy errors of the 1970s proved to be particularly difficult to eradicate (an example of inflation inertia). The main problem faced by policymakers at the time was that the inflation was accompanied by high unemployment—under the prevailing Keynesian orthodoxy these two macroeconomic problems would not ordinarily coexist. Governments felt constrained about how to deal with simultaneously occurring inflation and unemployment. The traditional remedy for high inflation—tighter monetary and fiscal policies—was not really an option, as it would have made a poor unemployment outcome even worse. Likewise, the usual technique for lowering the rate of unemployment—expansionary fiscal and monetary policies—carried with it the danger that these policies would worsen inflation. It very much appeared that governments the world over had lost control of their respective economies.

This, of course, was an exaggeration. What the Great Inflation demonstrated was the incredible resilience of inflation once it becomes entrenched, a resilience caused, for example, by people incorporating expectations of future inflation into their daily life. The Great Inflation was eventually defeated, but it came, in Australia's case, at the cost of the severest recession since the 1930s. In the wake of this came new knowledge about how to avoid a repeat of the Great Inflation. The answer is to ensure that monetary policy is *credible,* that is, to put in place institutional structures that mean economic agents would have no choice but to lower their expectations of inflation if, in fact, lower inflation was the central bank's objective. This led to a change in how central banks were organised. First, central banks were given more independence from the government. Second, they adopted publicly stated inflation targets. The effect of these changes has been to lock in low inflationary expectations and, as a result, the past 25 years have seen no new breakout of inflation in countries such as Australia.

The Great Depression and the Great Inflation taught us much about how to manage the macroeconomy. The third calamitous economic event of the twentieth century has also taught us much but is perhaps the most difficult economic issue of them all for policymakers to address. This is the disparity in growth outcomes across countries. We explained the reasons countries may have different economic growth rates in Chapters 13 to 15. Countries grow at different rates for any number of reasons, ranging from differences in propensities to save (and hence to invest) to factors that influence total factor productivity such as human capital acquisition and socio-political factors.

Understanding why growth performances might differ, although not always easy, is something that economists are now reasonably good at. Knowing how to improve the growth performance of those countries that are lagging is a far greater challenge. It is very difficult, for example, to tell the citizens of a country who are existing on subsistence income levels that saving must be increased so that the country can move to a higher steady state in the long run. Is this a realistic policy? For this reason, many of the world's poorest countries are keen to join the globalised world economy, to give them access to international capital flows and to provide them with markets for their produce.

The final macroeconomic event that has shaped our views on how to manage the economy is the Global Financial Crisis, the origins of which we discussed in Chapters 6 and 7. Debate about the policy responses that were implemented to deal with the crisis, essentially very aggressive expansionary monetary and fiscal policies, is likely to continue for some years to come. The massive fiscal expansions that many countries introduced to manage the crisis have come in for criticism, mainly because of the associated rises in government debt. However, what is clear from the Global Financial Crisis is that following a period in which Keynesian policies had fallen out of favour, policies to reverse dramatic falls in aggregate demand to prevent economic contractions are once again part of policymakers' arsenal.

▹▹ RECAP

Economic history has taught macroeconomists important lessons. Specifically, the Great Depression made it clear that a collapse in aggregate demand could have a devastating effect on the economy. The Great Inflation made the achievement of credibility in anti-inflation policy a priority. Different countries' growth experiences showed that a variety of complex factors were important for long-run economic performance. The recent Global Financial Crisis has shown that demand management policies may still be needed.

19.2 SCHOOLS OF THOUGHT IN MACROECONOMICS

LO 19.5–19.9

One of the impressions a casual observer of macroeconomics might get is that it is a discipline that is beset by differences: the authors of this book have heard the adage 'If you laid a group of economists end to end, they wouldn't reach a conclusion' more times than we care to remember. While it is true that there are different schools of thought within macroeconomics, the differences between them are perhaps not as extreme as might first appear. Nor are these differences as apparent as they once were. There is far more consensus in macroeconomics today than perhaps there has ever been. This does not mean that there is no longer rigorous debate in macroeconomics—as we can attest, there most certainly is. But what has happened is a narrowing of the gap between different groups of macroeconomists: we can and do disagree, but on many issues there is surprising amount of agreement.

In this, our penultimate section, we take you on a brief guided tour of some of the main schools of macroeconomic thought. There are some economists who very clearly pledge allegiance to one or other of these schools. Increasingly, however, there is a far more eclectic approach to macroeconomics, where approaches are adopted that are best suited for the problem at hand regardless of the school of thought from which the approach originated.

19.2.1 KEYNESIAN ECONOMICS

Milton Friedman, a staunch opponent of Keynesian economics for all his professional life, once famously proclaimed ‘we are all Keynesians now’. He was not conceding any intellectual ground when he made this statement. Instead Friedman was acknowledging that the framework within which the central questions in macroeconomics are analysed was given shape by Keynes and by the insights he reached in his book *The General Theory* (1936). One need not be a fully-fledged Keynesian to make use of aspects of the analytical framework that stemmed from Keynes’s ground-breaking work.

We will meet some of the alternatives that have been put forward to Keynesian economics shortly. First, however, we will sketch some of the key features that would enable one to identify an individual as being a Keynesian economist.

First and foremost, a Keynesian economist believes that it is the demand side of the economy that holds the key to understanding business cycle fluctuations. As we saw in Chapter 7, a fall in aggregate demand can give rise to an aggregate level of output that is below the economy’s potential level of output. This would be a contraction, a period of low output and high unemployment. A Keynesian economist would see this as a self-perpetuating situation: the low output associated with a recession translates into low income—this pulls consumption down, reinforcing the lack of aggregate demand in the economy that was the root cause of the contraction.

There is another sense in which Keynesian economists believe that contractions, and especially recessions, are self-perpetuating: this relates to the concept of **coordination failure.** Think of a collection of firms, each of which is considering a new investment project (perhaps the installation of a new production line). The problem each firm faces is that before committing funds to the new investment project they have to feel confident that the project will yield profits in the future. However, it takes time for the new output produced by the investment to be delivered to the market, so it is the *expectation* of likely profits in the future that must guide firms' current investment plans. A buoyant economy—one where the level of aggregate demand is strong and firms feel confident that things will remain that way—is the most likely scenario in which firms would feel confident about going ahead with the investment. Suppose, however, the economy is in the grip of a recession. Historical experience, and indeed the aggregate demand–aggregate supply model of Chapter 11, tells us that eventually the recession will end. If the project is not too farfetched, firms' investments will most likely turn a profit eventually. The question then is, should firms invest? Think of the risk for the firm that invests first. Without other firms also investing there is little likelihood of the economy's aggregate demand being sufficiently strong to guarantee that the investment project will be profitable (recall that investment is an important component of aggregate demand). So why would any firm go first—the risks are probably too high. And this is what Keynesians mean by a coordination failure. Without a coordinated plan, whereby all firms agree to increase their investment at the same time, no firm is likely to go it alone and be the first to invest, because the extra investment made by one firm is unlikely to provide sufficient extra aggregate demand for that investment to be profitable. The result is that the economy becomes trapped in a low investment–low output equilibrium, where no firm feels sufficiently confident about the future to proceed with the investment projects that the economy needs to push it out of recession.

The fact that recessions can be self-perpetuating gives rise to another distinguishing characteristic of Keynesian economists, a belief that the government should ensure that the economy's level of aggregate demand is high enough so that contractions can be avoided: the government has at its disposal fiscal and monetary policies that can be used to affect the level of aggregate demand. Keynesians believe that the government should actively use these policies to maintain a high level of aggregate demand so that the economy remains at its potential level of output. The government, by ensuring that aggregate demand remains high, can overcome firms' coordination problems.

Keynes's ideas very quickly became the orthodoxy in macroeconomics, especially throughout the 1950s and 1960s. However, the body of knowledge that is known as Keynesian economics did not remain static in these years. Countless macroeconomists working within the Keynesian tradition added to Keynes's original ideas with new theories concerning consumption, investment and financial markets. The result was a blending of Keynes's original insights about the origins of the business cycle with more sophisticated models of households' consumption behaviour, firms' investment behaviour and the role played by financial assets, including money, in the economy.

19.2.2 MONETARISM

The recognition that macroeconomic models needed to have more sophisticated treatments of underlying economic behaviour produced in the 1960s and early 1970s the first significant challenge to the Keynesian orthodoxy. This came from the monetarist school and its intellectual leader, Milton Friedman. Monetarists were highly sceptical about many of the key propositions of Keynesian macroeconomics. First and foremost, they disagreed with the idea that the economy might naturally find itself trapped in a low output–high unemployment equilibrium, and that the government's role was to create an environment where this situation could not happen. Monetarists, in fact, turned the argument on its head: if it was the case that the economy was in a deep recession, the reasons were often due to poor government policy. For example, monetarists saw the Great Depression as being caused by misguided monetary policy, most notably allowing the money supply to contract at a time when expansionary monetary policy was needed to offset the contractionary effects of a series of spectacular bank collapses. Added to this was an innate belief in the ability of the price system to restore potential output. What was crucial, according to the monetarists, was that the government avoid policies that led to high inflation, since they believed that inflation acted to impede the price system's ability to allocate resources efficiently.

The ideas espoused by the monetarists might not have carried weight very much if it had not been for the calamitous economic events of the mid-1970s, where an oil price shock simultaneously produced both high inflation and high unemployment. Keynesian remedies were not appropriate in this environment since attempts to boost aggregate demand would worsen an already high rate of inflation. Those governments that went ahead and tried Keynesian remedies quickly found, as the monetarists had warned, that they were left with very little improvement in unemployment, but a far worse inflation problem than had previously been the case. Keynesian policies were being discredited and monetarist ideas quickly held sway.

19.2.3 NEW CLASSICAL MACROECONOMICS

Monetarism evolved in the late 1970s and 1980s into what became known as *new classical macroeconomics*. The hallmark of this school was a complete rejection of Keynesian ideas, both in terms of their practicality and on theoretical grounds. The new classical macroeconomists, of which the University of Chicago's Robert Lucas Jr and the University of Minnesota's Thomas Sargent were the most famous, argued quite vehemently that Keynesian models were fatally flawed through their lack of attention to the processes by which people's expectations are formed. The new classicists argued that all people in the economy, not just economists, understood that in the long run there would be a return to potential output in the aftermath of a shift of the aggregate demand curve. Agents in the economy were said to have **rational expectations**, which involves a complete understanding of the structure of the macroeconomy. (Rational expectations is a theory that has gone beyond macroeconomics. For example, it is regularly used by analysts of financial markets. There, rational expectations mean that financial prices such as share prices embody all relevant pieces of information that bear on the current and future profitability of firms.) An implication of this is that firms and households would organise their affairs, such as negotiating wage contracts, on the assumption that the economy would be at its potential level of output (the **natural level of output** was the term that new classical macroeconomists favoured). New classical models predicted that under these circumstances—that is, where firms and households assume that the economy is at its potential—any systematic shift in the aggregate demand curve would have no effect on output but would merely change the inflation rate. (However, a completely unexpected shift in the aggregate demand curve might have a short-run effect on output because it would catch people by surprise. Under rational expectations, unexpected shifts in aggregate demand would have to be completely *random* events, otherwise people could have predicted what would occur and already have factored in the effects of the changed demand conditions.) For example, a fall in aggregate demand would lead to firms and workers negotiating wage contracts on the understanding that inflation would now be lower, therefore real wages could be maintained at their existing level by ensuring that the rate of nominal wage increase now matched the lower rate of inflation. As the real wage would be unchanged, there would be no change in employment and therefore no change in the amount of output that would be produced. This, of course, was a serious attack on the twin pillars of Keynesianism, namely that aggregate demand shifts are responsible for the business cycle and that the government could affect aggregate output by using policy to shift the aggregate demand curve.

The new classical assumption of rational expectations has become an accepted part of economists' analytical tool kit. In academic work one is now nearly always called upon to justify an expectations assumption that does not conform to rational expectations. But this does not mean that the rest of new classical macroeconomics continues to exert the influence on economists that it did in the 1970s and 1980s. In fact, the past 30 years or so has seen a resurgence in Keynesian ideas, though the models often look very different from what Keynes presented in *The General Theory*. Economists working on this latest incarnation of Keynesian models are known as *new Keynesians*.

19.2.4 NEW KEYNESIAN MACROECONOMICS

New Keynesians share with their new classical colleagues a belief in the need to model individual economic behaviour carefully. But where the two schools differ is that new Keynesians believe the structural framework within which people operate is not as perfect at allocating resources efficiently as the new classical macroeconomists believe. Instead, there are impediments to the efficient allocation of resources, which mean that aggregate demand shifts can cause output to deviate from potential. The list of these impediments is long: sometimes it seems as if every economist working in the new Keynesian tradition has their own pet reason as to why prices do not adjust quickly to move the economy back to its potential level of output. Some new Keynesians emphasise imperfections in financial markets and the information asymmetries that cause banks to ration credit based on arbitrary rules of thumb. Others look to labour market institutions such as the existence of trade unions or the irregularity with which labour contracts are negotiated. The resource cost of changing prices (menu costs—see Chapter 7) is something that other new Keynesians also emphasise. One feature that almost all new Keynesian models share, however, is that firms are imperfectly competitive, that is, they have some freedom to set the prices for their own products. Ordinarily this means that these firms can set prices above costs and therefore generate profits. When demand falls, for example in an economic contraction, imperfectly competitive firms may not lower prices; instead they may attempt to maintain profits at their pre-contraction level by cutting costs. And one way to do this is by lowering production.

Once one accepts that the price system is impeded in its ability to restore potential output following a demand or supply disturbance, there emerges a role for government policy to try to improve macroeconomic performance. Although new Keynesian models emphasise features of the economy that were not thought about by Keynes and Keynesian economists, the idea that the government has a role in managing economic affairs is indeed very Keynesian in nature.

19.2.5 GROWTH THEORY AND THE REAL BUSINESS CYCLE SCHOOL

Throughout this discussion of macroeconomic schools of thought you will note that we have not yet mentioned growth theory. There is an important reason for this: there is far more agreement about the fundamental factors that lead to long-run growth than there is about reasons for the short-run business cycle. Although growth theorists disagree on the specifics of various models—for example on factors that motivate long-run savings—it is probably fair to say that there is a reasonable degree of consensus among economists about factors that promote economic growth.

However, one area of controversy has been an attempt by economists who belong to the *real business cycle* school to argue that the distinction between growth theory and short-run macroeconomics is artificial. These economists argue that technological shocks—that is, events that act to change the economy's total factor productivity—can produce short-run effects in the economy that look very much like the business cycle. For example, suppose for some reason there is a fall in total factor productivity. This will have implications for the labour market. As we saw in Chapter 5, the demand for labour is very closely related to the marginal productivity of labour. A fall in the economy's total factor productivity would result in a lowering of workers' marginal productivity. As a result, the demand for labour curve would shift to the left, lowering real wages and leading to a fall in the equilibrium level of employment. At the lower real wage, fewer people would be willing to supply labour—and so the fall in employment is in fact the economy's optimal response to the fall in total factor productivity. But, with a lower level of employment, there will be less output produced. And so, what looks like a recession is in fact simply an efficient response, in terms of the allocation of labour, to the productivity decline. On the other hand, should total factor productivity increase, the result will be the exact opposite, with higher real wages, higher employment and higher output—the economy would look as if it was amid a boom.

Real business cycle theory has focused economists' attention on the effect that productivity changes can have on not just the economy's long-run behaviour but also its behaviour in the short run. But few economists believe that *only* productivity changes cause business cycle fluctuations in the economy. In any case, the predictions of the size of recessions and expansions that emerge from real business cycle models are usually far below what we see in the real world. It is hard, for example, to think of a negative productivity shock large enough to have caused the Great Depression. For this reason, economists by and large still believe that demand-side forces are an important part of the explanation of fluctuations of the business cycle—productivity changes may be an influence but are not necessarily the whole story.

▹▹ RECAP

Keynesian economists look to the aggregate demand side of the economy to explain business cycle fluctuations. They believe that recessions are self-perpetuating, in the sense that the economy, once in recession, will find it difficult to get out of recession. Keynesians believe that government management of the macroeconomy is required to maintain a high level of aggregate demand so that the economy can avoid recessions.

Monetarists reject the Keynesian view that the economy tends to move into recession. Instead, they believe that recessions are the product of poor macroeconomic policies. Monetarists view inflation as being a significant threat to the ability of the market to allocate resources efficiently.

New classical macroeconomists argue that people are well informed about the consequences of shifts in the aggregate demand curve and will adjust their behaviour in ways that ensure that output is unaffected. A key component of new classical macroeconomics is rational expectations, the assumption that economic agents are well informed about the structure of the economy.

New Keynesian macroeconomists believe that there are a range of impediments that prevent the price system from returning the economy quickly to potential output following a shift in the aggregate demand curve. They advocate government management of the economy to correct for these impediments.

Economists who adhere to the real business cycle school believe that changes to total factor productivity can give rise to fluctuations in real output that look very much like a business cycle. They argue that the cause of business cycle fluctuations stems from the supply side of the economy and actually represents an efficient response to productivity changes.

19.3 SOME CONCLUDING THOUGHTS

We now reach the end of our book but by no means the end of macroeconomics. We have written this book on the assumption that this is your first course in macroeconomics, and we have tried to cover as much ground as is possible in a book of this nature. But the reality is that we have only scratched the surface of our discipline.

Macroeconomics is constantly evolving: new developments in the economy and new theories to explain what we see around us mean that macroeconomics is forever changing. And not just the analytical tools we use change but also the questions for which we seek answers. For example, macroeconomists are now researching topics such as the effect of the IT revolution on the economy, the implications of globalisation and the effects of an ageing population. The causes and consequences of the Global Financial Crisis are likely to be keenly debated by macroeconomists for years to come.

The beauty of macroeconomics is that it provides a systematic framework within which these important social trends can be analysed. We hope that this book has given you some insight into the valuable contribution that macroeconomics can make to our understanding of the modern world. We also hope that this book is just the first step you take in your acquisition of macroeconomic knowledge. There is much to be learnt. We wish you every success in your endeavours.

SUMMARY

- Macroeconomics has been informed by historical events.
- The first of these was the Great Depression. The work of John Maynard Keynes was a response to the Depression: his view was that events such as the Depression were the result of deficient aggregate demand and that this could be overcome through government management of the macroeconomy.
- The Great Inflation of the 1970s and 1980s led to a loss of faith in Keynesian analysis and Keynesian policy recommendations. Inflation became an entrenched feature of many economies as economic agents maintained expectations of high inflation. Monetary policy eventually eliminated the inflation but only when inflationary expectations were lowered. This led to reform of central banking to ensure that anti-inflation policies would have credibility.
- Different growth outcomes for different countries have focused attention on the fundamental structural features of economies that affect the rates of economic growth.
- Over time there have been a number of different schools of thought in macroeconomics although at the moment there is more consensus among macroeconomists than has previously been the case. The schools of thought differ in the analysis of the origin of business cycles and of the role of the government in macroeconomic management.

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- Keynesians and new Keynesians believe that the economy can be away from potential output for prolonged periods of time and that this provides a rationale for government management of the economy.
- Monetarists and new classical macroeconomists believe that the price system will quickly return the economy to potential output following a shift in the aggregate demand curve. New classical economists believe that this will occur almost instantaneously because economic agents have rational expectations and understand the implications of aggregate demand shifts.
- Real business cycle theorists look to the economy's supply side as the source of business cycle fluctuations and, in particular, to changes in the level of total factor productivity.

KEY TERMS

REVIEW QUESTIONS

1. Explain how a collapse in aggregate demand could have led to the Great Depression. LO 19.1 **MEDIUM**
2. Using the aggregate demand–aggregate supply framework, review how an oil price shock could lead to simultaneously high inflation and high unemployment. LO 19.2 **MEDIUM**
3. What are the distinguishing features of a Keynesian economist? LO 19.5 **EASY**
4. What are the main differences between Keynesian and monetarist economists? LO 19.5 **EASY**
5. What assumption is made by new classical economists about how economic agents form their expectations? Why is this significant? LO 19.7 **MEDIUM**
6. How do new classical and new Keynesian economists differ? LO 19.8 **EASY**
7. Explain how productivity shocks can lead to fluctuations in aggregate output. LO 19.9 **MEDIUM**

PROBLEMS

1. What are the current rates of inflation, unemployment and GDP growth? LO 19.1 –9 **EASY**
2. Considering the information you found in Problem 1, prepare two briefing papers for the government on macroeconomic policy options for your economy; one should be written assuming you are a Keynesian or new Keynesian macroeconomist, the other on the assumption that you are a monetarist or new classical macroeconomist. LO 19.1 –9 **HARD**
3. Make a list of the differences and similarities in the two briefing papers you have prepared in Problem 2. LO 19.1 –9 **MEDIUM**
4. Now suppose that you are the Treasurer, charged with the responsibility for implementing macroeconomic policy. How would you choose between the two briefing papers? LO 19.1 –9 **HARD**

REFERENCES

Gregory TE, Von Hayek FA, Plant A and Robbins L 1932, 'Public works from rates', Letter, *The Times,* 19 October, available at https://thinkmarkets.files.wordpress.com/2010/06/keynes-hayek-1932-cambridgelse.pdf.

Keynes JM 1936, *The General Theory of Employment, Interest and Money,* London, Macmillan.

MacGregor DH, Pigou AC, Keynes JM, Layton W, Salter A and Stamp JC 1932, 'A comment from economists', Letter, *The Times,* 17 October, available at https://thinkmarkets.files.wordpress.com/2010/06/keynes-hayek-1932-cambridgelse.pdf.

Rizzo M 2010, 'Keynes vs. Hayek: The great debate continues', *The Christian Science Monitor,* 1 July, https://www.csmonitor.com/Business/ThinkMarkets/2010/0701/Keynes-vs.-Hayek-The-great-debate-continues.

Wapshott N 2011, *Keynes/Hayek: The Clash that Defined Modern Economics,* WW Norton & Company.

ANSWERS TO CONCEPT CHECKS

CHAPTER 1

1.1 Your answer will depend upon the current unemployment rate available at the OECD website.

1.2 Your answer will depend upon the current budget data.

1.3 **a)** Positive. This is a prediction of the effect of a policy, not a value judgement on whether the policy should be used.

b) Normative. Words like *should* and *inappropriately* express value judgements about the policy.

c) Normative. The statement is about the desirability of certain types of policies, not their likely effects.

d) Normative. The statement is about desirability of a policy.

e) Positive. The statement is a prediction of the likely effects of a policy, not a recommendation on whether the policy should be used.

1.4 **a)** Macroeconomists. Government spending and unemployment are aggregate concepts pertaining to the national economy.

b) Microeconomists. Google, though large, is an individual firm.

c) Microeconomists. The issue relates to the supply and demand for a specific service, education.

d) Macroeconomists. Inflation is an aggregate, economy-wide concept.

e) Macroeconomists. Average saving is an aggregate concept.

f) Microeconomists. The focus is on a relatively narrow set of markets and products rather than on the economy as a whole.

CHAPTER 2

2.1 In the text, GDP was calculated to be $64.00. If, in addition, Orchardia produces five oranges at $0.30 each, GDP is increased by $1.50 to $65.50.

2.2 The value added of the wholesale distributor together with the ultimate producers of the cards is $500. Amy’s value added—her revenue less her payments to other firms—is $200. Since the cards were produced and purchased by Amy during the year 2017 (we assume), the $500 counts toward year 2017 GDP. The $200 in value added originating in Amy's card shop counts in year 2018 GDP since Amy actually sold the cards in that year.

2.3 The sale of stock represents a transfer of ownership of part of the assets of Benson Buggywhip, not the production of new goods or services. Hence, the stock sale itself does not contribute to GDP. However, the broker's commission of $100 (2% of the stock sale proceeds) represents payment for a current service and is counted in GDP.

2.4 As in Example 2.7, the market value of domestic production is 1 000 000 autos × $15 000 per auto, or $15 billion.

Also as in Example 2.7, consumption is $10.5 billion and government purchases are $0.75 billion. However, because 25 000 of the autos that are purchased are imported rather than domestic, the domestic producers have unsold inventories at the end of the year of 50 000 (rather than 25 000 as in Example 2.7). Thus, inventory investment is 50 000 autos × $15 000, or $0.75 billion, and total investment (autos purchased by businesses plus inventory investment) is $3.75 billion. Because exports and imports are equal (both are 25 000 autos), net exports (equal to exports minus imports) are zero. Notice that because we subtract imports to get net exports, it is unnecessary also to subtract imports from consumption. Consumption is defined as total purchases by households, not just purchases of domestically produced goods.

Total expenditure is $C + I + G + NX$ = \$10.5 billion + \$3.75 billion + \$0.75 billion + 0 = \$15 billion, the same as the market value of production.

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2.5 Real GDP in the year 2018 equals the quantities of pizzas and pasta produced in the year 2018, valued at the market prices that prevailed in the base year 2013. So real GDP in 2018 = (30 pizzas × \$10/pizza) + (30 pasta × \$5/calzone) = \$450.

Real GDP in 2013 equals the quantities of pizzas and pasta produced in 2013, valued at 2013 prices, which is \$175. Notice that because 2013 is the base year, real GDP and nominal GDP are the same for that year.

The real GDP in the year 2018 is \$450 / \$175, or about 2.6 times what it was in 2013. Hence the expansion of real GDP lies between the threefold increase in pizza production and the doubling in pasta production that occurred between 2013 and 2018.

CHAPTER 3

3.1 The weighted average rate of price increase, using the Laspeyres methodology, is now −7.56%. The value of the CPI is therefore 92.440. Note this is an example of deflation where the average level of prices has fallen (even though the prices of two goods, movie tickets and hamburgers, has increased). This is because electricity, the good with the lower price, is such a large component of the household's budget in the base year.

3.2 The percentage changes in the CPI in each year from the previous year are as follows:

1930	−4.4% = (0.087 − 0.091)/0.091
1931	−10.3%
1932	−5.1%

Negative inflation is called deflation. The experience of the 1930s, when prices were falling, contrasts sharply with the 1970s, during which prices rose rapidly.

3.3 By subtracting the rate of inflation from the nominal interest rate, it is apparent that deflation increased Japan's real interest rate to 2.8% (up from 1.3% in 2006).

CHAPTER 4

4.1 If Mary's student loan were for \$6500 instead of \$3000, her liabilities would be \$6750 (the student loan plus the credit card balance) instead of \$3250. The value of her assets, \$6280, is unchanged. In this case, Mary's wealth is negative, since assets of \$6280 less liabilities of \$6750 equals −\$470. Negative wealth or net worth means one owes more than one owns.

4.2 If water is being drained from the tub, the flow is negative, equal to 23 litres per minute. There are 37 litres in the tub at 7.16 pm and 34 litres at 7.17 pm. The rate of change of the stock is 23 litres per minute, which is the same as the flow.

4.3 **a)** Mary has incurred a new liability of \$50. So her net saving for the week is \$30. Since her assets have increased by \$80 but her liabilities (her credit card balance) have increased by \$50, her net wealth has increased by \$30.

b) Mary reduced her assets by \$300 and reduces her liabilities by \$300 by reducing her credit card balance to zero. Thus, there is no change in her wealth. There is also no change in her saving (note that Mary's income and spending on current needs have not changed).

c) The value of Mary's assets increases by \$500. So her wealth also rises by \$400. Changes in the value of existing assets are not treated as part of saving, however, so her saving is unchanged.

d) The decline in the value of Mary's furniture is a capital loss of $300. Her assets and wealth fall by $300. Her saving is unchanged.

4.4 The Australian Government had expenditures greater than receipts, so it ran a deficit. The federal deficit equalled expenditures of $117.8 billion minus revenues of $100.7 billion, or $17.1 billion. Equivalently, the federal budget surplus was *minus* $17.1 billion.

4.5 The loss of value of $200 over the year is another financial cost of owning the mower, which Patrick should take into account in making his decision. His total cost is now $240 in interest costs plus $200 in anticipated loss of the value of the mower (known as depreciation), or $440. This exceeds the value of the marginal product, $400, and so now Patrick should not buy the mower.

4.6 Household saving is part of national saving. A decline in household saving, and hence national saving, at any given interest rate, shifts the saving supply curve to the left. The results are as in Figure 4.15. The real interest rate rises and the equilibrium values of national saving and investment fall. Lower investment is the same as a lower rate of capital formation, which would be expected to slow economic growth.

CHAPTER 5

5.1 The value of the marginal product of the seventh worker is $39 000, and the value of the marginal product of the eighth worker is $33 000. So the seventh but not the eighth worker is profitable to hire at a wage of $35 000.

5.2 With the computer price at $5000, it is profitable to hire three workers at a wage of $100 000 since the third worker's value of marginal product ($105 000) exceeds $100 000 but the fourth worker's value of marginal product ($95 000) is less than $100 000. At a computer price of $3000, we can refer to Table 5.1 to find that not even the first worker has a value of marginal product as high as $100 000, so at that computer price BCC will hire no workers. In short, at a wage of $100 000, the increase in the computer price raises the demand for technicians from zero to three.

5.3 The seventh but not the eighth worker's value of marginal product exceeds $50 000 (Table 5.3), so it is profitable to hire seven workers if the going wage is $50 000. From Table 5.1, before the increase in productivity, the first five workers have values of marginal product greater than $50 000, so the demand for labour at a given wage of $50 000 is five workers. Thus the increase in productivity raises the quantity of labour demanded at a wage of $50

000 from five workers to seven workers.

5.4 Even though you are receiving no pay, the valuable experience you gain is likely to raise the pay you will be able to earn in the future, so it is an investment in human capital. You also find working in the radio station more enjoyable than working in a car wash, presumably. To decide which job to take, you should ask yourself, ‘Taking into account both the likely increase in my future earnings and my greater enjoyment from working in the radio station, would I be willing to pay $3000 to work in the radio station rather than earn $3000 working in the car wash?’ If the answer is yes, then you should work in the radio station; otherwise you should go to the car wash.

A decision to work in the radio station does not contradict the idea of an upward-sloping labour supply curve, if we are willing to think of the total compensation for that job as including not just cash wages but such factors as the value of the training that you receive. Your labour supply curve is still upward-sloping in the sense that the greater the value you place on the internship experience, the more likely you are to accept the job.

5.5 In this situation, the demand for labour would exceed the supply forthcoming at the wage. As a result, labour is a scarce factor and employers will offer higher wages to entice workers to offer their labour services. Given the labour supply curve is upward sloping, the higher wages on offer will lead to an increased labour supply (a movement up and along the labour supply curve) and a reduced demand for labour (a movement up and along the labour demand curve) until the equilibrium is reached.

5.6 Immigration to a country raises labour supply-indeed, the search for work is one of the most powerful factors drawing immigrants in the first place. An increase in labour supply will tend to lower the wages that employers have to pay, while raising overall employment. Because of its tendency to reduce real wages, labour unions generally oppose large-scale immigration, while employers support it.

5.7 Workers and employers are both concerned with the real wage in reaching their labour market decisions. A low rate of inflation means that the rate of nominal wage increase need only match the low rate of inflation to preserve the real value of the wage. Thus, in times of low inflation, a low rate of nominal wage increase is to be expected.

CHAPTER 6

6.1 Using the formula

$$100 \times \left(\frac{Y - Y*}{Y*}\right) = -\beta \times (U - U*),$$

the output gap is given by −1.8*(6.0 − 5.5) = 0.9%.

CHAPTER 7

7.1 If GDP is below its equilibrium, we know that is a situation in which planned aggregate expenditure is greater than output, which is equivalent to saying that planned investment is greater than saving. Firms in this economy will be experiencing an unplanned fall in inventories of previously unsold stock. This acts as a signal for firms to boost production, thereby increasing aggregate income, inducing an increase in consumption and saving. This continues until a new equilibrium is reached where planned aggregate expenditure equals output and saving and planned injections are also equal.

7.2 If the economy's actual GDP was larger than its equilibrium value, planned aggregate expenditure would be less than output and withdrawals would be greater than planned injections. Firms would experience an unplanned increase in their inventories of unsold goods. This acts as a signal to cut back production, inducing falls in consumption and withdrawals. This process continues until equilibrium is reached where planned aggregate expenditure and output are equal and withdrawals equals planned injections.

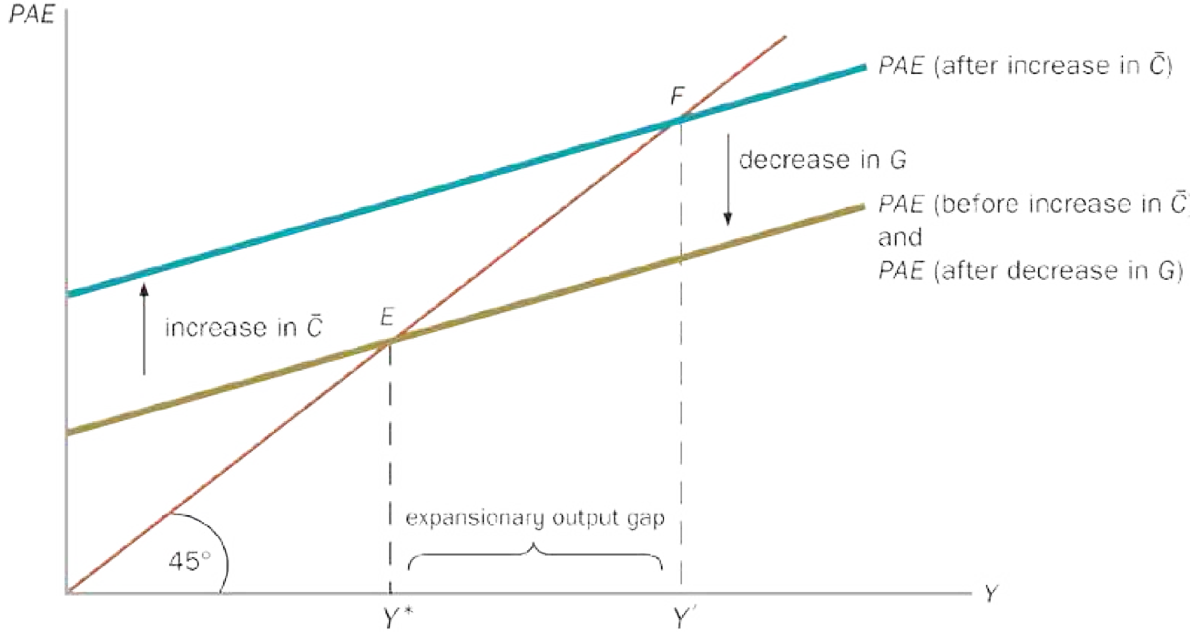
7.3 Originally, exogenous expenditure in this economy was 960, so an increase of 10 units causes it to rise to 970. Instead of the economy's planned spending being described by the equation $PAE = 960 + 0.8Y$, as initially, it is now given by $PAE = 970 + 0.8Y$. Since the intercept of the planned expenditure line (equal to exogenous expenditure) has increased from 960 to 970, the effect of the Increase in consumer spending will be to shift the expenditure line up in parallel fashion, by 10 units.

The new equilibrium will be the right of the original equilibrium point *E,* an expansionary gap in the economy.

Numerically, how large is the expansionary gap? At the new equilibrium you should be able to establish that Y = 4850. Relative to the original equilibrium (4800), this implies an expansionary output gap of 4 per cent.

CHAPTER 8

8.1 Consumers becoming more confident will lead to an increase in the exogenous component of consumption, $\overline{C}$ As consumption is a component of planned aggregate expenditure, the increase in $\overline{C}$ will shift the economy's PAE schedule upwards, leading to an increase in equilibrium income and the opening of an expansionary output gap. A reduction in government expenditure is required to offset the increase $\overline{C}$ remembering that government expenditure, *G,* is a component of the economy's overall exogenous spending. This will shift the PAE schedule downwards to its original position, restoring the economy's equilibrium GDP to Y^*.



PAE
PAE (after increase in C̄)
F
decrease in G
PAE (before increase in C̄)
and
PAE (after decrease in G)
increase in C̄
E
expansionary output gap
45°
Y
Y*
Y′

8.2 Consumption, in the basic Keynesian model, is related to disposable income. A cut in the tax rate means that a higher proportion of every dollar of income is retained by households and not paid to the government. As a result, the tax cut induces more consumption expenditure at each level of GDP, thereby increasing the economy's equilibrium GDP. Another way to think about this is the cut in the tax rate means there are less withdrawals from the circular flow of income, meaning that the equality of withdrawals and planned injections can be achieved at a higher (equilibrium) GDP.

8.3 Either a decrease in government expenditure or an increase in taxes (either through an increase in the exogenous component of taxes or through an increase in the tax rate) will be required to offset the expansionary policy. Note that a decrease in government expenditure or an increase in exogenous taxes will shift the PAE schedule downwards; an increase in the tax rate will steepen the PAE schedule. All of these fiscal policies will imply a smaller budget deficit.

Page 499

CHAPTER 9

9.1 Table 9.6 shows the balance sheet of banks after two rounds of lending and redeposits. At that point, deposits are 2 710 000 guilders and reserves are 1 000 000 guilders. Since banks have a desired reserve–deposit ratio of 10 per cent, they will keep 271 000 guilders (10% of deposits) as reserves and lend out the remaining 729 000 guilders. Loans to cheese producers are now 2 439 000 guilders. Eventually the 729 000 guilders lent to the cheese producers will be redeposited into the banks, giving the banks deposits of 3 439 000 guilders and reserves of 1 000 000 guilders. The balance sheet is as shown in the accompanying table:

ASSETS	
Currency (= reserves)	1 000 000 guilders
Loans to cheese producers	2 439 000 guilders
LIABILITIES	
Deposits	3 439 000 guilders

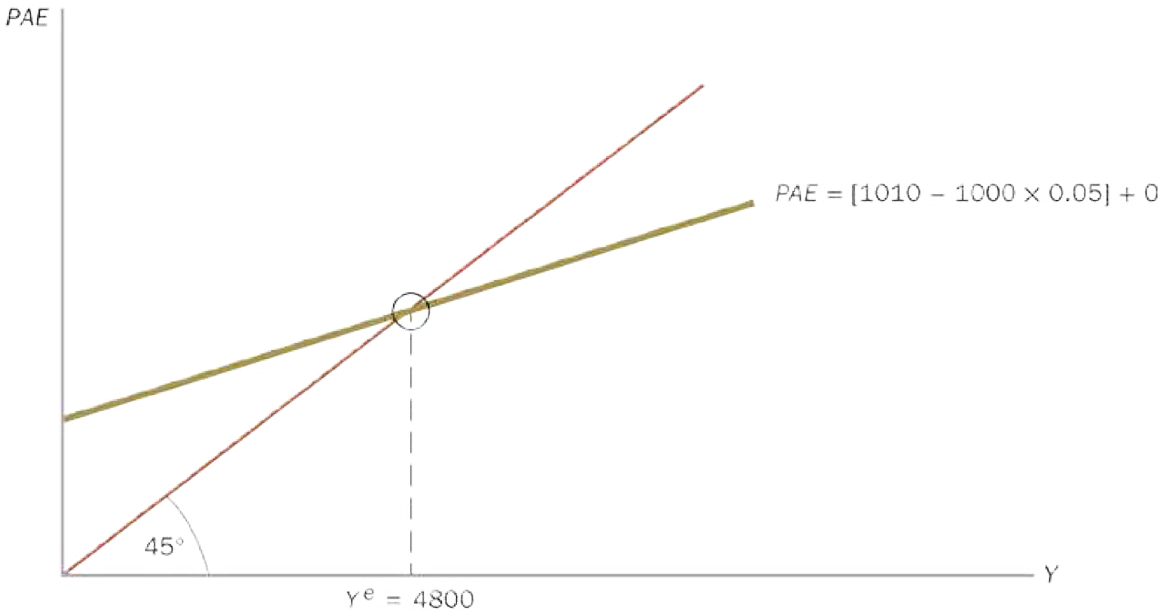
Notice that assets equal liabilities. The money supply equals deposits, or 3 439 000 guilders. Currency held in the banks as reserves does not count in the money supply.

9.2 Because the public holds no currency, the money supply equals bank deposits, which in turn equal bank reserves divided by the reserve–deposit ratio (Equation 9.1). If bank reserves are 1 000 000 and the reserve–deposit ratio is 0.05, then deposits equal 1 000 000/0.05 = 20 000 000 guilders, which is also the money supply. If bank reserves are 2 000 000 guilders and the reserve–deposit ratio is 0.10, then the money supply and deposits are again equal to 20 000 000 guilders, or 2 000 000/0.10.

9.3 If the central bank sells 50 shekels of government bonds in exchange for currency, the immediate effect is to reduce the amount of currency in the hands of the public by 50 shekels. To restore their currency holding to the desired level of 1000 shekels, the public will withdraw 50 shekels from commercial banks, reducing bank reserves from 200 shekels to 150 shekels. The desired reserve–deposit ratio is 0.2, so ultimately deposits must equal 150 shekels in reserves divided by 0.2, or 750 shekels. (Note: To contract deposits, the commercial banks will have to 'call in' loans, reducing their loans outstanding.) The money supply equals 1000 shekels in currency held by the public plus 750 shekels in deposits, or 1750 shekels. Thus, the open-market purchase has reduced the money supply from 2000 to 1750 shekels.

CHAPTER 10

10.1



10.2 We are given that the Reserve Bank sets the real interest rate at 3 per cent. Setting r = 0.03 in Equation 10.1 gives:

$$PAE = [1010 - 1000 \times (0.03)] + 0.8Y$$

Simplifying, we get:

$$PAE = 980 + 0.8Y$$

So, when the real interest rate is 3 per cent, Page 500

exogenous expenditure is 980 and induced expenditure is $0.8Y$.

Short-run equilibrium output is the level of output that equals planned aggregate spending. To find short-run equilibrium output use the equilibrium condition that $PAE = Y$. Therefore, in this example, we have:

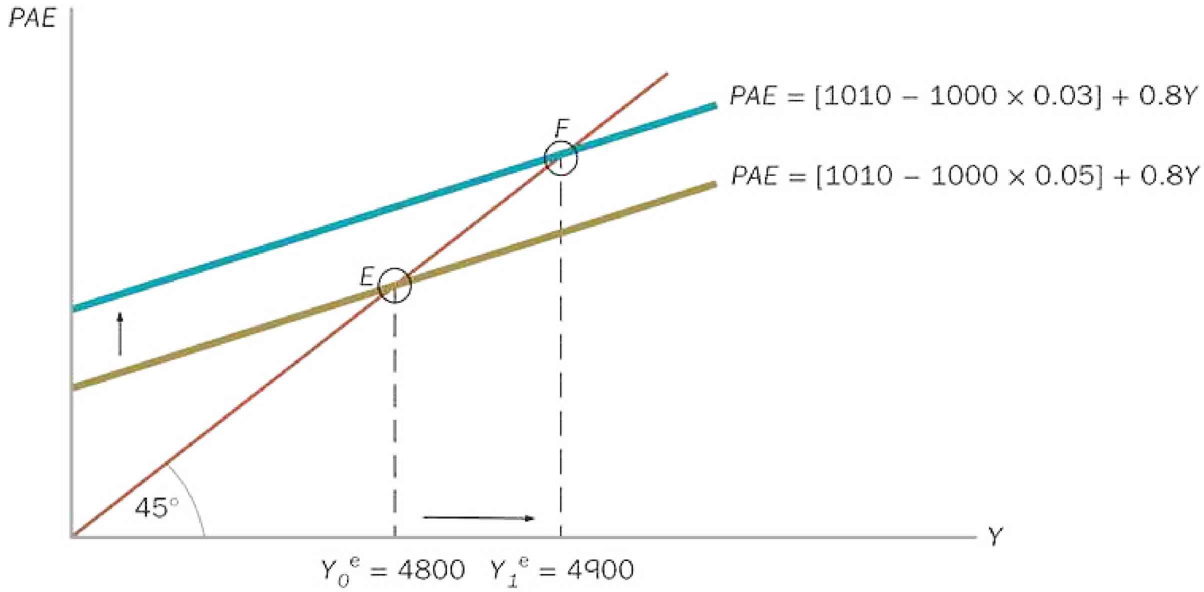
$$Y = 980 + 0.8Y$$

in equilibrium.

Subtracting $0.8Y$ from both sides implies that:

$$0.2Y = 980$$

and hence that equilibrium $Y = 980/0.2 = 4900$.



The cut in the interest rate from 5 per cent to 3 per cent leads to an increase in planned investment expenditure and hence to an upward shift in the economy's PAE schedule. At the original equilibrium GDP, firms will find their inventories depleted as they meet the increased demand by drawing down on their stocks of previously unsold goods. Firms respond by increasing production, leading to induced movements up and along the new PAE schedule until a new equilibrium is established at point F.

10.3 In Example 10.2 we showed that with the real interest rate at 5 per cent short-run equilibrium output for this economy is 4800. Potential output is

4850, so the output gap, $100 \times \left(\frac{Y - Y^*}{Y^*}\right)$, equals −1.03 per cent (which corresponds to 50 units). Because actual output is below potential, this economy faces a contractionary gap.

To fight the contraction the Reserve Bank should lower the real interest rate, raising aggregate expenditure until output reaches 4850, the potential level. That is, the Reserve Bank's objective is to increase output by 50. Because the multiplier equals 5, to increase output by 50 the Reserve Bank must increase exogenous expenditure by 50/5 = 10 units. By how much should the Reserve Bank reduce the real interest rate to increase exogenous expenditure by 10 units? Exogenous expenditure in this economy is [1010 − 1000*r*], as you can see from Equation 10.1, so that each percentage point reduction in *r* increases exogenous expenditure by 1000 × (0.01) = 10 units. To increase exogenous expenditure by 10, the Reserve Bank should lower the real interest rate by one percentage point, from 5 per cent to 4 per cent.

10.4 If π = 0.03 and the output gap is zero, we can plug these values into the Taylor rule to obtain

$$r = 0.01 - 0.5(0) + 0.5(0.03 - 0) = 0.025 = 2.5\%.$$

This means real interest rate implied by the Taylor rule when inflation is 3 per cent and the output gap is zero is 2.5 per cent. The nominal interest rate equals the real rate plus the inflation rate, or 2.5% + 3% = 5.5%.

If there is a recessionary gap of 1 per cent of potential output, the Taylor rule formula becomes

$$r = 0.01 - 0.5(0.01) + 0.5(0.03 - 0) = 0.02 = 2\%.$$

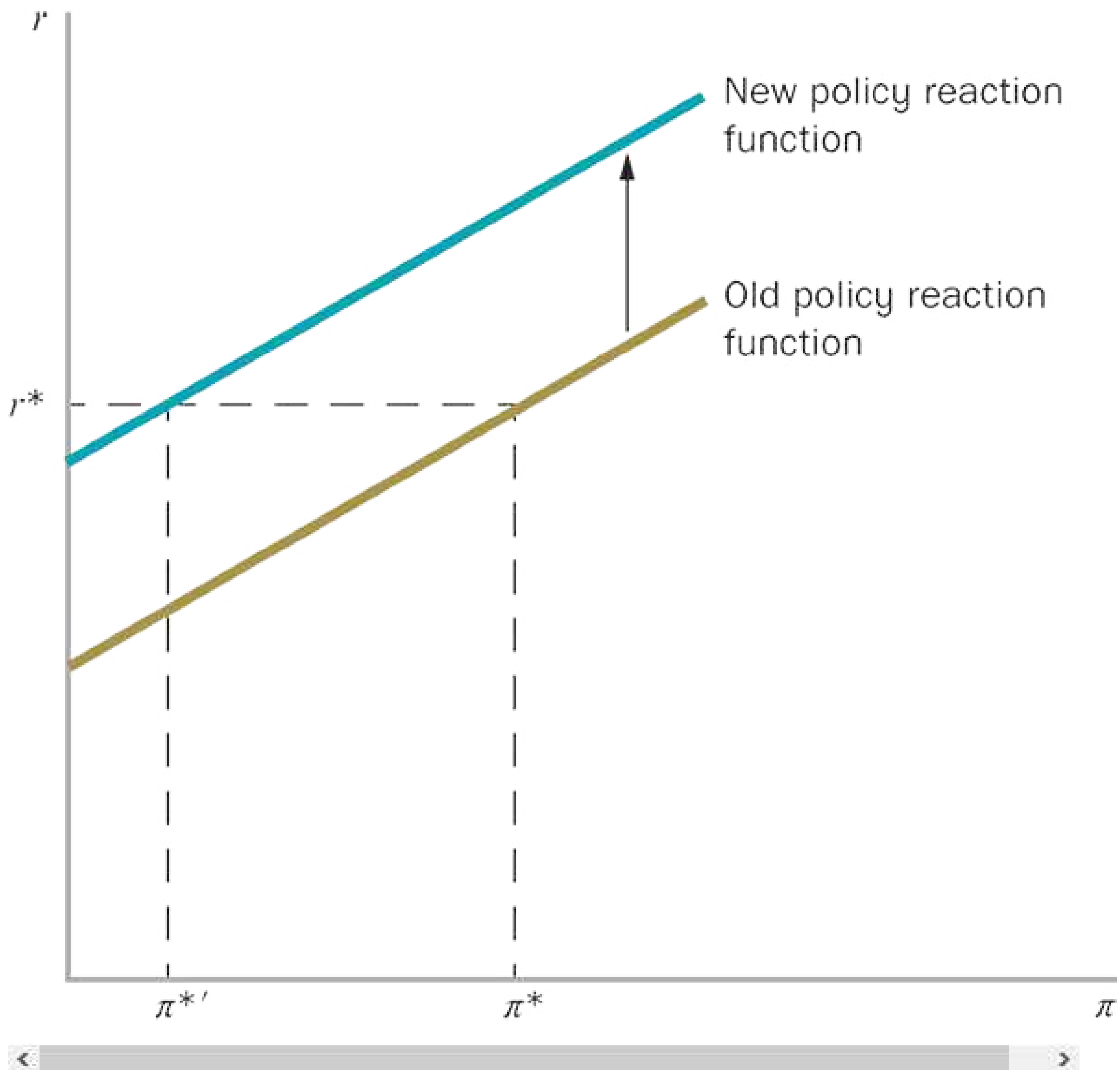
The nominal interest rate implied by the Taylor rule in this case is the 2 per cent real rate plus the 3 per cent inflation rate, or 5 per cent. Therefore, the Taylor rule has the Reserve Bank lowering the interest rate when the economy goes into recession, which is both sensible and realistic.

CHAPTER 11

11.1 a) At the current level of inflation, output and real interest rate, an exogenous reduction in business spending on new capital will reduce investment, causing a decline in overall aggregate expenditures and a reduction in short-run equilibrium output. Because output has fallen for a given level of inflation, the decrease in business spending leads to a leftward shift in the AD curve.

b) At the current level of inflation, output and real interest rate, a reduction in federal income taxes increases consumers' disposable income ($Y - T$), which leads to an exogenous increase in consumption at all income levels. The upward shift in the consumption function increases overall aggregate expenditures and leads to an increase in short-run equilibrium output. Because output has increased for a given level of inflation, the reduction in income taxes leads to a rightward shift in the AD curve.

11.2 In the long run, the real interest rate set by the Reserve Bank must be consistent with the real interest rate determined in the market for saving and investment. To find the Reserve Bank's long-run inflation target, take as given the real interest rate determined in the long run by the market for saving and investment and read off the corresponding inflation rate from the Reserve Bank's policy reaction function. As the accompanying figure illustrates, a tightening of Reserve Bank policy (an upward shift of the policy reaction function) implies that, for any given long-run real interest rate, the Reserve Bank's inflation target must be lower.



11.3 a) An upward shift in the Reserve Bank's policy reaction function means that the Reserve Bank is raising the real interest rate associated with a given level of inflation. An increase in the real interest rate causes both consumption and investment spending to fall, reducing overall aggregate expenditures and short-run equilibrium output. Thus, a shift in the Reserve Bank’s policy reaction function causes the output level to fall for a given level of inflation, resulting in a leftward shift in the AD curve.

b) The Reserve Bank’s policy reaction function illustrates that the Reserve Bank responds to rising inflation rates by raising the real interest rate (a move along the policy reaction function), which causes a reduction in overall aggregate expenditures and short-run equilibrium output. However, in this case the Reserve Bank’s response to higher inflation causes a move along a given AD curve.

Note that while the two actions appear to be similar, there is a key difference. In the first case the Reserve Bank is changing its policy rule for a given inflation rate, while in the second case the Reserve Bank is responding to a changing inflation rate. Changes in aggregate spending for a given inflation rate shift the AD curve, while changes in aggregate spending resulting from Reserve Bank policy responses to a rise or fall in inflation lead to moves along a given AD curve.

11.4 **a)** If inflation is expected to be 2 per cent next year and workers are expecting a 2 per cent increase in their real wages, then they will expect, and ask for, a 4 per cent increase in their nominal wages.

b) If inflation is expected to be 4 per cent next year, rather than 2 per cent, workers will expect, and ask for, a 6 per cent increase in their nominal wages.

c) If wage costs rise, firms will need to increase the prices of their goods and services to cover their increased costs, leading to an increase in inflation. In part b, when expected inflation was 4 per cent, firms will be faced with larger increases in nominal wages than in part a, when expected inflation was only 2 per cent. Thus, we can expect firms to raise prices by more when expected inflation is 4 per cent than when expected inflation is 2 per cent. From this example, we can conclude that increased inflationary expectations lead to higher inflation.

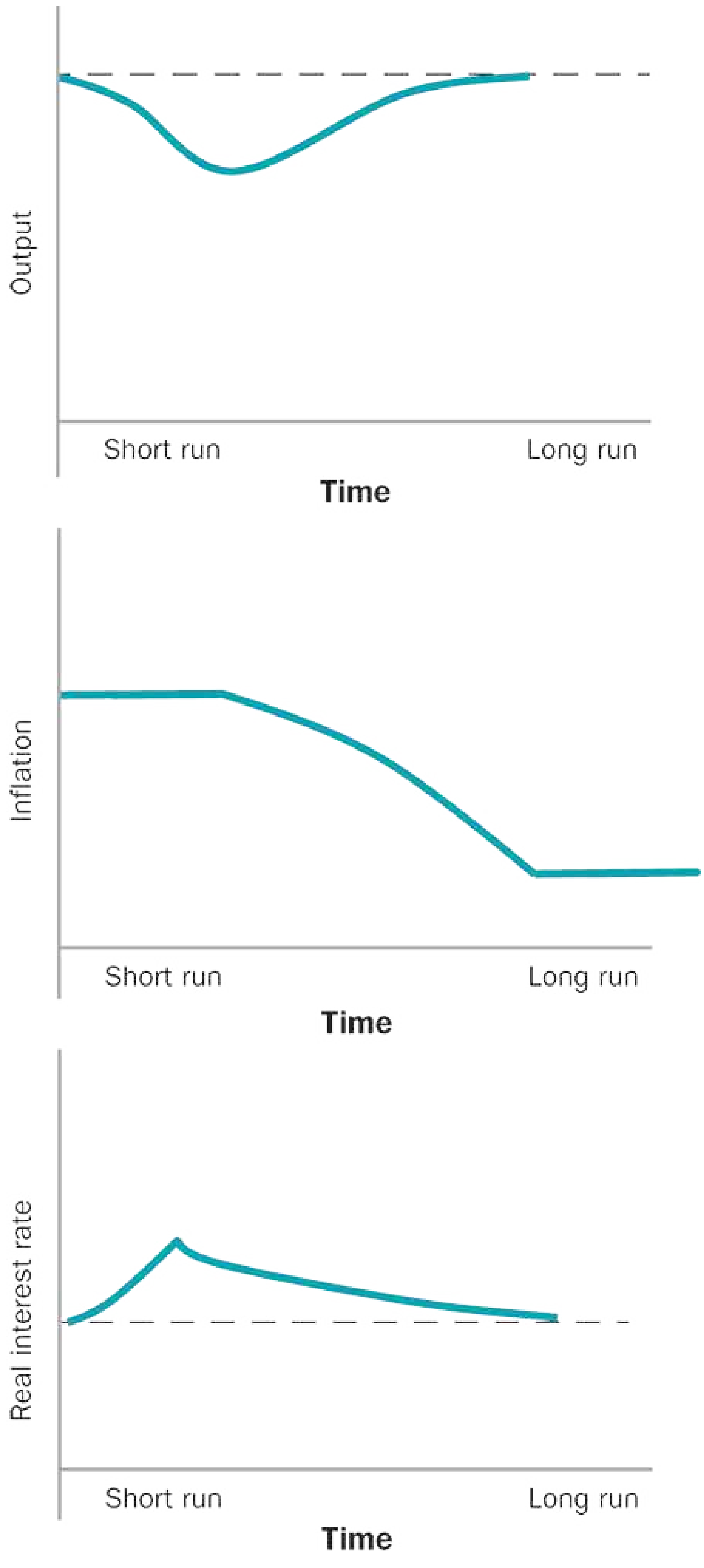
11.5 If the inflation rate is high, the economy will tend to stay in this high-inflation state due to expectations of high inflation and the existence of long-term wage and price contracts, while if the inflation rate is low, the economy will likewise tend to stay in this low inflation state for similar reasons. However, since high inflation rates impose economic costs on society, the Reserve Bank has an incentive to avoid the high inflation state by keeping inflation low, which helps to maintain people's expectations of low inflation and leads to lower future inflation rates -perpetuating the 'virtuous circle' illustrated in Figure 11.4.

11.6 An increase in spending on new capital by firms for a given level of inflation, output and real interest rate increases aggregate expenditures and short-run equilibrium output. Since the economy was originally operating at potential output, the increase in investment spending will lead to an expansionary gap; actual output, Y, will now be greater than potential output, Y^*. When $Y > Y^*$, the rate of inflation will tend to rise.

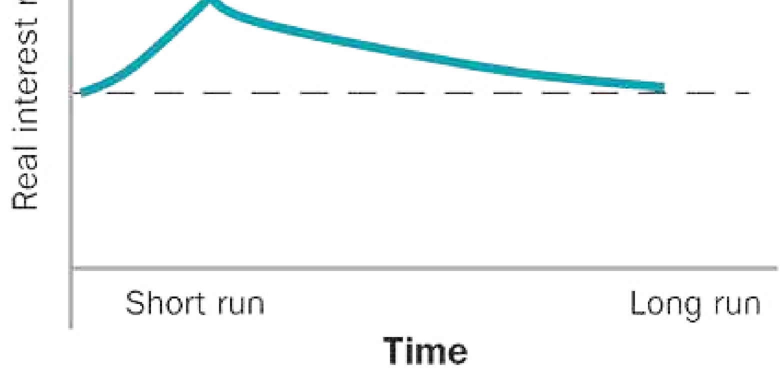
11.7 A decrease in oil prices is an example of a 'beneficial' inflation. In this case, starting from a long-run equilibrium where output equals potential output, a beneficial inflation shock reduces current inflation, causing the SRAS line to shift downward. The downward shift in the SRAS line leads to a short-run equilibrium with lower inflation and higher output, creating an expansionary gap. If the Reserve Bank does nothing, eventually the SRAS will begin to shift upward, and the economy will return to its original inflation and output levels. However, the Reserve

Bank may instead choose to tighten its monetary policy by shifting up its policy reaction function, raising the current real interest rate, shifting the AD curve to the left and restoring equilibrium at potential GDP, but at the new, lower inflation rate.

11.8



Output
Short run
Long run
Time
Inflation
Short run
Long run
Time
Real interest rate
Short run
Long run
Time



CHAPTER 12

12.1 A significant fall in the price of imported food will imply a reduction in the rate of inflation and will also lead to reduced expectations of inflation. The economy's short-run aggregate supply curve will shift downwards, and a new short-run equilibrium will be established with higher GDP (due to the Reserve Bank reducing the real interest rate in line with lower inflation). As GDP is now higher than its potential, there is an expansionary output gap. Given time, this will put upward pressure on inflation, and the SRAS line will shift upwards. The economy will self-correct, returning to its original point of long-run equilibrium.

12.2 A tax on firms' purchases of capital equipment will discourage firms from investment expenditure resulting in a leftward shift of the aggregate demand curve. In the new short run equilibrium, there will be a contractionary output gap and we would expect an eventual downward shift of the short-run aggregate supply line and a new long-run equilibrium established with a lower rate of inflation and GDP equal to its potential. However, a fall in investment expenditure is likely to reduce the economy's stock of productive capital and this will shift the long-run aggregate supply curve to the left. It is possible, though not guaranteed, that the new long-run equilibrium is characterised by the same rate of inflation that existed previously but with a reduced level of output, consistent with the economy now having a lower potential GDP.

CHAPTER 13

13.1 If Australia had grown at the Japanese rate for the period 1870–2016, real GDP per person in 2016 would have been (\$5 947) × $(1.0241)^{146}$ = \$192 435. Actual GDP per person in Australia in 2016 was \$48 845, so at the higher rate of growth, output per person would have been \$192 435/\$48 845 = 3.9 times higher.

13.2 As before, Kevin can wrap 4000 chocolates per week, or 100 chocolates per hour. Len can wrap 500 chocolates per hour, and working 40 hours weekly, she can wrap 20 000 chocolates per week. Together Kevin and Len can wrap 24 000 chocolates per week. Since they work a total of 80 hours between them, their output per hour as a team is 24 000 chocolates wrapped per 80 hours = 300 chocolates wrapped per hour, midway between their hourly productivities as individuals.

13.3 Because Len can wrap 300 chocolates per hour by hand, the benefit of giving Len the machine is 500 − 300 = 200 additional chocolates wrapped per hour. Because Kevin wraps only 100 chocolates per hour by hand, the benefit of giving Kevin the machine is 400 additional chocolates wrapped per hour. The benefit of giving the machine to Kevin is greater than of giving it to Len. Equivalently, if the machine goes to Len, then Kevin and Len between them can wrap 500 + 100 = 600 chocolates per hour, but if Kevin uses the machine the team can wrap 300 + 500 = 800 chocolates per hour. So, output is increased by letting Kevin use the machine.

13.4 Now, working by hand, Kevin can wrap 300 chocolates per hour and Len can wrap 500 chocolates per hour. With a machine, either Kevin or Len can wrap 800 chocolates per hour. As in Concept check 13.3, the benefit of giving a machine to Kevin (500 chocolates per hour) exceeds the benefit of giving a machine to Len (300 chocolates per hour), so if only one machine is available, Kevin should use it.

The table analogous to Table 13.2 now looks like this:

NUMBER OF MACHINES (CAPITAL)	TOTAL NUMBER OF CHOCOLATES WRAPPED EACH WEEK (OUTPUT)	TOTAL HOURS WORKED PER WEEK	CHOCOLATES WRAPPED PEI HOUR WORKEI (PRODUCTIVIT
0	32 000	80	400
1	52 000	80	650
2	64 000	80	800
3	64 000	80	800

Comparing this table with Table 13.2, you can see that technological advance has increased labour productivity for any value of the number of machines available.

Adding one machine increases output by 20 000 chocolates wrapped per week, adding the second machine increases output by 12 000 chocolates wrapped per week, and adding the third machine does not increase output at all (because there is no worker available to use it). So, diminishing returns to capital still hold after the technological improvement.

13.5 Although the individual worker is the same person he was in Bangladesh, by coming to the Australia, he gains the benefit of factors that enhance average labour productivity in this country, relative to his homeland. These include more and better capital to work with, more natural resources per person, more advanced technologies, sophisticated entrepreneurs and managers, and a political–legal environment that is conducive to high productivity. It is not guaranteed that the value of the immigrant's human capital will rise (it may not, for example, if he speaks no English and has no skills applicable to the Australian economy), but normally it will.

Since increased productivity leads to higher wages and living standards, on economic grounds, the Bangladeshi worker has a strong incentive to immigrate to Australia if he is able to do so.

CHAPTER 14

14.1 a) An increase in the real interest rate raises the cost to firms of acquiring funding for new (or replacement) capital equipment. This is either an increase in the direct cost of using borrowed funds or an increase in the opportunity cost of using existing funds. All else being equal, the balance between the benefits and costs of acquiring capital equipment has shifted towards costs, therefore making a smaller capital stock optimal.

b) A technological advance that makes capital more productive will increase the benefits obtained from a given capital stock. All else being equal, the balance between the benefits and costs of acquiring capital equipment has shifted towards benefits, therefore making a larger capital stock optimal.

14.2 **a)** The golfer will need to evaluate the benefit they receive from an improved golf game against the wages forgone by working fewer hours in order to practice. If the benefit does not offset the value of the wages lost, then there is likely to be no change to the hours of work supplied. If the benefit offsets, or more than offsets, the value of the wages lost, then there is likely to be a reduction in the hours of work supplied.

b) As the cost of commuting to work has increased, the effective wage received from working has declined. This may make golf more attractive as the opportunity cost of working has increased, meaning labour supply will fall. It is possible that the individual supplies more hours of work in order to compensate for the higher cost of getting to work. The end result on labour supply is not clear.

c) If the individual substitutes swimming for golf, there may be no change to the hours of labour supplied. However, it is possible that the individual may substitute swimming (the activity which has had a cost decrease) for some hours of work (the activity which has had a cost decrease) and therefore fewer hours of work supplied.

14.3 **a)** An improvement in education standards makes each individual worker that is hired more valuable to the firm than was previously the case. All else being equal, the firm will increase its demand for labour (a rightward shift of the labour demand curve).

b) A lower price for firms' products lowers the marginal revenue product of labour—each worker is now worth less to the firm. The result, all else being unchanged, will be a fall in the demand for labour.

14.4 **a) and b)**

LABOUR	CAPITAL	OUTPUT	MP_K
1	1	5.00	
1	2	5.74	0.74
1	3	6.23	0.49
1	4	6.60	0.37
1	5	6.90	0.30

14.5

LABOUR	CAPITAL	OUTPUT	MP_K
3	3	15.00	
3	6	17.23	2.23
3	9	18.69	1.46
3	12	19.79	1.11
3	15	20.70	0.90

The production function does display constant returns to scale as multiplying both factors by three yields three times the output.

CHAPTER 15

15.1 The real interest rate acts as the 'price' in the market for saving and investment. For savers, the real interest rate is the reward that is obtained for postponing consumption on current needs. For firms, the real interest rate represents the cost of borrowed funds needed to finance investment or the opportunity cost of using internally generated funds. An increase in the real interest rate, which would result from an excess of investment demand over saving, will encourage saving and discourage investment, returning the market to equilibrium. A decrease in the real interest rate, which would result from an excess of saving over investment, will encourage investment and discourage saving, again returning the market to equilibrium.

15.2 **a)** Starting from an initial steady-state, a slowdown on the rate of population growth will result in there being more saving than replacement investment, therefore net investment will be positive. The capital–labour ratio will therefore begin to grow, leading to economic growth (an increase in per capita GDP). This will continue until a new steady state is reached at a higher capital–labour ratio than the initial situation. At the new steady state, economic growth will cease. In terms of the Solow–Swan diagram, the $\left(\frac{RI}{L}\right)$ will rotate downwards (due to a lower value of n), and the steady-state point will shift to the right.

b) Starting from an initial steady state, a fall in the saving rate means there are fewer resources available for net investment. As a result, the capital–labour ratio begins to fall because it not possible to fully offset the effects of depreciation and population growth. This will continue until a new steady state is reached at a lower capital–labour ratio than the initial situation. At the new steady state, economic growth will cease. In terms of the Solow–Swan diagram, the $\left(\frac{SI}{L}\right)$ will shift downwards (due to a lower value of θ), and the steady-state point will shift to the left.

15.3 To find the steady state, set saving equal to replacement investment and solve for the capital–labour ratio.

Freedonia

$$\begin{aligned}\left(\frac{S}{L}\right) = 0.1 \times 2\left(\frac{K}{L}\right)^{*0.5} &= \left(\frac{RI}{L}\right) = (0.02 + 0.01)\left(\frac{K}{L}\right)^{*} \\ \left(\frac{K}{L}\right)^{*} &= \left(\frac{0.2}{0.03}\right)^{2} = 44.5 \\ \left(\frac{Y}{L}\right)^{*} &= 2 \times 44.5^{0.5} = 13.3\end{aligned}$$

Moldavia

$$\begin{aligned}\left(\frac{S}{L}\right) = 0.1 \times 1\left(\frac{K}{L}\right)^{*0.5} &= \left(\frac{RI}{L}\right) = (0.02 + 0.01)\left(\frac{K}{L}\right)^{*} \\ \left(\frac{K}{L}\right)^{*} &= \left(\frac{0.1}{0.03}\right)^{2} = 11.1 \\ \left(\frac{Y}{L}\right)^{*} &= 2 \times 11.1^{0.5} = 6.7\end{aligned}$$

The difference between the two countries’ respective total factor productivities means they do not have identical production functions. As can be seen in the numerical calculations, this means the respective steady-state values of the capital–labour ratio and per capita output differ. Each country will achieve its steady state in the long run. As these are different steady states, they will not converge in terms of their per capita incomes.

CHAPTER 16

16.1 The opportunity cost of producing coffee equals the number of computers given up for each extra pound of coffee produced. Carlos can produce either 100 kg of coffee or one computer per week, so his opportunity cost is given by:

$$\frac{\text{Loss in computers}}{\text{Gain in coffee}} = \frac{-1 \text{ computer/week}}{100 \text{ kg of coffee/week}} = \frac{-1}{100} \text{ computer/kg of coffee}$$

Maria can produce either 100 kg of coffee or two computers per week, so her opportunity cost is:

$$\frac{\text{Loss in computers}}{\text{Gain in coffee}} = \frac{-2 \text{ computer/week}}{100 \text{ kg of coffee/week}} = \frac{-1}{50} \text{ computer/kg of coffee}$$

Since each kilogram of coffee Carlos produces requires the sacrifice of 1/100 of a computer, while each kilogram of coffee produced by Maria sacrifices 1/50 of a computer, Carlos has the smaller opportunity cost of producing coffee. Thus, he has a comparative advantage in producing coffee.

16.2 When the economy is closed, Brazilians can obtain 80 computers by having Maria work 40 weeks making computers. If Maria works the remaining 10 weeks producing coffee and Carlos works 50 weeks producing coffee, the Costa Ricans will be able to consume (10 + 50) × 100 = 6000 kg of coffee per year.

The world price of computers is 80 kg of coffee, which is greater than Maria's opportunity cost of producing computers but less than Carlos's opportunity cost. Thus, if the economy opens to trade, Maria will specialise in computers and Carlos will specialise in coffee. If Maria produces 100 computers, 80 of which are consumed domestically, 20 computers are available for export. Because a computer is worth 80 pounds of coffee on the world market, the 20 exported computers can be traded for 1600 kg of coffee. Carlos still produces 5000 kg of coffee. Total coffee consumption in Brazil is thus 1600 + 5000 = 6600 kg. Opening to trade has allowed Brazilians to consume 10 per cent more coffee at no sacrifice in computers.

16.3 If the world price of computers is \$1200, domestic demand for computers is 3000 − 0.5(1200) = 2400 computers. Domestic supply is 1000 + 0.5(1200) = 1600 computers. The difference between the quantity demanded and the quantity supplied, 800 computers, is imported. A tariff of \$400 raises the domestic price of computers to $1600. Now domestic demand is 2200 and domestic supply is 1800. The difference, 400 computers, equals imports. Revenue for the government is ($400/computer) × (400 imported computers) = $160 000. If the world price of computers is $1800 and there is no tariff, domestic demand is 2100; domestic supply is 1900; and imports are 200. A tariff of $400 raises the world price to $2200, which is greater than the domestic price when there is no trade ($2000). No computers are imported in this case and no tariff revenue is raised.

CHAPTER 17

17.1 From https://www.rba.gov.au/statistics/frequency/exchange-rates.html on 16 November 2018, the value of the Australian dollar was:

British pound: A $1 = £0.5683
Singapore dollar: A$1 = $S1.0004
Japanese yen: A$1 = ¥82.46

a)

$$£0.5683 = S\$1.004 \Rightarrow £1 = \frac{1.004}{0.5683} = S\$1.76$$

$$£0.5683 = S\$1.004 \Rightarrow S\$1 = \frac{0.5683}{1.0004} = £0.5681$$

b)

$$S\$1.0004 = ¥82.46 \Rightarrow S\$1 = \frac{82.46}{1.0004} = ¥82.427$$

$$S\$1.0004 = ¥82.46 \Rightarrow ¥1 = \frac{1.0004}{82.46} = S\$0.012$$

17.2 The dollar price of the computer is \$2400 and each dollar is equal to 110 yen. Therefore the yen price of the computer is (110 yen/dollar) × (\$2400), or 264 000 yen. The price of the Japanese computer is 242 000 yen. Thus the conclusion that the Japanese model is cheaper does not depend on the currency in which the comparison is made.

17.3 Since the law of one price holds for gold, its price per ounce must be the same in New York and Stockholm:

$$\$300 = 2500 \text{ kronor}$$

Dividing both sides by 300, we get

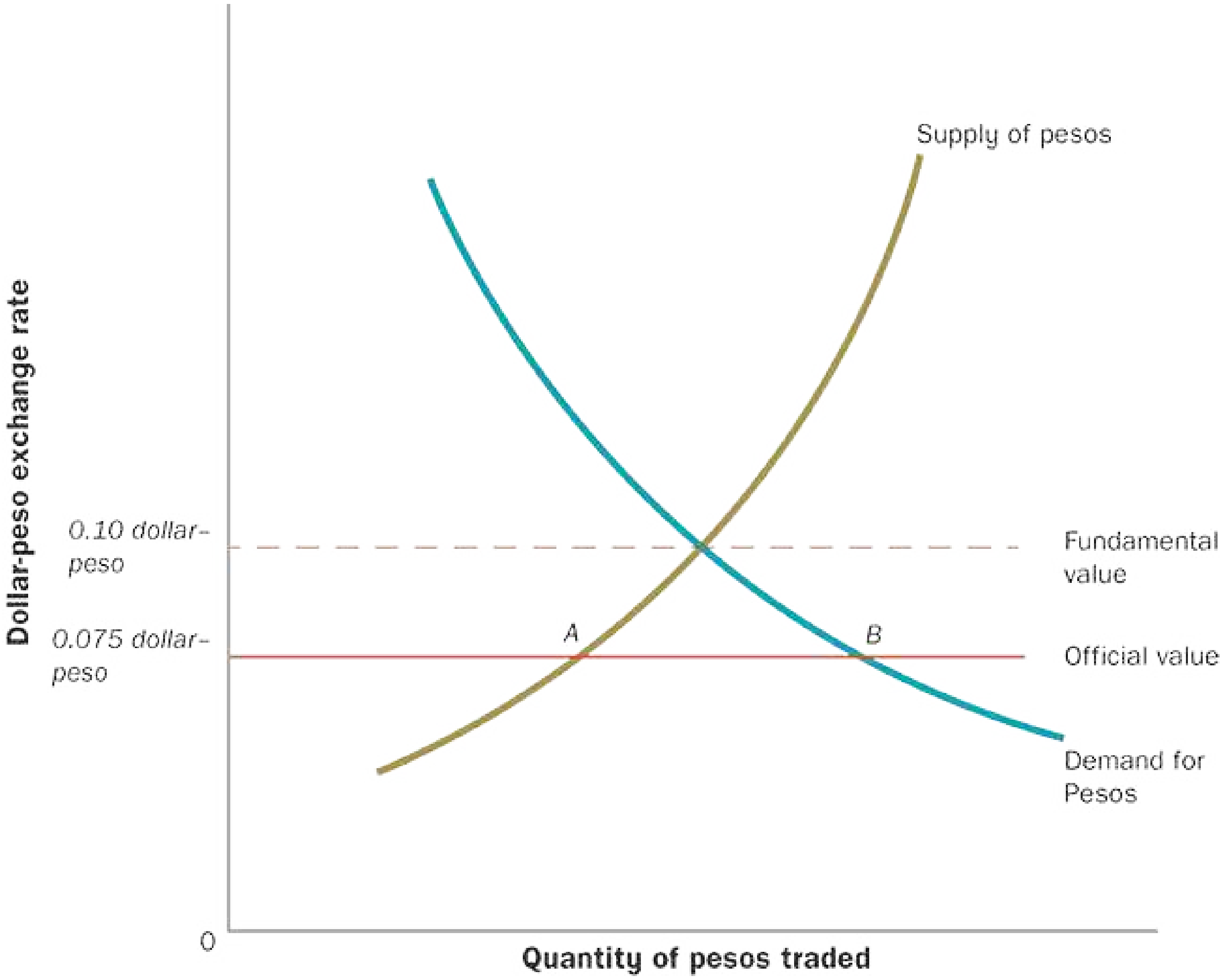
$$\$1 = 8.33 \text{ kronor}$$

So the exchange rate is 8.33 kronor per dollar.

17.4 A decline in Australian GDP reduces consumer incomes and hence imports. As Australian residents are purchasing fewer imports, they supply fewer dollars to the foreign exchange market, so the supply curve for dollars shifts to the left. Reduced supply raises the equilibrium value of the dollar.

17.5 At a fixed value for the peso of 0.15 dollars, the demand for the peso equals 25 000 − 50 000(0.15) = 17 500. The supply of the peso equals 17 600 + 24 000(0.15) = 21 200. The quantity supplied at the official rate exceeds the quantity demanded by 3700. Latinia will have to purchase 3700 pesos each period, so its balance-of-payments deficit will equal 3700 pesos, or 3700 × 0.15 = 555 dollars. This balance-of-payments deficit is larger than we found in Example 17.6. We conclude that the greater the degree of overvaluation, the larger the country’s balance-of-payments deficit is likely to be.

17.6 The figure shows a situation in which the official value of the currency is *below* the fundamental value, as determined by the supply of and demand for the currency in the foreign exchange market, so the currency is undervalued. At the official value of the exchange rate, the quantity demanded of the domestic currency (point *B*) exceeds the quantity supplied (point *A*). To maintain the official value, the central bank must supply domestic currency to the foreign exchange market each period in the amount *AB*. In contrast to the case of an overvalued exchange rate, here the central bank is providing its own currency to the foreign exchange market and receiving foreign currencies in return.



The central bank can print as much of its own currency as it likes, and so with an undervalued currency there is no danger of running out of international reserves. Indeed, the central bank's stock of international reserves increases in the amount *AB* each period as it receives foreign currencies in exchange for the domestic currency it supplies.

CHAPTER 18

18.1 **a)** Credit: tourism is recorded as an export.

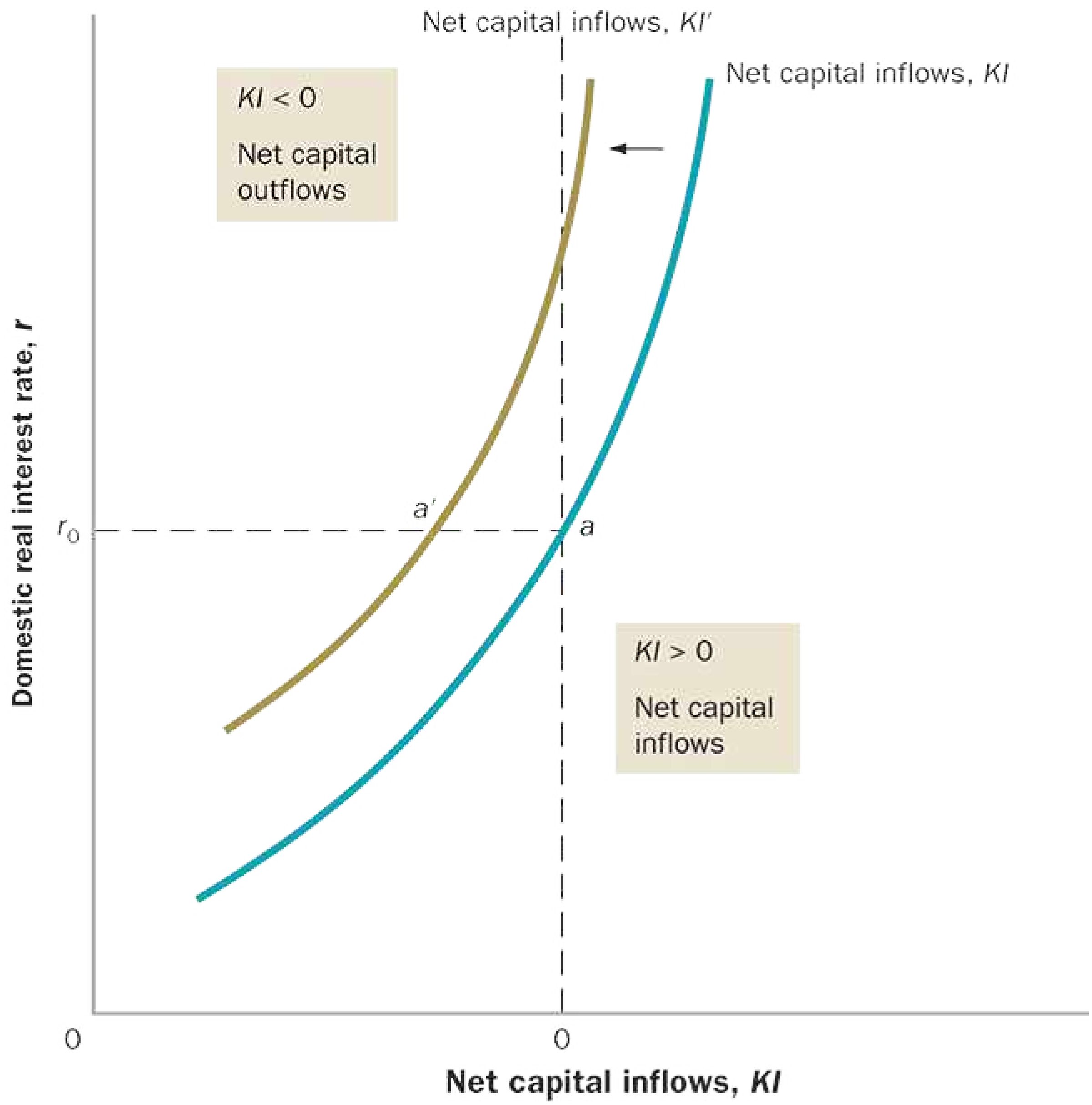
b) Debit: the books will be counted as an import.

c) Debit: this is an income flow to the United Kingdom.

18.2 The purchase of shares would be recorded as a debit item in the capital account of Australia's balance of payments as it involves a loan being made (capital outflow). This would be recorded as a credit item in the UK capital account as it involves borrowing from overseas (capital inflow). The dividends represent an income flow and would therefore be recorded in the countries' respective current accounts, as a credit item for Australia and a debit item for the United Kingdom.

18.3 The purchase of a Japanese government bond would be recorded as a debit item in Australia's capital account. The $20 000 would have to be sold in exchange for Japanese yen in order for this transaction to occur. The new 'owner' of the $20 000 could either lend it to an Australian resident, which would be recorded as a credit in Australia's capital account, or it could be used to purchase Australian exports, which would be recorded as a credit in Australia's capital account. Either way, the debit of $20 000 in the capital account would be offset, ensuring equation 18.1 is satisfied.

18.4 An increase in the real interest rate abroad, all else being equal, will lead to capital outflow. This is shown on the following diagram by a leftward shift in the *KI* line. For example, if the prevailing domestic real interest rate is r_0, the increase in the real interest rate abroad will mean a shift from point a to point *a′*.



Net capital inflows, KI′
Net capital inflows, KI
KI < 0
Net capital
outflows
KI > 0
Net capital
inflows
a′
a
r0
Domestic real interest rate, r
0
0
Net capital inflows, KI

GLOSSARY

100 per cent reserve banking All bank deposits are kept in the form of cash reserves.

45-degree diagram A diagrammatic representation of the economy over the short run (the period in which prices do not adjust in response to demand), enabling the identification of the equilibrium level of GDP.

accommodating policy A policy that allows the effects of a shock to remain.

aggregate demand (AD) curve Shows the relationship between the short-run equilibrium output, *Y,* and the rate of inflation, *p;* the name of the curve reflects the fact that short-run equilibrium output is determined by, and equals, total planned spending in the economy; increases in inflation reduce planned spending and short-run equilibrium output, so the aggregate demand curve, *AD,* is downward sloping.

aggregate supply shocks Inflationary shocks and shocks to potential output.

aggregation The adding up of individual economic variables to obtain economy-wide totals.

anchored inflationary expectations When people's expectations of future inflation do not change even if inflation rises temporarily.

appreciation An increase in the value of a currency relative to other currencies.

assets Anything of value that one owns.

autarky A country whose economy is closed to the rest of the world.

automatic stabilisers Provisions in the law that imply automatic increases in government spending or decreases in taxes when real output declines.

average labour productivity Output per employed worker, or per hour of work.

balance of payments deficit The net decline in a country's stock of international reserves over a year.

balance of payments surplus The net increase in a country's stock of international reserves over a year.

balance of payments A record of all transactions between the residents of one country and the residents of all other countries.

balance on merchandise trade The difference between exports and imports (same as net exports).

balance on the capital account The difference between total credit items (sales of domestic assets/acquisition of a liability by a domestic resident) and total debit items (purchase of a foreign asset/discharge of a liability by a domestic resident) in the capital account of the balance of payments.

balance on the current account The difference between total credit and total debit items summed across all components of the current account.

balanced budget multiplier The short-run effect on equilibrium GDP of an equal change in government expenditure and net taxes.

bank reserves Reserve of cash kept by banks to meet their customers' demands to withdraw deposits.

barter The direct trade of goods or services for other goods or services.

base money The amount of currency in circulation plus the deposits that banks have with the Reserve Bank in exchange settlement accounts.

bequest saving Saving done for the purpose of leaving an inheritance.

bond A legal promise to repay a debt, usually including both the principal amount and regular interest, or coupon, payments.

boom An economic growth period, characterised by strong economic activity, high consumer demand, an increase in stockmarket activity and (often) an increase in inflation.

business cycle Short-run fluctuations in GDP.

capital account That part of the balance of payments that records transactions leading to either the purchase or sale of domestic assets.

capital gains Increases in the value of existing assets.

capital good A long-lived good that is used in the production of other goods and services.

capital inflows When financial capital flows into a country as the result of a sale of a domestic asset. This is equivalent to a domestic resident acquiring a liability to an overseas agent.

capital losses Decreases in the value of existing assets.

capital outflows When financial capital flows out of a country as the result of a purchase of a foreign asset. This is equivalent to a foreign resident acquiring a liability to a domestic agent.

capital–labour ratio The amount of capital available per worker.

central bank independence When central bankers are insulated from short-term political considerations and are allowed to take a long-term view of the economy.

circular flow of income The economy's national income, which can be equivalently measured using the production, expenditure or income approaches.

classical cycle A view of the business cycle that relates to movements in the level of real GDP. Upswings in the level of real GDP are expansions; downswings are contractions.

closed economy An economy that does not trade with the rest of the world.

Cobb–Douglas production function A specific type of production function given by the equation $Y_t = A_t K_t^{a} L_t^{1-a}$.

comparative advantage Everyone does best when each person concentrates on the activities for which their opportunity cost is lowest.

comparative economic growth The name given to the study of different countries' growth experiences.

compound interest The payment of interest not only on the original deposit but on all previously accumulated interest.

conditional convergence Countries with similar economic fundamentals are more likely to converge since they will have a similar steady state. Therefore, convergence is conditional on countries having the same steady state.

constant returns to scale A situation where a proportionate rise in both primary factors of production leads to the same proportionate rise in output.

consumer price index (CPI) A weighted average of the percentage change in the prices of a basket of goods purchased by Australian households.

consumption expenditure, or consumption Spending by households on goods and services such as food, clothing and entertainment.

consumption function The relationship between consumption spending and its determinants, in particular disposable (after-tax) income.

consumption possibilities The combination of goods and services that can feasibly be consumed.

contraction A period in which the economy is moving from a peak to a trough.

contractionary gap A negative output gap, which occurs when potential output exceeds actual output.

contractionary policies Government policy actions designed to reduce planned spending and output.

convergence hypothesis A prediction made by the Solow–Swan model whereby countries with relatively low per capita capital stocks grow faster than countries with high per capita capital stocks. Given a similar steady-state level of per capita capital, countries' per capita incomes eventually converge (attain the same level).

coordination failure Occurs when there exists opportunity for improvement in economic outcomes if economic agents act together, but the incentive to do so is lacking.

coupon payments Regular interest payments made to the bondholder.

coupon rate The interest rate promised when a bond is issued; the annual coupon payments are equal to the coupon rate times the principal amount of the bond.

credibility of monetary policy The degree to which the public believes the central bank’s promises to keep inflation low, even if doing so may impose short-run economic costs.

crowding out The tendency of increased government deficits to reduce investment spending.

current account deficit When the total of the debit items on the current account exceeds the total of the credit items on the current account.

current account surplus When the total of the credit items on the current account exceeds the total of the debit items on the current account.

current account That part of the balance of payments that records transactions leading to a change of ownership of commodities or a direct flow of income or similar payment.

current transfers One-off transactions that are not recorded elsewhere in the current account.

cyclical unemployment The extra unemployment that occurs during periods of economic contraction and especially recessions.

deflating Using the CPI to convert quantities measured at current dollar values into real terms.

deflation A situation in which the prices of most goods and services are falling over time so that inflation is negative.

Demographic change Change to the structure of a population, such as an increase in longevity or a reduction in birth rates.

depreciation A decrease in the value of a currency relative to other currencies.

devaluation A reduction in the official value of a currency (in a fixed exchange rate system).

diminishing marginal productivity The tendency for the marginal product of a factor to decline as the amount of that factor used in the production process increases. Note that this assumes that all other factors of production are held constant.

diminishing returns to capital If the amount of labour and other inputs employed is held constant, then the greater the amount of capital already in use, the less an additional unit of capital adds to production.

diminishing returns to labour If the amount of capital and other inputs in use is held constant, then the greater the quantity of labour already employed, the less each additional worker adds to production.

discouraged workers People who say they would like to have a job but have not made an effort to find one in the past four weeks.

disequilibrium When planned aggregate expenditure differs from output, or equivalently when planned injections differ from withdrawals.

disinflation A fall in inflation engineered through tighter monetary or fiscal policy.

disposable income Aggregate income less net taxes.

diversification The practice of spreading one’s wealth over a variety of different financial investments to reduce overall risk.

dividend A regular payment received by stockholders for each share that they own.

duration The length of an unemployment spell.

entrepreneurs People who create new economic enterprises.

entrepreneurs’ expectations Expectations held by decision-makers in firms about the future profitability of proposed investment projects.

exchange settlement accounts Accounts kept by the commercial banks with the Reserve Bank of Australia, which are used to manage the flow of funds between commercial banks generated by the commercial activities of their customers.

exogenous expenditure The portion of planned aggregate expenditure that is independent of output.

exogenous variable A variable whose value is determined from outside of the model.

expansion A period in which the economy is moving from a trough to a peak.

expansionary gap A positive output gap, which occurs when actual output is higher than potential output.

expansionary policies Government policy actions intended to increase planned spending and output.

final goods or services Goods or services consumed by the ultimate user—because they are the end products of the production process, they are counted as part of GDP.

financial deregulation The process of removing price and quantity controls from financial markets so that the allocation of financial products is predominantly based on the market forces of supply and demand.

fiscal policy Decisions that determine the government's budget, including the amount and composition of government expenditures and government revenues.

fixed exchange rate An exchange rate whose value is set by official government policy.

flexible exchange rate An exchange rate whose value is not officially fixed, but varies according to the supply and demand for the currency in the foreign exchange market.

flow A measure that is defined per unit of time.

foreign exchange market The market on which currencies of various nations are traded for one another.

forward guidance Information that a central bank provides to financial markets regarding its expected future monetary policy path.

four-sector model A model of the economy in which there are households, firms, the government and the foreign sector.

fractional-reserve banking system A banking system in which the reserve–deposit ratio is less than 100 per cent.

free trade agreements Agreements signed by two or more countries usually guaranteeing free trade between those countries.

frictional unemployment The short-term unemployment associated with the process of workers searching for the right job.

fundamental value of the exchange rate (or equilibrium exchange rate) The exchange rate that equates the quantities of the currency supplied and demanded in the foreign exchange market.

Gini coefficient A summary measure of income inequality.

Government budget constraint The concept that government spending must be financed either by raising taxes or by government borrowing.

government budget deficit The excess of government spending over tax collections.

government budget surplus The excess of government tax collections over government spending; the government budget surplus equals public saving.

government purchases Purchases by federal, state and local governments of final goods and services. Government purchases do not include transfer payments, which are payments made by the government in return for which no current goods or services are received, nor do they include interest paid on the government debt.

gross domestic product (GDP) The market value of the final goods and services produced in a country during a given period.

growth accounting A method of dividing a country's historical growth experience between growth in the primary and growth in secondary factors of production.

growth cycle A view of the business cycle that relates to movements in the growth rate of real GDP. Expansions are associated with faster than normal real GDP growth; contractions with lower than normal real GDP growth.

hyperinflation When the inflation rate is extremely high.

income effect The change in demand for a good or service, caused by a change in price, that is attributable to the effect of that price change on the real purchasing power of consumers' incomes.

income–expenditure multiplier The effect of a one-unit increase in exogenous expenditure on short-run equilibrium output; for example, a multiplier of 5 means that a 10-unit decrease in exogenous expenditure reduces short-run equilibrium output by 50 units.

indexing Using the CPI to convert real quantities into current-dollar terms.

induced expenditure The portion of planned aggregate expenditure that depends on output.

inflation dove Someone who is not strongly committed to achieving and maintaining low inflation.

inflation hawk Someone who is committed to achieving and maintaining low inflation, even at some short-run cost in reduced output and employment.

inflation shock A sudden change in the normal behaviour of inflation, unrelated to the nation’s output gap.

injections All sources of exogenous expenditure in the economy.

inside lag (of macroeconomic policy) The delay between the date a policy change is needed and the date it is implemented.

Intergenerational equity The concept that the current generation should not impose an unfair burden on future generations.

intermediate goods or services Goods or services used up in the production of final goods and services and therefore not counted as part of GDP.

international capital flows Flows of financial capital between countries because of the sale or purchase of one country’s assets by other countries.

international reserves Foreign currency assets held by a government for the purpose of purchasing the domestic currency in the foreign exchange market.

investment Spending by firms on final goods and services, primarily capital goods and housing.

involuntary part-time workers People who say they would like to work full-time but are able to find only part-time work.

labour force The total number of employed and unemployed people in the economy (the first two categories of respondents to the ABS survey).

Laspeyres price index A weighted average of price changes through time where the weights reflect expenditure patterns in the base period.

law of one price If transport costs are relatively small, the price of an internationally traded commodity must be the same in all locations.

liabilities The debts one owes.

lifecycle saving Saving to meet long-term objectives, such as retirement, university attendance or the purchase of a home.

long-run aggregate supply (LRAS) line A vertical line showing the economy's potential output, Y^*.

Lorenz curve A graphical representation of income inequality.

macroeconomic policies Government actions designed to affect the performance of the economy as a whole.

marginal product of capital (MPK) The increment to output from a one-unit increase in the capital stock, holding all other factors of production constant.

marginal propensity to consume (MPC) The parameter c, the amount by which consumption rises when disposable income rises by one dollar. We assume that $0 < c < 1$.

marginal revenue product of capital (MRPK) The extra revenue received by a firm from selling the output obtained from an extra unit of capital.

marginal revenue product of labour (MRPL) The extra revenue received by a firm from selling the output obtained from an extra unit of labour.

marginal tax rate The amount by which taxes rise when before-tax income rises by one dollar.

maturation date The date at which the principal of a bond will be repaid.

medium of exchange An asset used in purchasing goods and services.

menu costs The costs of changing prices.

monetary policy The determination of the nation's money supply.

money Any asset that can be used in making purchases.

national income accounting identity A mathematical relation that shows how GDP is equal to the sum of expenditure on consumption, investment, government purchases and net exports.

national saving Total saving in the economy undertaken by households, firms and the government.

natural level of output Another term for the economy's potential level of output.

natural rate of employment The part of the total unemployment rate that is attributable to frictional and structural unemployment; equivalently, the unemployment rate that prevails when cyclical unemployment is zero so that the economy has neither a contractionary nor an expansionary output gap.

natural rate of unemployment, U* The part of the total unemployment rate that is attributable to frictional and structural unemployment; equivalently, the unemployment rate that prevails when cyclical unemployment is zero, so that the economy has neither a contractionary nor an expansionary output gap.

neo-classical growth model A model that focuses on the role of capital accumulation to explain countries' growth experiences.

net exports Exports minus imports.

net income The difference between total credit and total debit items on the net income account.

net investment Investment that adds to the size of the per capita capital stock. A positive rate of net investment means that each worker has available a larger amount of capital than was previously the case.

net services The difference between total credit and total debit items on the net services account.

nominal exchange rate The rate at which two currencies can be traded for each other.

nominal GDP A measure of GDP in which the quantities produced are valued at current-year prices; nominal GDP measures the current dollar value of production.

nominal interest rate The annual percentage increase in the nominal, or dollar, value of a financial asset.

nominal quantity A variable measured in current value terms.

normative analysis An analysis that includes recommendations on whether a particular policy should be implemented.

Okun's law Each extra percentage point of cyclical unemployment is associated with approximately a 1.8 percentage point (for Australia) increase in the output gap, measured in relation to potential output.

open-market operations Open-market purchases and open-market sales.

open-market purchase The purchase of government bonds from the public by the Reserve Bank for the purpose of increasing the balances in banks' exchange settlement accounts.

open-market sale The sale by the Reserve Bank of government bonds to the public for the purpose of reducing the balances in banks' exchange settlement accounts.

opportunity cost The value of the next-best alternative to taking a particular action.

optimal capital stock The capital stock at which the benefits from adding another unit of capital are exactly offset by the costs of adding another unit of capital.

output gap The difference between the economy’s potential output and its actual output at a point in time.

outside lag (of macroeconomic policy) The delay between the date a policy change is implemented and the date by which most of its effects on the economy have occurred.

overnight cash interest rate The interest rate that clears the overnight cash market.

overnight cash market A specialised segment of the financial system where commercial banks borrow and lend money for very short periods of time in order to manage their exchange settlement balances.

overnight cash rate The rate of interest applied to loans in the overnight cash market.

overvalued exchange rate An exchange rate that has an officially fixed value greater than its fundamental value.

participation rate The percentage of the working-age population in the labour force (i.e. the percentage that is either employed or looking for work).

peak The beginning of a contraction; the high point of economic activity prior to a downturn.

per capita income The ratio of total income to the population. In the Solow–Swan model it is usual to assume that all people are workers so that per capita income could equivalently be called per worker income.

planned aggregate expenditure (PAE) Total planned spending on final goods and services.

policy reaction function A simple mathematical representation of how a central bank adjusts interest rates considering the state of the economy.

positive analysis An objective analysis aimed at determining only the economic consequences of a particular policy—not whether those consequences are desirable.

potential output, Y* (or potential GDP or full-employment output) The amount of output (real GDP) that an economy can produce when using its resources, such as capital and labour, at normal rates.

precautionary saving Saving for protection against unexpected setbacks, such as the loss of a job or a medical emergency.

private saving The saving of the private sector of the economy is equal to the after-tax income of the private sector minus consumption expenditures (*Y-T-C*); private saving can be further broken down into household saving and business saving.

production function A representation of the relationship between primary and secondary factors of production and output.

production possibilities curve (PPC) A graph that describes the maximum amount of one good that can be produced for every possible level of production of the other good.

progressive income taxes A system of taxation that levies higher tax rates on additional dollars earned as income increases.

protectionism The view that domestic activities should be protected from foreign competition.

public saving The saving of the government sector is equal to net tax payments minus government purchases (T-G).

purchasing power parity (PPP) The theory that nominal exchange rates are determined as necessary for the law of one price to hold.

quality adjustment bias The bias that causes measured inflation to overstate changes in the cost of living caused by the failure to adjust adequately for improvements in the quality of goods and services.

quantitative easing (QE) An expansionary monetary policy in which a central bank buys long-term financial assets, thereby lowering the yield or return of those assets while increasing the money supply.

quantity equation An identity that states the nominal value of expenditure in the economy must be equivalent to the stock of money multiplied by its velocity of circulation.

quota A legal restriction on the volume of imports that can enter a country.

rate of inflation The annual percentage rate of change in the average price level, as measured, for example, by the CPI.

rational expectations The assumption that economic agents are fully informed about the structure of the economy and so understand all the implications of shifts in the aggregate demand curve.

real exchange rate The price of the average domestic good or service relative to the price of the average foreign good or service, when prices are expressed in terms of a common currency.

real GDP A measure of GDP in which the quantities produced are valued at the prices in a base year rather than at current prices; real GDP measures the actual physical volume of production.

real interest rate The percentage increase in the real purchasing power of a financial asset.

real quantity A variable measured in physical terms.

real wage The real purchasing power of a wage.

relative price The price of one good relative to other goods.

replacement investment Investment that is either to replace worn-out, depreciated capital or to provide capital to new workers. Replacement investment does not change the size of the per capita capital stock.

Reserve Bank of Australia Australia's central bank.

reserve–deposit ratio The ratio of reserves to total deposits held by a bank.

revaluation An increase in the official value of a currency (in a fixed exchange rate system).

risk premium The rate of return that financial investors require to hold risky assets minus the rate of return on safe assets.

saving function A graph showing how per capita saving varies as the per capita capital stock varies.

saving rate The proportion of total income devoted to saving. In a closed economy this is equivalent to the investment rate.

saving Current income minus spending on current needs.

scarcity principle Having more of one good thing means having less of another.

short-run aggregate supply (SRAS) line A horizontal line showing the current rate of inflation, as determined by past expectations and pricing decisions.

short-run equilibrium output The level of output that prevails during the period in which prices are predetermined.

short-run equilibrium A situation in which inflation equals the value determined by past expectations and pricing decisions and output equals the level of short-run equilibrium output that is consistent with that inflation rate; graphically, short-run equilibrium occurs at the intersection of the AD curve and the SRAS line.

skill-biased technological change Technological change that affects the marginal products of higher-skilled workers differently from those of lower-skilled workers.

Solow–Swan model Another name given to the neo-classical growth model in honour of the two economists who first developed the model.

speculative attack A massive selling of domestic currency assets by financial investors.

stabilisation policies Government policies that are used to affect planned aggregate expenditure, with the objective of eliminating output gaps.

standard of living The degree to which people have access to goods and services that make their lives easier, healthier, safer and more enjoyable.

steady state A situation in which the per capita capital stock is neither growing nor shrinking and per capita income is unchanging.

stock (or equity) A claim to partial ownership of a firm.

stock A measure that is defined at a point in time.

store of value An asset that serves as a means of holding wealth.

structural policy Government policies aimed at changing the underlying structure, or institutions, of the nation’s economy.

structural unemployment The long-term and chronic unemployment that exists when the skills or aspirations of workers are not matched to the jobs available in the economy.

substitution bias The bias that causes measured inflation to overstate changes in the cost of living caused by the failure to take into account people's substitution towards relatively less expensive goods and services.

supply-side policy A policy that affects potential output.

supply-siders People who support the need for tax cuts to encourage people to work harder, save more and innovate.

tariff A tax levied on imports designed to make domestically produced goods and services appear competitive.

total factor productivity (TFP) Another name for the secondary factors of production. These are factors other than the amounts of capital and labour that affect the amount of output that is produced.

transfer payments Payments the government makes to the public for which it receives no current goods or services in return.

trough The end of a contraction; the low point of economic activity prior to a recovery.

two-sector model A simplified model of the economy in which there are only households and firms.

unattainable point Any combination of goods that cannot be produced using currently available resources.

undervalued exchange rate An exchange rate that has an officially fixed value less than its fundamental value.

unemployment rate The number of unemployed people divided by the labour force.

unemployment rate The proportion of the labour force without a job who are actively seeking employment.

unemployment spell A period during which an individual is continuously unemployed.

unit of account A basic measure of economic value.

value added For any firm, the market value of its product or service minus the cost of inputs purchased from other firms.

velocity A measure of the amount of expenditure that can be financed from a given amount of money over a particular period.

wealth effect The tendency of changes in asset prices to affect households' wealth and thus their spending on consumption goods.

wealth The value of assets minus liabilities.

withdrawals That part of income not used for consumption purposes.

worker mobility The movement of workers between jobs, firms and industries.

world price The price at which goods are traded in the world market.

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