Routledge Studies in Development Economics

THE ECONOMIC CONSEQUENCES OF GLOBALIZATION ON THAILAND

Juthathip Jongwanich

ROUTLEDGE

The Economic Consequences of Globalization on Thailand

This book explores the impact of globalization, especially in the context of trade and investment policies, on the key economic outcomes, including innovation, productivity, employment, and wages, using Thai manufacturing as a case study. The book also looks at the impacts of the shift of manufacturing share from industrialized to emerging countries and emergence of 'global value chains' (GVCs) as well as liberalization through the proliferation of free-trade agreements (FTAs) on key economic outcomes.

The book highlights that globalization, through trade (including the parts and components trade) and investment, continues in Thailand amid the anti-globalization sentiment since the onset of the new millennium, especially the US–China trade war and the COVID-19 pandemic. Thailand has gained considerable benefit from trade and investment liberalization in various forms, including innovation, firm productivity improvements, and workers' skills enhancement. Although the country has prospered in these areas, several further enhancements are needed in order to effectively harness the benefits available from globalization, including continued trade and investment policy reforms. Key policy inferences are provided in the last chapter.

The book will appeal to those with an interest in international economics, especially issues relating to the economic consequences of globalization. It will also appeal to policymakers and practitioners responsible for international trade and investment regulations.

Juthathip Jongwanich is an associate professor at the Faculty of Economics, Thammasat University in Thailand. She holds a PhD (High Distinction) in Economics from the Australian National University. Her research interests lie in the area of international economics, international macroeconomics, capital mobility, multinational enterprises, and international production networks. Her research output has been published in leading peered review journals such as *World Development*, *Food Policy*, *World Economy*, *Oxford Development Studies*, *Review of Policy Research*, *Applied Economics*, *Journal of Asian Economics*, *Journal of the Asia Pacific Economy*, *Developing Economies*, *Asian-Pacific Economic Literature*, and *Asian Economic Paper*. She also works as a consultant to the World Bank, the Asian Development Bank, and the Economic Research Institute for ASEAN and East Asia.

Routledge Studies in Development Economics

156 A Quantitative Analysis of Regional Well-Being
Identity and Gender in India, South Africa, the USA and the UK
Vani Kant Borooah

157 Economic Liberalisation in Latin America
Gerardo Angeles-Castro

158 Migration, Remittances and Sustainable Development in Africa
Maty Konte, Linguère Mously Mbaye and Valentina Mazzucato

159 Developmental State of Africa in Practice
Looking East with Focus on South Korea
Edited by Steve Kayizzi-Mugerwa and Charles Leyeka Lufumpa

160 The Evolution of Economic Development in Africa
African Trade, 1948–2017
Francis K. Mbroh

161 Trade Liberalisation and Economic Development in Africa
Gift Mugano
Edited by Michael Brookes

162 Fiscal and Monetary Policies in Developing Countries
State, Citizenship and Transformation
Rashed Al Mahmud Titumir

163 Law and Development
Theory and Practice (Second Edition)
Yong-Shik Lee

164 The Economic Consequences of Globalization on Thailand
Juthathip Jongwanich

For more information about this series, please visit: www.routledge.com/series/SE0266

The Economic Consequences of Globalization on Thailand

Juthathip Jongwanich

Routledge
Taylor & Francis Group
LONDON AND NEW YORK

First published 2022
by Routledge
2 Park Square, Milton Park, Abingdon, Oxon OX14 4RN

and by Routledge
605 Third Avenue, New York, NY 10158

Routledge is an imprint of the Taylor & Francis Group, an informa business

© 2022 Juthathip Jongwanich

The right of Juthathip Jongwanich to be identified as author of this work has been asserted in accordance with sections 77 and 78 of the Copyright, Designs and Patents Act 1988.

All rights reserved. No part of this book may be reprinted or reproduced or utilised in any form or by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying and recording, or in any information storage or retrieval system, without permission in writing from the publishers.

Trademark notice: Product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation without intent to infringe.

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data
A catalog record has been requested for this book

ISBN: 978-0-367-69972-7 (hbk)
ISBN: 978-0-367-69973-4 (pbk)
ISBN: 978-1-003-14407-6 (ebk)

DOI: 10.4324/9781003144076

Typeset in Galliard
by Deanta Global Publishing Services, Chennai, India

Contents

Figures

Tables

Acknowledgments

The author would like to acknowledge the two anonymous reviewers arranged by the Routledge editorial team for their suggestions on my proposal. Deep appreciation goes to Prof. Prema-chandra Athukorala, Prof. Hal. Hill, and Prof. David Vines for their time to review my manuscript and provide the online endorsement quotes.

Some parts of the book are drawn from my contributions, which received initial funding from the Economic Research Institute for ASEAN and East Asia (ERIA), Asian Development Bank, and Thailand Science Research and Innovation (TSRI). The author wishes to record deep thanks for those grants. I would like to give special thanks to Ms. Yongling Lam, book editor for Business Management and Economics of Routledge, Ms. Payal Bharti, editorial assistant of Routledge, Ms. Jayanthi Chander and Deanta Global team, for their efficient and helpful work in producing this volume. Last but not least, I would like to thank my family, particularly Assoc. Prof. Archanun, Pitchaya and Pitchayut Kohpaiboon, for their great support.

1 Introduction

Since the onset of the new millennium, anti-globalization sentiment has grown stronger, especially in the realm of trade and investment liberalization. Applied tariff rates have been raised in many countries and non-tariff measures instigated. The trade war between the United States (US) and China stands as an obvious case where the tension has simmered since February 2018 when the US implemented 'global safeguard tariffs' wherein a 30 percent tariff was placed on solar panel imports and a tariff of 20 percent on washing machines.[1] Although the US–China trade unrest seems to have de-escalated recently, especially since the two sides signed the Phase One Deal in January 2020, anti-globalization convictions persist in the slow progress of tariff rollbacks. The prevailing trend of escalating tariffs and non-tariff measures is also evident in developing countries, such as Indonesia, Malaysia and Vietnam.[2] COVID-19 has the potential to kindle anti-globalization positions even further.[3] Japan, for example, has announced as part of their coronavirus countermeasures package an initiative to encourage firms to re-shore manufacturing operations back to Japan. In addition to tariff and non-tariff measures, other restrictions, including direct investment constraints, are also evident. For example, in March 2020, the acquisition of StayNTouch, a mobile hotel property management system operation, by the Chinese firm Beijing Shiji Information Technology Co., Ltd. and her partners, subsidiaries or affiliates was prohibited. According to Global Trade Alert, the number of cross-border restrictions increased noticeably, from around 1,800 cases in 2017 to about 2,400 cases in 2018.[4] Many countries, especially developed nations, encountered considerable disappointment resulting from pursuing conventional economic policies under the Washington Consensus, including trade and investment liberalization and, in particular, increasing employment polarization, growing income inequality, and widening current account deficits (Autor et al., 2015; Goos et al., 2014; Dustmann et al., 2009).

Ongoing debates regarding the benefits of globalization, especially in the medium to long term, are contentious and in fact have long been so, dating back to the early 1970s. Many scholars (including Baldwin, 1969; Krueger, 1978 and Bhagwati, 1978) in the early 1970s believed that government failure was worse than market failure, and that trade and investment liberalization, together with macroeconomic stability, represented basic requirements for productivity

DOI: 10.4324/9781003144076-1

improvements, skills upgrading, growth, and industrialization. Two influential works, Krueger (1978) and Bhagwati (1978), showed that export growth supported by well-publicized and stable government commitment comprised the most favorable conditions for economic growth and productivity. In particular, Bhagwati (1978) pointed out that pursuing an export-promoting strategy seems to be more neutral among industries and the incentives provided tend to be less chaotic. This is likely to promote economic growth more effectively than an import-substitution regime. Papageorgion et al. (1990) argued that trade liberalization promotes economic growth, even in the short term, and does not increase unemployment in either the manufacturing or agriculture sectors. Dollar (1992), Sachs and Warner (1995), Edwards (1998), Esser et al. (1996), Taylor (1998), and Altenburg (2011) acknowledged that liberalization is conducive to economic growth. Hobday (1995), Pietrobelli (1998), Kraay (1999), and Hahn (2004), who all applied firm-level data, supported learning by exporting hypotheses and demonstrating potential causality travelling from exports to productivity improvements.

However, since the late 1990s, many governments have been reassessing these policies in the wake of significant setbacks resulting from pursuing conventional economic policies under the Washington Consensus. Consequently, policymakers in these countries started searching for alternative development strategies. The crises that hit many countries, from the Mexican and Asian financial crises to the global financial meltdown, have tended to accelerate the revival of industrial policy initiatives. Rodriguez and Rodrik (2001) and Harrison and Hanson (1999) criticized previous empirical works, mostly on the grounds of model misspecification, inappropriate data sets and unsuitable econometric techniques. Such critics argue that there is no credible evidence to support trade liberalization having positive consequences for economic growth. Bernard and Jensen (1999), Isgut (2001), Arnold and Hussinger (2005) and Alvarez and López (2005), who all support a self-selection hypothesis,[5] challenge the traditional view of the benefits of trade openness for productivity and economic growth and posit that exporting does not necessarily improve productivity, and that the positive correlation which occurs between exports (trade) and productivity (growth) arises because firms who participate in export markets are already productive operations. Pack and Saggi (2006) and Chang and Andreoni (2016) argue that industrial policy could play an important and successful role in supporting latecomer industrialization, mainly because of pervasive market failures. Such market breakdowns include coordination failure, in which firms will not invest until others undertake necessary related spending; dynamic scale economies and knowledge spillovers, whereby industrial policy helps to determine future production possibilities under learning-by-doing economies; and information externality, within which governments are able to encourage the discovery of future business opportunities. Hausmann, Hwang and Rodrik (2007), and Hausmann and Rodrik (2003) argued that due to the nature of investment, where externality is involved, without any interventions such as subsidies or trade protection for innovative activities, the investment levels of these products are likely to be suboptimal.

A number of recent studies have also offered new seeds of thought regarding the use of industrial policies, addressing the shortcomings of past failures and highlighting the conditions necessary for such initiatives to work effectively going forward. Melitz (2005), Greenwald and Stiglitz (2006), and Aghion et al. (2015) were in favor of the role of industrial policy in generating economic growth, but the effectiveness of such policy depends on the supporting environment. For example, Melitz (2005) highlighted the role of industry characteristics such as learning potential, the shape of the learning curve, and the degree of substitutability between domestic and foreign goods that must be taken into consideration when assessing policy effectiveness. Aghion et al. (2015) pointed to the importance of domestic competition for suitably designed industrial policies in inducing innovation and productivity growth. In the absence of domestic competition, firms may choose to operate in different sectors to face lower competition in product markets, leading to high sectoral concentration and low incentives to innovate.

Debates on the impact of globalization go beyond growth, productivity, and innovation. The trade liberalization–wage nexus is another aspect receiving attention. Based on a neoclassical trade model, it is expected that the wage difference between skilled and unskilled workers will contract as a corollary outcome of international trade, generating a favorable effect on income equality. Supporting evidence has been uncovered in some countries, such as India (Mishra and Kumar 2005), Kenya (Bigsten and Durevall, 2006), and Indonesia (Amiti and Cameron, 2012). However, such a theoretical postulation is not always supported by empirical studies. The wage premiums have been found to be persistent in a number of studies, for example, the cases of Morocco (Currie and Harrison, 1997), Mexico (Hanson and Harrison, 1999), Argentina (Galiani and Sanguinetti, 2003), Colombia (Attanasio et al., 2004), Turkey (Meschi et al., 2016), and Ethiopia (Haile et al., 2017). Friction in labor markets, pre-liberalization and post-liberalization protection structures, and the skill-enhancing trade hypothesis provide explanations for the persistence of the wage skill premiums revealed in these studies.

Another crucial aspect of the debate relates to the shift of manufacturing share from industrialized to emerging countries and emergence of 'global value chains' (GVCs). From the 1990s onwards, the manufacturing share of G7 nations fell noticeably from two-thirds to under a half (Baldwin and Okubo, 2019), and many multinational enterprises shifted the labor-intensive stages of production to low-wage nations. Not only did production processes move out of G7 countries, but also some parts of managerial, technical, and marketing operations migrated offshore away from the G7 participants. In addition, rapid advances in production technology and technological innovations in transportation and communications, along with liberalization in trade and investment policy, allowed companies to 'unbundle' the stages of production so that different tasks were able to be performed in disparate locations. This has resulted in a pivot in the composition of exports (trade) towards intermediate goods (parts and components [P&Cs]) and has facilitated global integration in many countries, especially within Asia. Some scholars argue that productivity improvements emerge under this type of trade with ample business opportunities for firms to grow and become internationally competitive (Jones and Kierzkowski, 1990, Jones and Kierzkowski, 2001 and Deardorff, 2011). Technology spillovers, especially vertical spillover, induced by the involvement of multinational enterprises (MNEs) in GVCs helps boost productivity in a host country (see, for example, Javorcik, 2004 and Blalock and Gertler, 2008).

However, the shift of manufacturing share from industrialized countries and the emergence of GVCs, partly induced by trade and investment liberalization, have led to concerns, especially relating to the effects on labor market outcomes. Artuc et al. (2010), Autor et al. (2013), and Ebenstein et al. (2014) found that trade with lower income countries depresses wages and employment in the industries, occupations and regions that are subject to import competition in developed countries. In addition, many studies (such as Feenstra and Hanson, 2001 and Bhagwati, 2000) point to the relative increase in the demand for skilled workers due to the increasing importance of global production networks, resulting in a persistent wage gap between unskilled and skilled employees. Employment polarization and burgeoning income inequality became some of the prime causes driving the recent anti-globalization trade tension between the United States and China and tariff hikes in many countries.

The emergence of GVCs and relocation of MNEs have raised concerns, not only for developed countries, but also for developing nations. While participating in GVCs provides ample business opportunities for firms to grow and become internationally competitive, such prospects tend to be unevenly spread and are usually in favor of large and/or multinational enterprises. In many cases, the growth openings for these organizations come at the expense of small and medium enterprises. Hence, participating in GVCs potentially results in even greater productivity disparities across firms, which may not guarantee overall improvement in a country's productivity. In addition, the shift in favor of the demand for skilled workers in developed countries in response to GVCs and the relocation of MNEs may imply an increase in the demand for unskilled labor in developing countries. As a result, with the continued specialization in global production, the wage gap between unskilled and skilled workers in developing countries will potentially contract, but this raises alarm bells in terms of broader economic development issues since the expanding global production network might result in a trap involving low-skill, low-quality production in developing nations having an adverse impact on overall economic development, as well as sustainable economic growth. However, some scholars, for example Feenstra (2004), Leamer and Schott (2005), and Kiyota (2012), argue that firms operating in developing and developed countries face different cones of production. Unskilled labor-intensive activities outsourced by firms in developed countries might require relatively skillful workers in developing countries. Therefore, it is possible that the demand for skilled workers could increase in both developing and developed countries simultaneously.

Additional crucial debate is related to the impact of liberalization through the proliferation of free trade agreements (FTAs). FTAs represent one of the most notable phenomena emergent in the world economy since the onset of the new millennium (Baldwin and Jaimovich, 2012). The cumulative notifications of FTAs notified to the World Trade Organization (WTO) increased from 44 in 1994 to 501 in 2020. Whether and how exporters respond to FTA preferential schemes are open empirical questions with immense policy implications, because of the fact that not all exports are eligible to enter into preferential schemes. Products must comply with rules of origins (RoOs), that is, the rules proving the origin of goods for the purpose of determining their eligibility for tariff concessions. In addition, there exists a burden induced by the administrative procedures necessary to receive the preferential treatment. All in all, the impact of preferences on exports and other key variables like productivity is not as straightforward as usually expected in cases of multilateral and/or unilateral liberalization. Empirical studies have not yet reached consensus on the impact of FTAs on economic outcomes, especially concerning trade and productivity.[6]

1.1 Purpose of the book

With the unsettled debates ongoing, this book aims to examine the impact of globalization, especially in the context of trade and investment regimes, on key economic outcomes by using Thailand as a case study. The key economic outcomes under scrutiny in this book are informed by the debates discussed earlier, including trade, innovation, productivity, and labor market outcomes (wages and employment). Employing a country as a case study not only provides an insightful perspective, especially in terms of policy changes and their impacts, but is also in line with the firm heterogeneity theory postulated by Melitz (2003), where even within a narrowly defined industry, some firms are much larger in size, more productive, and more profitable than others. Thus, using firm-level or plant-level data to analyze the effects of globalization is more appropriate. So far there has been no empirical study which synchronizes all these issues/debates in analyzing the impact of globalization on key economic outcomes, particularly one using Thailand as a focus of research.[7]

Thailand provides a potentially illuminating case study for the subject at hand due to the following reasons. First, trade liberalization has been evident in Thailand since the late 1980s. Tariffs represent a core tool in conducting trade policy, while non-technical non-tariff measures (non-technical NTMs) have been used only across a narrow range of products, mainly certain sensitive agricultural goods such as soybean, palm seed, silk, and milk. Between the 1960s and the mid-1980s, as in other developing countries, the high tariff levels associated with an escalating tariff structure were used to promote industrialization. As part of its commitments under the WTO, a comprehensive plan for tariff reduction and rationalization was proposed in 1990 and implemented in 1995 and 1997. The Thai government again introduced tariff cuts, commencing in June 2003, followed by a 4-year period of tariff reductions from 2004 to 2008. Average tariff rates in Thailand have declined noticeably since 1995. The Thai government has also been active in signing FTAs. As a result, as of the end of 2020, 14 FTAs are in effect and another 5 are under negotiation. FTA partners include various countries in Asia and Latin America, including ASEAN (Association of Southeast Asian Nations) members, Japan, the Republic of Korea, China, Australia, New Zealand, India, Chile, Peru, and Hong Kong – many of which have more than one FTA running in effect concurrently. Whether such liberalization leads to better economic outcomes in Thailand, especially firm productivity improvements and better labor market outcomes, remains an unresolved issue.

An additional consideration is that Thai manufacturing is broad-based when compared to neighboring countries, covering a wide range of industries from traditional labor-intensive products such as garments and footwear to several key industries in the machinery and transport equipment sectors, including automotive, electronic, and electrical appliances. Multinational enterprises (MNEs) have engaged in the Thai manufacturing development over the past four decades, and foreign direct investment (FDI) has been a crucial channel supporting MNE involvement in Thailand. In attracting FDI, providing investment incentives through the Thailand Board of Investment (BOI) represents a key instrument. The direction of investment promotion has been altered several times, in line with implemented industry policies. A major change took place once again in 2017 with the BOI investment promotion plan (2015–2021), and ten newly targeted industries were selected to hopefully serve as new growth engines. The Eastern Economic Corridor (EEC), connecting three eastern provinces, was established as a new special promoting zone in 2017 to help enhance national competitiveness through research and development (R&D) and innovation. The means by which providing investment incentives through the BOI helps attract foreign investment and by which globalization via the involvement of MNEs helps enhance innovation, productivity, and skilled employment in Thailand remain unclear, and empirical evidence is also sparse. Previous empirical studies have been undertaken (such as Kohpaiboon, 2003, 2006; Wongseree, 2012 and Tanttratananuwat, 2015), but they examine the issue mainly from the perspective of the impact of MNEs on generating growth and technology spillovers, while little attention has paid to the role of BOI investment promotion.

Lastly, Thailand stands out among Southeast and East Asian countries as having intensively participated in GVCs, indicated by the relative importance of parts and components (P&Cs) in total manufacturing trade – around 24 percent and 30 percent of exports and imports in 2020, respectively (Table 4.7). As pointed out earlier, there is still an unresolved debate concerning the impact of GVCs in developing countries, particularly in terms of issues relating to the GVC-productivity nexus, GVC wage/employment, and GVC upgrading. So far there has been no empirical study examining these issues systematically within the Thai context. Chongvilaivan and Thangavelu (2012) and Kohpaiboon (2019) investigated the role of GVCs, but only in terms of labor market outcomes, that is, employment. Chongvilaivan and Thangavelu (2012) did not address the role of GVCs itself; instead, outsourcing in their study is defined loosely as the arrangements whereby the physical and/or human resources related to a firm's production factors are administrated by outside providers. Kohpaiboon (2019), using the industrial censuses of Thai manufacturing between 2006 and 2016, examined the decision to hire workers, but did not clearly illustrate its impacts on wage skill premiums, innovation, and productivity.

1.2 Contents of the book

The book is organized in the following manner. The first three chapters intend to lay the groundwork for analyzing the impact of trade and investment liberalization on the key economic outcomes in Thailand discussed later in Chapters 5, 6, and 7. Chapter 2 looks at the trade policy regime in Thailand, especially after the late 1980s, when liberalization and export promotion were emphasized. The trade policy reviewed in this chapter is composed of both tariff and non-tariff measures, although the former represents the core tool in conducting trade policy in Thailand. With respect to tariff measures, not only nominal tariff rates are considered, but also effective rates of protection, where both input and output tariffs are simultaneously examined. The key factors determining tariff rates are also presented and discussed in this chapter. Turning to non-tariff measures, this chapter provides a broader perspective, including a focus on technical NTMs like sanitary and phytosanitary (SPS), which have become increasingly predominant, not only in Thailand but also in other countries, since the early 2000s. The factors determining SPS are also presented in this chapter.

Another two important policies relevant to the path of globalization in Thailand, free trade agreements (FTAs) and investment initiatives, especially those governing foreign investment, are reviewed in Chapter 3. Details of FTAs, especially those concerning effective market liberalization, in which Thailand has been involved since the 1990s, involving coverage and tariff cuts are discussed in this chapter. In addition to FTAs, this chapter reviews the investment promotion regime in Thailand since the late 1980s, when export-led industrialization was implemented. A major change that took place in 2017 in the wake of an amendment included in the Board of Investment (BOI) promotion plan (2015–2021) to promote activities enhancing national competitiveness through research and development (R&D) and innovation under the new policy package known as Thailand 4.0 is also assessed.

Chapter 4 looks at trends and patterns concerning trade, both by sector and market, in Thailand. Trade in global value chains (GVCs) is investigated to reveal the trends and patterns within the parts and components trade in Thailand and other Asian countries. Movements of inward foreign direct investment in Thailand by sector and economic territory are also discussed in this chapter. Whether the introduction of new investment promotion privileges and the establishment of Eastern Economic Corridors (EEC) have been able to attract more foreign investors and changes in foreign investment patterns, both in terms of sector and territory, are investigated here. The impact of the US–China trade war and COVID-19 on trade and investment in Thailand is also briefly examined.

Progressing on to Chapter 5, the impacts of MNEs and exporting on R&D investment in Thailand are examined. Three types of R&D investment are considered in this chapter, namely R&D leading to improved production technology, R&D product development, and R&D process innovation. Both a firm's decision to invest in the three types of R&D and its R&D intensity are investigated. Examining both aspects assists us to clearly understand the role of MNEs and exporting activity in terms of influencing these three types of R&D. In addition, it is possible that MNEs may import technology from their headquarters, instead of decentralizing R&D activity in the host country. However, their entering may help stimulate indigenous firms to set up more R&D activities in the home country. This chapter examines not only the direct effect of MNEs on R&D activity, but also their indirect effect, referred to here as R&D spillover, to help indigenous firms set up R&D activities in the country.

In Chapter 6, globalization and firm productivity are analyzed. A range of industrial policy tools, including tariffs, subsidies as non-technical NTMs, and investment incentives, are included in investigating the role of globalization within firm productivity. The tariff protections applied here comprise both nominal and effective tariffs. With nominal tariffs, the effects on output and input products are separately investigated. In terms of effective rates of protection (ERP), this study includes not only a traditional ERP measure, but also a measure incorporating possible water in tariffs, that is, the tariffs imposed are not effective in protecting firms in industries. The effects of partial trade liberalization undertaken through FTAs between Thailand and its trading partners, as well as the role of GVCs, measured through in terms of the parts and components trade, are also examined.

The effects of trade and investment liberalization on employment skills and wage skill premiums are explored in Chapter 7. As in the previous chapter, various types of industry policies are examined. Tariff protection is considered both in terms of nominal – separated between finished and raw material – and effective tariffs. For the effective rates (ERP), a traditional ERP measure and a measure incorporating possible water in tariffs, as well as the effect of FTAs, are all considered. The roles of firm-specific factors, including market orientation, capital deepening, foreign ownership, and industry-specific variables, particularly the role of the parts and component trade, are included to better understand the impact of globalization on labor market outcomes. The impact of investment incentives through the BOI is also analyzed in this section. In the last chapter, conclusions and policy inferences are provided.

Notes

1 This was followed in July 2018 by the US levying a 25 percent tariff on 818 imported Chinese products (List 1), followed by a further 25 percent on List 2 products ($US 16 billion) and 10 percent on List 3 ($US 250 billion) in September 2018. In retaliation, China levied a range of additional tariffs, between 5 percent and 25 percent, on 5,207 products ($60 billion), before imposing reciprocal 25 percent tariffs on US$16 billion worth of goods in August 2018 and $60 billion the following month. Note that the Phase One Deal refers to the initiative related to rollback tariffs, expanding trade purchases, and renewing commitments on intellectual property, technology transfer, and currency practices.

2 For example, in Indonesia, the government announced in August 2019 an increase in tariffs of 7.5 percent–10 percent on 900 consumer goods, while in November 2019 the authorities imposed a provisional duty on imports of yarn made of synthetic and artificial staple fibres, with the rate of duty equalling Rp.1,405 per kg. as well as removing several categories under which (temporary) imports are tariff exempt. In Malaysia, anti-dumping duty has been imposed in many cases. In November 2019, for example, the authorities imposed a provisional anti-dumping duty, with the rate from 35.4 percent to 108.1 percent of the CIF value, on imports of cellulose fiber–reinforced cement flat and pattern sheeting from Indonesia, while in January 2020, a definitive anti-dumping duty, with the rate between 3.62 percent and 20.09 percent, on imports of steel concrete–reinforced bar products from Singapore and Turkey was imposed for a period of 5 years. Vietnam has levied tariffs on some goods from China, accusing the latter of using Vietnam to avoid the US tariff imposing on Chinese goods exports, e.g., an anti-dumping tax of between 2.46 percent and 35.58 percent on aluminum products from China. Other countries, Malaysia and Indonesia, for example, have also imposed tariffs on Chinese steel imports with the same accusations as argued by Vietnamese officials.

3 See references from https://www.wionews.com/opinions-blogs/economic-nationalism-takes-a-lead-in-post-covid-19-asia-298897

4 Information was retrieved from https://www.globaltradealert.org/global_dynamics/year-from_2020/year-to_2020/day-to_0729.

5 The self-selection hypothesis posits that only the more productive firms are able to export, that is to say, firms self-select into export markets. Under this hypothesis, exporting would not improve productivity gains, and the positive correlation which occurs between exports (trade) and productivity (growth) is because firms who participate in export markets are already productive operations.

6 Boffa et al. (2019); Osnago et al. (2017); Ruta (2017), for example, found preferential trade agreements help boost exports and deepen global value chains. However, some studies, including Hayakawa et al. (2020); James (2005) and Krishna (2005), have some doubts about the ability of preferential trade agreements to boost exports/trade. James (2005) and Krishna (2005) argued that RoOs have been used as policy instruments to benefit some special interest groups. Hayakawa et al. (2020), using Thailand as a case study, show that RTA regimes have a small impact on exports. Export firms tend to use other regimes, including duty drawbacks, to import raw materials and other goods used for producing exports.

7 See for example, Urata and Yokota (1994) which examines trade liberalization effects on total factor productivity; Kohpaiboon (2003), Diao, Rattso, and Kokke (2006), which looked at the relationship between FDI and export growth. Hayakawa et al. (2020) examine the impacts of trade liberalization on linkages between exports and imports.

2 The trade policy regime in Thailand

2.1 Tariff measures

In the area of trade policy, Thailand has recently implemented both tariffs and quantitative restrictions (QRs) as trade policy instruments, but historically it has had a greater reliance on tariffs rather than on quantitative restrictions (QRs) (World Bank, 1993: pp.57–8). From 1960 to the early 1980s, trade policy was characterized as representing an import-substitution industrialization strategy in which trade policy-induced economic incentives in favor of domestic, rather than export-oriented, industries. To pursue the import-substitution industrialization strategy, the government introduced high tariff levels and an escalating tariff structure to encourage local manufacturing. Tariff rates on finished products were set at a high level and higher than intermediates and capital goods. For example, in 1971, tariff rates for durable and non-durable consumer goods were raised to around 30–55 percent, while those on intermediate goods, machinery and equipment were only 20–30 percent. In 1974, tariff rates on machinery and equipment for both agricultural and industrial use were reduced to 10 percent.[1] The escalating tariff structure tended to encourage local enterprises to enter the production of highly protected finished goods, regardless of the existing comparative advantages of the country. Hence, this was likely to cause inefficiency in domestic resource allocation.

Tariff restructuring in Thailand could not be implemented until the late 1980s mainly due to the poor fiscal situation. Between 1982 and 1984, a special surcharge on imports was imposed, but was replaced by an increase in nominal tariff rates in 1985; that is, tariffs on raw materials and intermediate goods were raised by 5 percent, while those on finished goods, except for certain textile and machinery items, were raised by 10 percent. From the late 1980s to the mid-1990s, when the fiscal position was improving along with the general economic boom, the Thai government undertook a considerable tariff cut. Tariff reductions commenced with electrical and electronic goods in Chapter 85 of the Harmonized System (HS), as well as with various industrial inputs, totaling 115 items in 1988 (World Bank, 1993). In September 1990, tariffs on several machinery and equipment imports were reduced to 5 percent (WTO, 1990: p.84, Kohpaiboon, 2006).

A comprehensive plan involving tariff reductions and rationalization was proposed in 1990 and implemented between 1995 and 1997 as part of World Trade Organization (WTO) commitments. Tariffs were significantly lowered on some

DOI: 10.4324/9781003144076-2

4,000 items (at the 6-digit Harmonized System (HS) level) or 75 percent of total tariff lines. The average tariff rates for overall products declined from around 40 percent in 1989–1993 to 22 percent in 1995, in which the reduction of tariffs was higher for manufacturing products than primary (Figure 2.1). Tariffs in all stages of production substantially declined, but the escalating tariff structure remained in place, reflected by a higher tariff rate on finished products than on capital and intermediate goods. Interestingly, the reform process was disrupted due to the financial crisis in 1997, and tariffs in many categories were temporarily increased. For several luxury products, such as cosmetics, clothing, glassware and crystal, certain shoes and jewelry, leather products, and perfumes, tariffs increased from 20 percent in 1995 to 30 percent in 1997. Moreover, in some products, such as lenses, eyeglasses, cameras, watches, pens, and lighters, tariffs were raised to 30 percent from only 5 percent during the same period. Tariffs on completely built-up (CBU) passenger cars were raised from around 42–69 to 80 percent. A surcharge of 10 percent was introduced, except for goods subject to less than 5 percent tariff rates. However, to encourage investment after encountering the financial crisis in 1997, tariff reductions for over 600 tariff lines and an abolition of surcharges occurred in August 1999 (WTO, 1999: p.37, Jongwanich and Kohpaiboon, 2007). The average applied tariff rates on all products declined to 17 percent in 2000 from around 42 percent in 1998–1999 (Figure 2.1). The share of categories in which applied tariff rates exceeded 30 percent was only 7.9 percent in 2002, dropping noticeably from more than 25 percent in the 1990s, while the share of products on which tariff rates were less than 5 percent doubled, jumping from 20 to 40 percent during the same period (Table 2.1).

Tariff restructuring received a renewed emphasis in the early 2000s. The Thai government introduced tariff cuts, commencing in June 2003 (implemented in October 2003), followed by a 4-year period of tariff reductions from 2004 to 2008. There were around 900 items involved in the tariff reduction process,

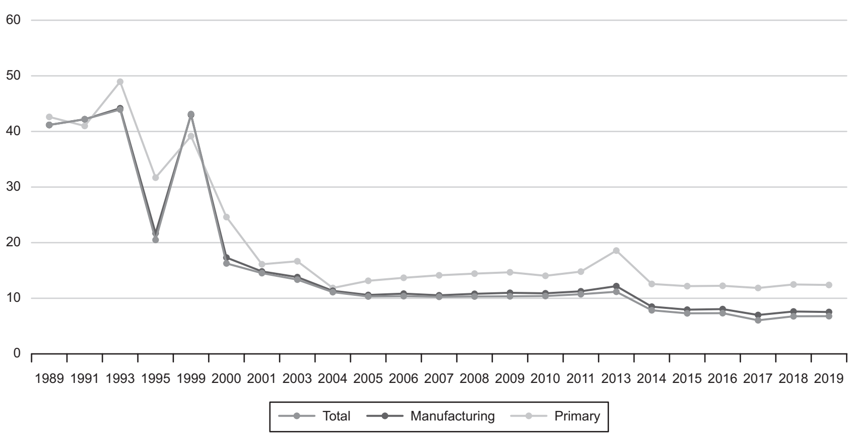

Figure 2.1 Average tariff rates (applied rate) in Thailand during 1989–2019 (percent). Source: Author' s calculation from World Integrated Trade Solution (WITS)

Table 2.1 Share of 4-digit HS categories of applied tariff rates in Thailand, 1989–2019 (percent)

Tariff band	*1989*	*1995*	*2002*	*2003–2005*	*2006–2010*	*2011–2015*	*2016–2019*
0	2.5	2.6	5.6	5.7	20.3	20.5	31.6
0.1–5	14.4	17.3	33.4	38.2	31.1	31.1	26.8
5.1–10	14.2	17.6	14.0	13.4	11.1	11.0	14.2
10.1–15	12.7	3.2	4.0	6.5	10.6	10.6	4.8
15.1–20	15.4	16.4	21.3	16.2	8.3	8.3	6.9
20.1–30	15.8	16.0	13.8	13.7	12.9	12.9	11.3
30.1–100	25.0	26.8	7.9	6.4	5.6	5.6	4.5

Source: Author's calculations.
Note: Data in 1989 and 1995 is from World Integrated Trade Solution (WITS).
From 2002, data is from the Ministry of Finance, Thailand.

covering a wide range of manufacturing intermediates, such as rubber and articles thereof (HS40), glass and glassware (HS70), knitted fabrics (HS60), other base metals (HS81), woven fabrics (HS58), articles of stone (HS68), man-made staple fiber (HS55), wadding yarns (HS56), cotton (HS52), and miscellaneous vegetable preparations (HS21) (see Table 2.2 providing details of the selected items scheduled to have tariff rates cut between 2002 and 2005, according to the magnitude of the cuts). Changes in tariff rates between 2006 and 2008 were minor compared to the 2005 tariff structure overhaul. The magnitude of tariff reductions involved was moderate, within the range of 0 percent to less than 8 percent. Interestingly, there was a shift in the distribution of the tariff lines due to the comprehensive tariff reform. More than 20 percent of tariff lines were in the zero-tariff rate in 2006–2010, up from only 5.6 percent in 2003–2005, while there was evidence of shifting the tariff lines from the 16 to 20 percent bracket to lower brackets, with little impact on those belonging to the above 20 percent brackets (Table 2.1).

The tariff rates gradually declined after 2008, except in 2011–2013, where the global financial crisis caused slight increases in tariff rates, which were more for primary products. The average tariff rates slightly declined from 10.8 percent in 2010 to 7.5 percent in 2019, with most of the reductions being with manufacturing products (Figure 2.1). There was a continuous shift in the distribution of tariff lines. In 2016–2019, around 32 percent of tariff lines were tariff free, while tariff lines between the 10 and 20 percent tariff rates noticeably declined to around 12 percent in 2016–2019 from about 21 percent in 2006–2010. However, despite a series of tariff reductions, the escalating tariff structure still exists. In 2019, tariffs for finished products were higher than those for intermediate products, that is, 13 percent for finished products and around 4 percent for capital and intermediate products. The cascading tariff structure exists even when weighted average tariff rates are considered (Table 2.3).

Compared to other countries in East and Southeast Asia, tariff rates in Thailand were noticeably higher before the tariff structural reform in the early 1990s (Table 2.4). While the average (simple) tariff rate in Thailand went as high as 42 percent in 1990, the rates in Indonesia and Malaysia were 23 and

Table 2.2 Average tariff of selected items under tariff restructuring in Thailand, 2002–2005 (percent)

HS		*Average tariff rates*				*Highest rates of tariff difference in 2002–2005*
		2002	*2003*	*2004*	*2005*	
		(1)	(2)	(3)	(4)	percent
40	Rubber and articles thereof	23.3	23.3	15.0	8.6	8.3
70	Glass and glassware	18.0	10.1	10.1	10.1	7.9
60	Knitted fabrics	20.0	20.0	12.5	5.0	7.5
81	Other base metals	9.4	3.2	2.5	2.5	6.2
58	Woven fabrics, lace, etc.	20.0	20.0	13.2	6.1	6.8
68	Articles of stone	18.3	11.6	11.6	11.6	6.6
55	Man-made staple fiber	15.9	15.9	9.4	4.8	6.5
56	Wadding yarns	17.7	17.7	11.4	6.1	6.3
52	Cotton	15.5	15.5	9.2	4.8	6.3
21	Miscellaneous vegetable preparations	30.3	24.1	24.1	24.1	6.2
54	Man-made filaments	15.0	15.0	8.9	5.0	6.1
13	Laces, gums, and other vegetable slabs	16.1	10.0	10.0	10.0	6.1
50	Silk	14.9	14.9	8.9	5.1	6.1
48	Paper and paperboards	17.7	12.2	12.2	6.8	5.5
83	Misc. articles of base metals	19.1	13.6	13.6	13.6	5.5
79	Zinc and articles thereof	9.0	5.9	4.1	4.1	4.9
87	Vehicles (other than railway)	38.2	38.2	33.5	32.2	4.8
78	Lead and articles thereof	9.2	4.9	4.5	4.5	4.7
69	Ceramic products	22.7	18.0	18.0	18.0	4.7
11	Products of the milling industry	30.1	26.2	25.5	25.5	4.5
82	Tools, implements, cutlery, etc.	20.6	16.2	16.2	16.2	4.4
	Average all tariff items	**14.3**	**13.3**	**12.0**	**11.0**	**2.3**

Source: Jongwanich and Kohpaiboon (2007).

16 percent, respectively. However, since the reform in the early 1990s, the gap between tariff rates in Thailand and other Asian countries has become narrower, reflecting significant progress in opening up the country, although the rate of tariffs in Thailand has still remained the highest among Asian countries. In 2000, the simple average of applied tariff rates in Thailand for all products was around 17 percent, while in Indonesia, Malaysia, and the Philippines, the tariff rates were less than 10 percent. The tariff rate in Vietnam was around 14 percent. Tariff rates in Thailand were still slightly higher than other Asian countries after the tariff reform in the 2000s, especially in terms of final products, but the reform lowered overall Thai tariff rates to 8 percent, compared to 4–7 percent in other countries in 2019. Interestingly, the cascading tariff structure is evident in all Asian countries; in other words, the tariff rates for finished products were set at a higher level than intermediates and capital goods, but the gap between finished products and intermediate/capital goods in Thailand tends to be higher than in other countries, even after the tariff reforms.

Table 2.3 Tariff rates by product category, 1990–2019 (percent)

	Simple average						
	1990	*1995*	*1999*	*2000*	*2005*	*2010*	*2019*
Total	**42.0**	**21.8**	**42.6**	**17.1**	**10.6**	**10.8**	**8.0**
Consumer goods	53.7	31.9	54.6	23.9	17.9	16.7	13.1
Capital goods	34.2	11.5	34.9	10.3	5.6	5.7	3.8
Intermediate goods	38.4	18.8	37.5	14.0	5.7	5.2	3.6
	Weighted average						
	1990	*1995*	*1999*	*2000*	*2005*	*2010*	*2019*
Total	**33.6**	**14.9**	**33.5**	**9.5**	**4.8**	**5.0**	**3.5**
Consumer goods	48.7	24.5	45.3	17.0	10.6	11.9	5.5
Capital goods	36.7	13.5	33.7	7.8	4.8	5.4	2.3
Intermediate goods	27.7	13.0	28.8	10.1	4.3	2.9	3.4

Source: Author's calculations from World Integrated Trade Solution (WITS).

Table 2.4 Tariff rates in Thailand and selected Asian countries, 1990–2019 (percent)

	Thailand			*China*			*Indonesia*		
	1990	*2000*	*2019*	*1992*	*2000*	*2018*	*1990*	*2000*	*2018*
Total	**42.0**	**17.1**	**8.0**	**39.7**	**16.4**	**7.6**	**23.2**	**8.0**	**6.3**
Consumer goods	47.4	24.6	11.4	40.3	16.1	7.1	34.8	9.6	7.3
Capital goods	34.2	10.3	3.8	27.9	13.8	5.3	13.8	4.4	3.6
Intermediate goods	38.4	14.0	3.6	35.9	14.5	6.2	12.7	7.3	4.4

	Malaysia			*Philippines*			*Vietnam*	
	1990	*2000*	*2016*	*1996*	*2000*	*2018*	*2000*	*2017*
Total	**16.4**	**9.5**	**6.2**	**24.8**	**7.2**	**4.0**	**13.8**	**6.5**
Consumer goods	21.0	13.5	9.2	13.5	9.9	6.3	20.1	9.3
Capital goods	8.7	4.4	3.3	48.0	4.0	1.4	6.7	3.1
Intermediate goods	14.7	8.1	5.7	24.1	6.0	2.9	11.2	3.9

Note: Tariff rates presented in this table are calculated by simple average, and there is no available tariff information for Vietnam before 2000.
Source: Author's calculations from World Integrated Trade Solution (WITS).

At a sectoral level, nominal tariff rates in almost all manufacturing sectors declined after the tariff structural reforms. For example, the tariff for processed food dropped to 12 percent in 2019 from around 17 percent in 2002, while that for textile products declined from about 20 percent to about 9 percent during the same period (Table 2.5). In 2019, almost all sectors had tariff rates of about 5–10 percent, except for garments and motor vehicles, for which the tariff rates are above 20 percent; and processed food products, for which the tariff rate is

Table 2.5 Tariff rates in Thailand, by sector, 1980–2019 (percent)

	1980	*1985*	*2002*	*2005*	*2010*	*2015*	*2019*
Nominal rate of protection (NRP)							
Agro-processing	34.4	30.9	17.3	18.0	16.6	16.8	12.5
Textile products	41.0	27.8	20.4	16.6	14.9	15.1	9.1
Apparel	n.a.	n.a.	31.6	31.2	31.9	33.7	28.0
Leather and footwear products	54.1	26.8	20.2	17.1	9.7	8.4	5.3
Wood products	31.6	28.2	8.2	1.9	3.1	3.0	2.2
Paper and pulp	24.0	17.8	9.9	6.8	5.0	4.9	4.2
Chemical and petroleum products	32.8	21.4	9.1	2.5	2.2	2.6	2.7
Rubber products	29.1	26.8	18.3	8.7	9.6	10.1	5.8
Other non-metal products	36.7	23.0	6.5	3.4	3.6	5.0	4.0
Metal products	25.2	16.6	1.6	0.6	0.5	0.6	0.4
Machinery and equipment	22.4	14.3	12.3	9.5	9.1	11.9	10.4
Electrical appliances	n.a.	n.a.	8.8	7.7	7.7	6.5	3.7
Medical, precision, and optical	31.2	19.7	5.3	4.3	4.0	3.5	1.9
Motor vehicles	n.a.	n.a.	26.6	22.1	23.7	24.0	21.0
Total manufacturing sector	n.a.	n.a.	11.1	8.5	7.7	9.1	7.6
Overall (weighted average)	n.a.	22.9	16.4	12.0	10.1	11.0	7.6

Source: Author's calculation.
Note: Tariffs in 1980 and 1985 are from Jongwanich and Kohpaiboon (2007), while from 2002 to 2019, tariff rates are calculated by using three input–output (IO) tables, i.e., IO2000, IO2005, and IO2015. The applied tariff rates are from the Ministry of Finance, Thailand (HS2002 6-digits).

approximately 12 percent. In line with the cascading tariff structure, industries producing intermediate goods (chemicals, metal products, and machinery, for example) tend to have relatively lower rates of tariffs than final goods–producing sectors (processed food, garments, motor vehicles, and so on) (Table 2.5). As a consequence of the cascading tariff structure, nominal protection does not provide a precise picture of protection in a particular industry.[2] In fact, the precise protection in each industry depends not only on the tariff rate applicable to that sector but also on the tariffs of all other sectors which provide production inputs (intermediate and capital goods) to that sector, both directly and indirectly.

2.2 Effective protection

To measure the protection in an industry where both input and output tariffs are simultaneously taken into consideration, the effective rate of protection (ERP) is applied. The ERP formula is shown in Equation (2.1).

$$ERP_{kt} = \frac{t_{kt} - \sum_{i=1}^{n} a^{*}_{ikt} t_{it}}{1 - \sum_{i=1}^{n} a^{*}_{ikt}} \tag{2.1}$$

where t_{kt} = tariff on product (finished products) k and time t

t_{it} = tariff on product (raw materials) i and time t

a^*_{ikt} = share of product i used in producing product k at time t.

The inter-industry linkage relationship is required to calculate ERP, which in this case is derived from Thailand's input–output table, compiled by the National Economic and Social Development Board (NESDB) and updated every 5 years. The applied tariff rates of input and output products are from HS2002 6-digits. The concordance between HS code, ISIC (International Standard Industrial Classification), and the IO table is applied in calculating ERP at the industry level.

Table 2.6 illustrates ERP estimates during the period 2002–2019, as well as the previous studies' estimates for the period 1980 and 1985.[3] Four key inferences can be drawn. First, ERP tended to be higher than NRP in all sectors, confirming the cascading structure of tariffs in Thailand. The gap between ERP and NRP was wider for finished products than industries producing intermediate goods. For example, in the processed food and garment sectors, the gap was around 16 and 50 percentage points during the period 2002–2019, while those for metal and chemical were only 0.2 and 3.6, respectively. Second, from 1985 to 2002, the ERP estimates exhibited a downward trend in all industries (Table 2.6). The simple average of the ERP in the manufacturing and overall sectors reduced from 78.4 percent and 65.9 percent in 1985 to 20.4 percent and 29.8

Table 2.6 Effective rates of protection in Thailand, 1980–2019 (percent)

	1980	*1985*	*2002*	*2005*	*2010*	*2015*	*2019*
Effective exchange rate (ERP)							
Agro-processing	58.1	135.2	30.3	38.9	31.3	31.6	27.3
Textile products	74.5	118.4	42.9	44.6	41.9	43.0	26.4
Apparel	n.a.	n.a.	68.1	78.7	84.1	91.0	87.5
Leather and footwear products	87.8	152.7	21.7	29.4	10.5	8.4	10.0
Wood products	65.4	62.0	21.5	4.7	7.9	7.8	6.0
Paper and pulp	20.4	53.5	18.8	13.8	8.7	7.6	8.1
Chemical and petroleum products	43.0	44.5	15.0	4.5	4.5	5.2	7.9
Rubber products	2.1	42.0	37.3	28.3	31.4	33.0	17.5
Other non-metal products	72.1	108.5	11.9	7.4	8.6	12.0	12.9
Metal products	35.6	70.9	2.7	0.5	0.5	0.6	0.5
Machinery and equipment	27.1	29.3	21.1	19.2	15.1	25.0	24.1
Electrical appliances	n.a.	n.a.	7.9	11.5	11.9	9.7	5.4
Medical, precision, and optical	n.a.	n.a.	0.4	2.7	3.7	2.8	0.3
Motor vehicles	n.a.	n.a.	63.1	59.1	57.0	61.3	56.6
Total manufacturing sector	51.7	78.4	20.4	18.0	15.2	19.6	17.8
Overall (weighted average)	n.a.	65.9	29.8	26.3	28.1	28.2	20.5

Source: Author's calculation.

Note: Tariffs in 1980 and 1985 are from Akrasance and Ajanant (1986) and World Bank (1988), respectively, while from 2002 to 2019, tariff rates are calculated by using three input–output (IO) tables, i.e., IO2000, IO2005, and IO2015. The applied tariff rates are from the Ministry of Finance, Thailand (HS2002 6-digits).

percent, respectively, in 2002. This is consistent with the tariff reform trend in the early 1990s, as mentioned earlier, where the rates of tariff reduction in finished products were higher than those in intermediate and capital goods. However, the tariff structural reform in the 2000s brought no significant progress in reducing ERP in various sectors, for example, agro-processing, textile products, apparel, leather and footwear products, and electrical appliances. This is an obvious example where tariff reduction during this period tended to emphasize intermediates, thereby widening the gap in ERP estimates with those of finished goods, instead of reducing the protection. For example, the ERP for processed food in 2002 was 30.3 percent and increased to 38.9 percent in 2005, while in the garment sector, the ERP jumped to 78.7 percent from 68.1 percent during the same period. However, there were some sectors where the ERP went down after the reform in the 2000s, including wood products, paper and pulp, chemical and petroleum, rubber products, metal and machinery, and equipment. Products in these sectors are likely to be intermediate products for others. For motor vehicles, the effective rate was still high even after the reform at about 59 percent in 2005, a slight decline from 63 percent in 2002, reflecting the high tariff rate attached to some types of automotive products, standing at around 80 percent.

Third, as a consequence of the global financial crisis, nominal tariff rates in many manufacturing sectors were pushed up, thereby raising the effective rate of protection in the sector. ERP in the manufacturing sector increased from 15.2 percent in 2010 to around 20 percent in 2015. ERP increased in almost all manufacturing sectors, except for wood products, paper and pulp, electrical appliances, and medical, precision, and optical equipment. Finally, the trade tension between the US and China, which has simmered since February 2018, has not interrupted trade liberalization in Thailand. ERP for the manufacturing sector dropped somewhat to 17.8 percent in 2019 from 19.6 percent in 2015, reflecting greater tariff cuts on finished products (Tables 2.5 and 2.6). ERP in all sectors, except paper and pulp, chemical and petroleum products, other non-metal products, and leather and footwear products, showed a declining trend. Many sectors, such as rubber products, textiles, and electrical appliances exhibited a significant decline in ERP during 2015–2019, but in some large sectors, such as agro-processing, machinery and equipment, and motor vehicles, ERP declined slightly by less than 10 percent.

Interestingly, ERP estimates, as in Equation (2.1), tended to overestimate the degree of trade restrictiveness for export-oriented industries (Jongwanich and Kohpaiboon, 2007 and 2020). The ERP formula as in Equation (2.1) has the implicit assumption that all tariff rates are binding on all products so that estimates of ERP accurately represent the potential incentive effects of the protective structure for firms selling products in a domestic market. Henceforth, ERP calculated as in Equation (2.1) can be referred to as ERP for import-competing products, $ERPic_{jt}$). However, tariff rates are not binding on all products, especially when firms improve productivity and are able to export. Meanwhile, as in many developing countries, Thailand has had schemes of input tariff exemption for exporters, implying input tariffs encountered by exporters are also not binding.

To take into account the situation of water in tariffs, wherein the imposed output tariffs become ineffective and input tariff exemption for exporters is considered, new ERP is estimated, called here ERP for exporting (ERPex_{jt}). Tariffs on finished products, (t_{jt}) in ERPex_{jt}, are treated as zero since the tariffs imposed become ineffective in protecting producers who export those products. Tariffs on raw materials are also treated as zero as exporters can apply for duty drawbacks.[4] However, exporters must pay tariffs in advance before applying for duty drawbacks. This creates opportunity costs for exporters, which, to a certain extent, could be captured by interest rates. In other words, t_{it} in the case of ERP for exporters is equal to market interest rates.[5]

Since only a proportion of firms in an industry can export, the ERP capturing water in tariffs ($ERPwater_{jt}$) is calculated as the weighted average between ERP for import-competing products ($ERPic_{jt}$) and the ERP for exporting ($ERPex_{jt}$), as in Equation (2.2):

$$ERPwater_{jt} = (1-\alpha_{jt}) \cdot ERPic_{jt} + \alpha_{jt} \cdot ERPex_{jt} \tag{2.2}$$

where α_{jt} is the share of exports in the output of industry *j* at time *t*.

Table 2.7 provides three alternatives of ERP for the sake of comparison, namely *ERPic*, *ERPex*, and *ERPwater* for 2002–2019. The first represents the potential incentive effects of the protective structure, while the second measure includes incentives toward exporters where their tariffs on imported inputs can be reimbursed and tariffs on finished products were not binding. Both are averaged, using export–output share, to become *ERPwater*. A reduction in ERP was revealed in all industries when water in tariffs and import exemption schemes are considered, so that the *ERPwater* for the overall manufacturing sector was only 14.6 percent, compared to the *ERPic*, which registered at 20.4 percent in 2002. The gap between *ERPic* and *ERPwater* was slightly wider during 2002–2019, partly due to the higher share of exports in output. However, the pattern for *ERPwater* was similar to that of *ERPic*, that is, comparing between 2002 and 2019, *ERPwater* declined significantly in all industries with some interruption during the global financial crisis. The considerable reduction in *ERPwater* in total manufacturing comes from six industries, which are agro-processing; electrical appliances; machinery and equipment; rubber products; medical, precision, and optical equipment; and motor vehicles, where the ERP reductions are more than 40 percent. Most of these, to a certain extent, tend to be labor-intensive sectors, in which Thailand tends to have a comparative advantage in the world market. The findings imply the less adverse impact of an escalating tariff structure when export-oriented activities are considered.

The factors determining protection across industries in Thailand have received less attention. However, Jongwanich and Kohpaibbon (2007) applied political explanations, given the economic consensus regarding the efficiency of free trade, to form a model examining protection across industries. In the model, the level of protection granted to a particular industry is determined by the interaction between demand for and supply of protection. Based on the framework,

Table 2.7 Different measures of effective rates of protection in Thailand, 2002–2019 (percent)

	2002			*2005*			*2010*			*2015*			*2019*		
	ERPic	*ERPex*	*ERPwater*	*ERPic*	*ERPex*	*ERPwater*	*ERPic*	*ERPex*	*ERPwater*	*ERPic*	*ERPex*	*ERPwater*	*ERPic*	*ERPex*	*ERPwater*
Effective exchange rate (ERP)															
Agro-processing	30.3	-2.2	10.5	38.9	-2.4	18.9	31.3	-1.7	13.3	31.6	-1.9	17.2	27.3	-1.7	15.1
Textile products	42.9	-1.9	32.3	44.6	-1.8	33.4	41.9	-1.6	32.0	43.0	-1.7	31.8	26.4	-1.7	19.3
Apparel	68.1	-2.2	53.0	78.7	-2.3	62.2	84.1	-2.5	65.9	91.0	-2.6	73.1	87.5	-2.6	70.0
Leather and footwear products	21.7	-2.1	16.4	29.4	-2.1	22.0	10.5	-1.7	5.6	8.4	-1.9	4.7	10.0	-1.9	6.4
Wood products	21.5	-1.6	14.7	4.7	-1.5	2.2	7.9	-1.7	5.7	7.8	-1.9	5.8	6.0	-1.9	4.7
Paper and pulp	18.8	-2.3	15.1	13.8	-2.3	11.3	8.7	-2.3	7.1	7.6	-2.6	5.7	8.1	-2.6	6.2
Chemical and petroleum products	15.0	-0.8	10.6	4.5	-0.9	3.9	4.5	-0.9	3.6	5.2	-1.1	4.1	7.9	-1.1	6.5
Rubber products	37.3	-1.5	18.7	28.3	-1.9	14.1	31.4	-1.8	15.1	33.0	-1.9	16.5	17.5	-1.9	8.4
Other non-metal products	11.9	-1.7	9.8	7.4	-1.4	5.1	8.6	-1.1	6.8	12.0	-1.2	9.2	12.9	-1.3	10.2
Metal products	2.7	-0.3	2.1	0.5	-0.4	0.3	0.5	-0.4	0.3	0.6	-0.4	0.5	0.5	-0.4	0.3
Machinery and equipment	21.1	-3.7	13.7	19.2	-3.6	12.4	15.1	-3.4	7.7	25.0	-3.5	14.2	24.1	-3.5	13.9
Electrical appliances	7.9	-8.4	1.8	11.5	-7.8	4.1	11.9	-5.8	6.8	9.7	-6.3	3.4	5.4	-6.3	0.9
Medical, precision, and optical	0.4	-4.6	-2.2	2.7	-4.8	-0.6	3.7	-4.0	0.9	2.8	-4.4	-0.3	0.3	-4.4	-1.5
Motor vehicles	63.1	-4.2	43.2	59.1	-3.7	40.5	57.0	-3.0	34.3	61.3	-3.1	37.5	56.6	-3.1	34.5
Total manufacturing sector	20.4	-2.0	14.6	18.0	-2.0	12.8	15.2	-1.8	9.8	19.6	-2.0	12.5	17.8	-2.0	11.5
Overall (weighted average)	29.8	-0.4	23.4	26.3	-1.8	20.3	28.1	-1.7	21.4	28.2	-1.9	20.7	20.5	-1.9	15.0

Source: Author's calculation.

Note: $ERPic_{jt}$ refers to the ERP for import-competing products, $ERPex_{jt}$ is the ERP for exporting, and $ERPwater_{jt}$ is the ERP capturing water in tariffs.

Jongwanich and Kohpaiboon (2007), using the tariff information from the early 2000s, showed that protection bargains in Thai manufacturing are struck on ERP instead of NRP, and for the demand side, the evidence supports the hypothesis that a highly concentrated industry[6] is more likely to successfully lobby policymakers to provide protection. The severe impact of the 'free-rider problem' tends to decrease and the ability of an industry to coordinate to pursue collective action tends to increase. An industry that is threatened with import competition, in other words, faces high import penetration ratios and tends to receive a higher level of protection. Import competition, instead of a decline in output growth, represents an effective force for individual enterprises to form an interest group and lobby for protection to be granted and for policymakers to opt for granting protection to slow the pace of structural change.

Interestingly, a degree of market orientation, measured by the export-to-output ratio, is insignificant in influencing protection in Thailand, with two plausible explanations. First, as in many developing countries, Thailand has had several schemes promoting input tariff exemption for exporters. Any requests for the lowering of protection levels from exporters become of diminished concern from the viewpoint of policymakers. Second, even though applying duty drawback schemes incurs dollar costs (for example, administrative costs) for exporters, requesting improvement in the administration of tariff exemptions (such as reducing red tape and bureaucratic procedures) would be easier and less costly than requesting reductions in input tariffs. By contrast, the high level of foreign firms in an industry[7] tends to lead to success in requesting protection reductions. This reflects the nature of the relatively open foreign investment policy regime of Thailand. Thai policymakers are likely to be more responsive to foreign investors' requests, including those for protection reductions.

Regarding supply-side factors, employment and backward linkage generation were used by policymakers to justify their decisions to grant protection.[8] Interestingly, the industry's value added *per se* becomes relatively less important when making decisions to grant protection. In other words, employment and backward linkage generation are better to evaluate 'foot-loose' industries than relying on the amount of value added *per se*. In addition, there is statistical evidence showing that policymakers tend to be more easily convinced by the lobby group of industries that are heavily capital intensive and have greater minimum efficient scales, proxied by the average firm size in each industry. All in all, political explanations, given the economic consensus regarding the efficiency of free trade, effectively explain protection across industries in Thailand. Political bargains in Thailand are indeed based on effective (ERP) rather than nominal rates of protection (NRP). Demand and supply-side factors, particularly policymakers' economic ideology, are on a par in determining levels of protection.

2.3 Non-tariff measures

Historically, Thailand has relied less on non-tariff barriers (NTBs), particularly QRs, as trade policy instruments in the manufacturing sector. Most quantitative restrictions have been implemented mainly in the agriculture trade sector (World Bank 1993, pp.57–8).[9] Although non-tariff barriers have diminished noticeably in the country,[10] non-tariff measures (NTMs), especially sanitary and phytosanitary (SPS) and technical barriers to trade (TBT), have become increasingly predominant, not only in Thailand but also other countries, since the early 2000s (Figure 2.2 and Table 2.8). According to UNCTAD (2013), NTMs are generally defined as 'policy measures other than ordinary customs tariffs that can potentially have an economic effect on international trade in goods, changing

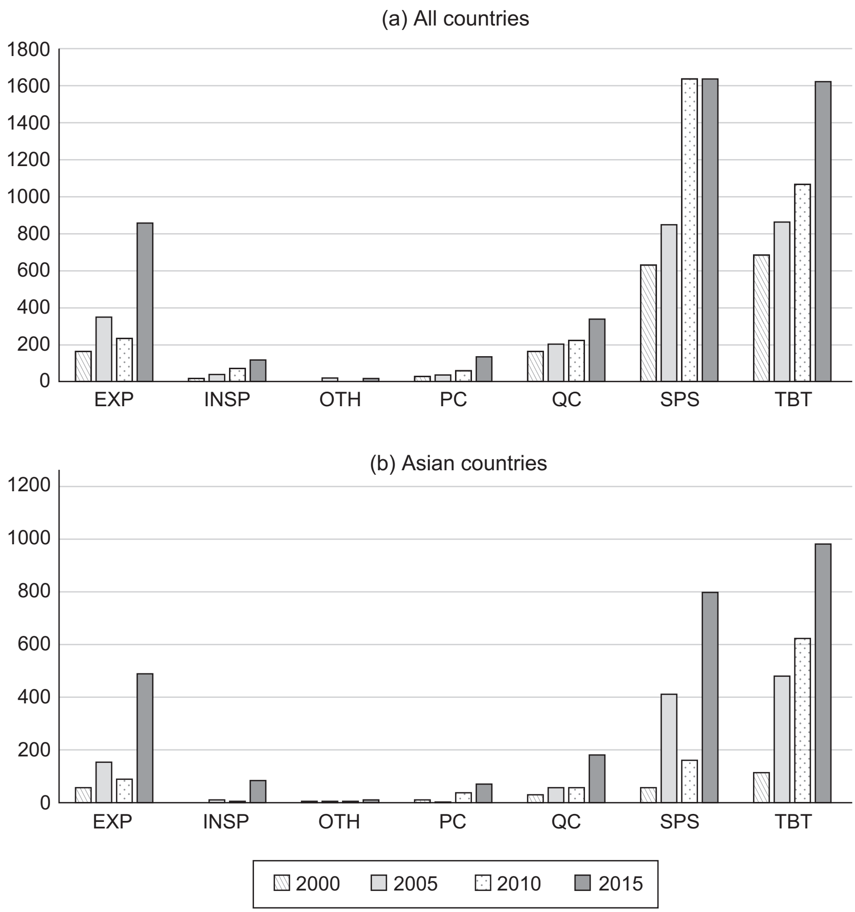

Figure 2.2 Number of non-tariff measures, 2000–2015. Note: CTPM = Contingent trade protective measures; EXP = export-related measures; INSP = pre-shipment inspection; PC = price control measures; QC = quantity control measures; SPS = sanitary and phytosanitary; TBT = technical barriers to trade. In 2017–2019, in some countries, there were no reports for various NTMs so that NTMs reported under this table tend to be underestimated. Source: Author's compilation from TRAINS (the global database on non-tariff measures). https://trains.unctad.org/Forms/MemberView.aspx?mode=search&data=default

Table 2.8 Non-tariff measures by country during 2016–2019

	2016–2019						
	CTPM	*EXP*	*INSP*	*PC*	*QC*	*SPS*	*TBT*
Asia total	3	680	111	138	347	1075	1917
AEC	3	365	83	73	187	375	739
Original AEC	2	162	68	49	104	317	377
Brunei Darussalam		1			3		4
Indonesia		41	23	15	39	115	97
Malaysia		14		1	8	7	11
Philippines		7	2	6	20	48	58
Singapore		11		1	11	5	9
Thailand	2	88	43	26	23	142	198
New AEC	1	203	15	24	83	58	362
Cambodia		31			9	15	35
Lao PDR		75	4	4	16	10	75
Myanmar		23	5	7	22	2	21
Vietnam	1	74	6	13	36	31	231
China		57	10	5	32	183	317
India		15		2	14	7	50
Japan		1	2		20	14	64
Korea		214	11	50	69	373	436
European Union	1	8	14	2	21	43	58
Middle East total		9	1		17	48	11
United States of America		18	23	2	6	108	64
Latin America	137	204	55	128	207	1843	619
Total	**167**	**998**	**205**	**277**	**638**	**3384**	**2926**

Note: In 2017–2019, in some countries, there were no reports for various NTMs, so that NTMs reported under this table tend to be underestimated.
Source: Author's compilation from TRAINS (the global database on non-tariff measures).

quantities traded, or prices or both'. The definition of NTMs is broader than that of non-tariff barriers (NTBs) since the former includes all measures, other than ordinary customs tariffs, which can be applied with protectionist intent or to address legitimate objectives such as health and safety. NTBs, by contrast, are likely to be implemented solely with protectionist intentions, such as quotas and voluntary export restrictions, so that NTBs are a subset of NTMs.

The UNCTAD classification categorizes NTMs into 16 chapters (A–P), broadly divided into import and export measures (see Figure 2.3). The export measures refer to conditions imposed by exporting countries on their own exports, while import measures are related to conditions imposed on the importing of products. The latter are further sub-divided into technical and non-technical measures. Technical measures are composed of sanitary and phytosanitary, technical barriers to trade, and pre-shipment inspection (INSP), while non-technical measures refer

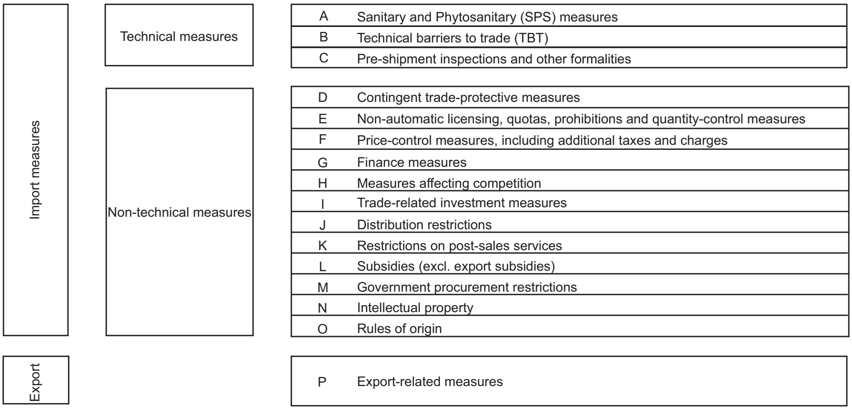

Figure 2.3 Classification of non-tariff measures. Note: Data are available only on Chapters A to I and Chapter P. Measures under Chapters J to O are not collected by TRAINS (the global database on non-tariff measures). Source: UNCTAD (2020)

to a range of other policies, which are likely to be involved more with protectionist intentions, such as price control measures, quantity control measures, countervailing, and safeguard measures. The non-technical measures are those classified as non-tariff barriers. Cadot and Gourdon (2015) point out that the nature of NTMs has altered over time. Technical measures, especially SPS and TBT, have gained more importance since the early 2000s, while prior to that they were dominated by non-technical measures, especially quotas and price restrictions.

Note that according to the WTO SPS agreement (UNCTAD, 2019), SPS refers to all measures the purpose of which is to protect human or animal health from food-borne risks, human health from diseases carried by animals or plants, and animals and plants from pests or diseases. TBT is a mandatory document laying down product characteristics or their related processes and production methods. Governments may introduce TBT regulations to fulfill legitimate objectives, such as national security, the prevention of deceptive practices, the protection of the environment, and the protection of human health or safety, animal or plant life, or health other than for SPS objectives. An example of an SPS measure is labelling requirements causally related to food safety, such as allergy warnings or warnings on the use and dosage of products. Labelling requirements can also be identified as TBT measures, but such requirements relate to providing information on the composition or quality of products, such as salt or calorie content, instead of health warnings. Another example of an SPS measure concerns identifying restrictions on residues of veterinary drugs or pesticides in food or drink, while providing safe-handling instructions related to drugs and pesticides is treated as TBT. See definitions of other measures in Appendix 2.1.

Table 2.8 shows that a number of SPS and TBT measures dominated other NTMs for Thailand and other countries during 2016–2019. The dominance of TBT over SPS was evident in East Asian countries like China, Korea, and Japan, while in the US and Latin America, SPS measures dominated TBT. In the six original Asian Economic Community (AEC) countries, the number of SPS imposed on importing products was relatively on a par with TBT measures, while in the new AEC, especially Vietnam, TBT significantly overshadowed other measures. In Thailand, the TBT measures applied on import products during 2016–2019 were slightly higher than SPS measures, that is, 198 measures for TBT and 142 for SPS. Figure 2.4 clearly shows that SPS measures in Thailand, as well as in other countries, were mostly applied for agriculture, food, and beverage products, while TBT measures were for manufacturing products. In Thailand,

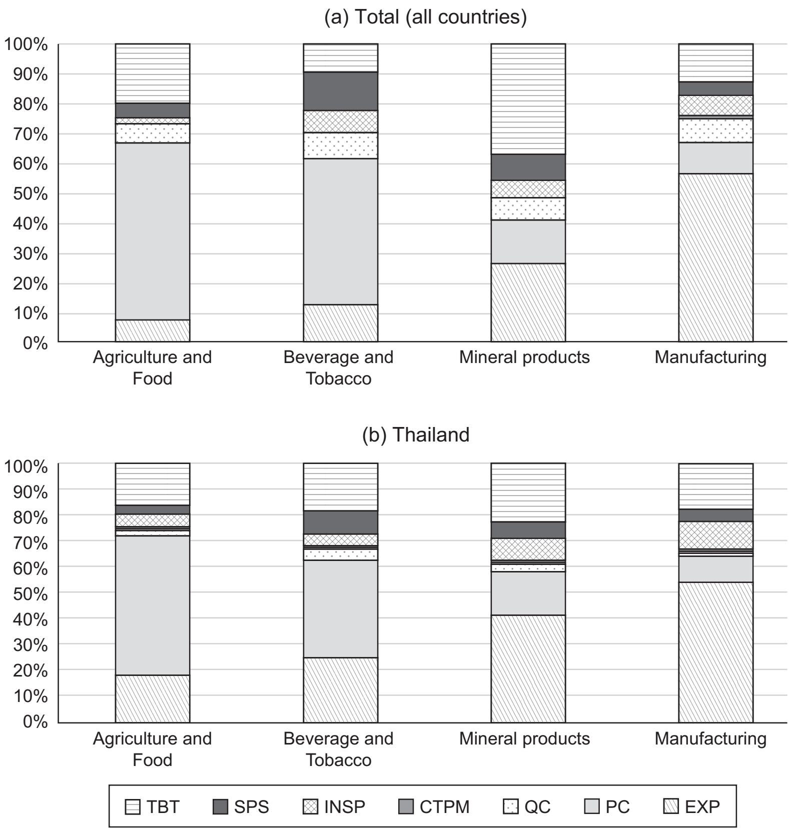

Figure 2.4 Proportion of implemented non-tariff measures, by products during 2016–2019. Note: (1) Agriculture and Food is HS code 01-21; Beverage and Tobacco (HS 22-24); Mineral (HS 25-27); Manufacturing (HS 28-96). (2) In 2017–2019, in some countries, there were no reports for various NTMs so that NTMs reported under this table tend to be underestimated. Source: Author's compilation from TRAINS (the global database on non-tariff measures)

SPS measures accounted for about 60 and 50 percent of total imposed non-tariff measures in food and beverage products, respectively, while around 10 percent were TBT measures. Edible vegetables, fruits, and nuts (HS07-08); meat, fish, and crustaceans (both frozen and processed) (HS02-03, 16); oil seed (HS12); and animal and vegetable fat (HS15) were products in which Thailand noticeably applied SPS measures. In manufacturing, by contrast, TBT measures accounted for more than 60 percent, mostly in electronics and machinery (HS84-85) and chemical products (HS28-38), whereas SPS measures were only around 10 percent. See Appendix 2.2 for examples of NTM measures imposed by Thailand during 2016–2019.

It is crucial to note that when the incidence of measures, namely the frequency index and the coverage ratios,[11] is concerned, the importance of the non-tariff measures introduced in Thailand is still evident. Figure 2.5(a) shows that the frequency index in Thailand increased to almost 0.4 in 2018 from 0.3 in 2015, while the coverage ratio went up to 0.5 from only 0.3 during the same period. However, the increases were lower than in other Asian countries, especially Vietnam, where both the frequency index and coverage ratio jumped to 0.9 from around 0.5 in 2015. In contrast to considering a number of measures (Table 2.8), the incidence of measures, especially the coverage ratio, suggests the far lesser importance of SPS compared to TBT measures, both in Thailand and other countries (Figure 2.5(b)). In Thailand, although a number of SPS and TBT measures were close (Table 2.8), the coverage ratio in the former was only around 0.1, while that of TBT was 0.3. The greater value of trade (as well as the number of tariff lines) associated with manufacturing products, which are mostly subject to TBT measures, than with agriculture and food, which are mostly linked to SPS, explains such a finding. Another interesting point is export-related measures (EXP), including export quotas or export prohibitions and quantity control (QC) measures; in particular, import quotas became more important. The frequency and coverage ratios of these two measures were higher than those associated with SPS, both in Thailand and other countries (Figure 2.5(b)). However, comparing Thailand to other Asian countries, the frequency and coverage ratios of these two measures were lower, especially the coverage ratios of quantity control (QC) measures; in Thailand, this variable stood at around 0.2 in 2018, while in the others it was around 0.5. Such evidence confirms that Thailand has been less reliant on quantitative restrictions as trade policy instruments than other Asian countries.

Product wise, a similar picture wherein several measures are concerned is evident in Thailand (Table 2.9). In terms of agriculture products, live animals and products, especially frozen meat, fish and crustaceans; vegetable and fruit products; and prepared foodstuffs, including processed meat, fish, and crustaceans were subjected significantly to SPS measures. In manufacturing products, TBT measures were mostly imposed on vehicles, chemicals, and electronics and machinery imports.

Interestingly, based on a country analysis, countries in Asia, especially ASEAN+6, tend to be less affected by Thai NTMs. The top five countries where the coverage ratio exceeded 0.85 in 2018 were Saint Lucia, Guyana, Antigua and Barbuda, Cabo Verde, and the Bahamas. In ASEAN+6, New Zealand had

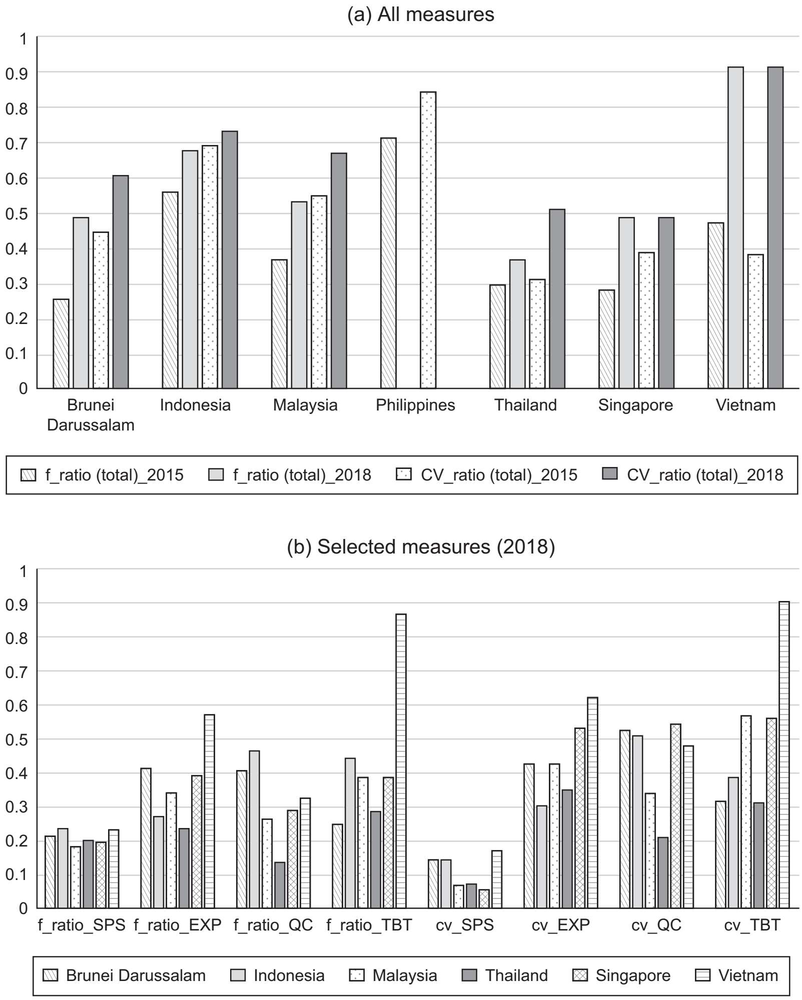

Figure 2.5 The frequency index and the coverage ratios of NTMs in selected Asian countries, 2015 and 2018. Note: EXP = export-related measures; QC = quantity control measures; SPS = sanitary and phytosanitary; TBT = technical barriers to trade. The year 2018 was selected due to more completed information of NTMs in these countries. Source: Author's calculation, using data from TRAINS (the global database on non-tariff measures)

the highest incidence (around 0.4), followed by Vietnam, Australia, Myanmar, Cambodia, Malaysia, and China, where the incidences were lower than 0.2. The higher incidence seen in the case of New Zealand is probably due to the nature of its export items to Thailand, which are mostly food products, including milk, fruits, fish and crustaceans, and preparations of cereals, flour, and starch. Particularly, in 2019–2020, milk and fruit exports from New Zealand accounted

Table 2.9 The frequency and coverage ratios imposed by Thailand by product in 2018

	The frequency ratio				*The coverage ratio*			
	SPS	*EXP*	*QC*	*TBT*	*SPS*	*EXP*	*QC*	*TBT*
Agriculture (HS01-21)	0.96	0.53	0.06	0.09	0.99	0.84	0.00	0.08
Live animals and products (HS01-05)	0.93	0.46	0.00	0.00	0.99	0.61	0.00	0.00
Vegetable products (Hs06-14)	0.96	0.31	0.00	0.41	0.99	0.00	0.00	0.04
Animal and vegetable fats, oils and waxes (HS15)	0.19	0.17	0.07	0.24	0.02	0.63	0.62	0.67
Prepared foodstuff (HS16-21)	0.96	0.31	0.18	0.18	0.98	0.19	0.11	0.12
Beverage and Tobacco	0.85	0.55	0.45	0.64	0.88	0.78	0.13	0.35
Mineral products	0.01	0.21	0.12	0.12	0.00	0.87	0.25	0.25
Manufacturing (HS28-96)	0.05	0.14	0.09	0.16	0.02	0.20	0.18	0.28
Products of the chemical (HS28-38)	0.14	0.32	0.20	0.30	0.07	0.32	0.32	0.42
Plastics and rubber (HS39-40)	0.01	0.06	0.05	0.15	0.00	0.03	0.03	0.07
Textiles and articles (HS50-63)	0.02	0.02	0.00	0.00	0.10	0.10	0.00	0.00
Articles of stone, plaster; glass (HS68-70)	0.00	0.07	0.04	0.16	0.00	0.01	0.01	0.20
Base metals and articles (HS72-83)	0.00	0.01	0.02	0.07	0.00	0.00	0.03	0.07
Machinery and electrical equipment (HS84-85)	0.00	0.04	0.05	0.16	0.00	0.15	0.15	0.25
Vehicles, aircraft and vessels (HS86-89)	0.00	0.58	0.01	0.67	0.00	0.43	0.01	0.54

Source: Author's calculation, using data from TRAINS (the global database on non-tariff measures).

for around 60 percent and 20 percent of total Thai imports. Another point that may lower the incidence of ASEAN countries is the implementation of mutual recognition agreements (MRAs) and harmonization agreements, which are intended to minimize the trade protection and compliance costs associated with non-tariff measures, implemented since 2002.[12] The agreement covers prepared foodstuffs (HS 16-22), electrical machinery, electronic equipment and telecommunications (HS85), cosmetics derivatives (HS 33-34), medical devices (HS 9018, 9019, 9022), medicinal products (HS 30), and automotive products (HS87). Products covered by MRAs and harmonization agreements account for about 40 percent of total intra-ASEAN imports. Cadot and Gourdon (2015) showed that clauses on MRAs and the harmonization of technical regulations, especially SPS and TBT, and conformity assessment procedures in regional trade agreements helped

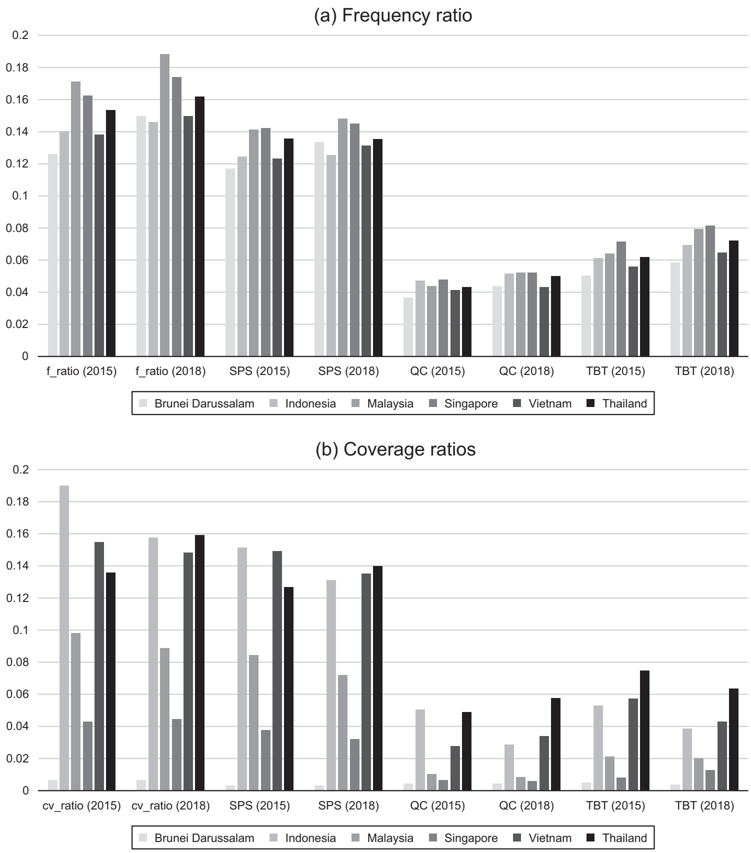

Figure 2.6 The frequency index and the coverage ratios of NTMs imposed by other ASEAN countries, 2015 and 2018. Source: Author's calculation, using data from TRAINS (the global database on non-tariff measures)

reduce the compliance costs associated with such NTMs and, hence, product prices. Deep integration through regional trade agreements (RTAs) with effective MRAs and harmonization agreements provides advantages to exporters/importers over other exporters/importers who stay outside of RTAs.

On the flip side, Thai exports have been subjected to NTMs from other ASEAN countries. The frequency index and coverage ratios show that the NTMs imposed by other ASEAN countries slightly increased during 2015 and 2018 (Figure 2.6). The coverage ratio increased to 0.16 from around 0.14 in 2015, while the frequency ratio went up from 0.13 to 0.15. Among all measures, SPS tends to be the most prevalent measure to which Thai products were subject, followed by TBT and quantitative measures. Compared to other ASEAN countries, the NTMs introduced for Thai products tended to be comparable to those introduced for Vietnamese and Indonesian products in 2015, while they were noticeably higher than those for Singaporean and Malaysian products, particularly when

Table 2.10 The frequency and coverage ratios imposed by other ASEAN countries by product in 2018

	The frequency ratio				*The coverage ratio*			
	Total	*SPS*	*QC*	*TBT*	*Total*	*SPS*	*QC*	*TBT*
Agriculture (HS01-21)	0.92	0.91	0.26	0.34	0.97	0.97	0.43	0.43
Live animals and products (HS01-05)	0.93	0.92	0.58	0.58	0.81	0.80	0.27	0.27
Vegetable products (Hs06-14)	0.89	0.88	0.02	0.24	0.98	0.98	0.38	0.39
Animal and vegetable fats, oils, and waxes (HS15)	0.15	0.15	0.02	0.02	0.07	0.07	0.00	0.00
Prepared foodstuffs (HS16-21)	1.00	1.00	0.24	0.23	1.00	1.00	0.53	0.53
Beverages and tobacco	0.50	0.50	0.00	0.04	0.74	0.74	0.00	0.02
Mineral products	0.05	0.01	0.04	0.04	0.01	0.00	0.00	0.00
Manufacturing (HS28-96)	0.03	0.00	0.02	0.03	0.03	0.00	0.01	0.02
Chemical products (HS28-38)	0.16	0.02	0.06	0.14	0.21	0.03	0.04	0.17
Plastics and rubber (HS39-40)	0.03	0.00	0.00	0.03	0.01	0.00	0.00	0.01
Vehicles, aircraft, and vessels (HS86-89)	0.06	0.00	0.00	0.06	0.03	0.00	0.00	0.03

Source: Author's calculation, using data from TRAINS (the global database on non-tariff measures).

coverage ratios are considered. However, in 2018, the SPS measures imposed on Thai products were higher than for Vietnam and Singapore, especially in terms of SPS and TBT. As shown earlier, the Thai products which were subjected to SPS measures were mostly in the agriculture and food sectors (Table 2.10). Animal and vegetable oil were affected the least among food products. Prepared foodstuffs, especially prepared vegetables, fruits, meat, fish, and crustaceans, were noticeably affected by the SPS measures introduced in other ASEAN countries. TBT was also high in the prepared foodstuff sector, but more crucial in manufacturing products, particularly chemical products.

When developed-country markets such as the US are considered, NTMs have continued to play a role in affecting Thai exports. The frequency index shows that the NTMs imposed by the US on Thai exports in 2018 were comparable to those in 2014 and the highest among selected Asian countries. SPS measures introduced by the US on Thai exports slightly declined, while TBT measures went up marginally (Figure 2.7). However, when the coverage ratio is considered, NTMs affecting Thai exports were far lower than those for Singapore, especially in terms of TBT measures. The significantly lower coverage ratio of SPS measures shown here is consistent with information released by the US Food and

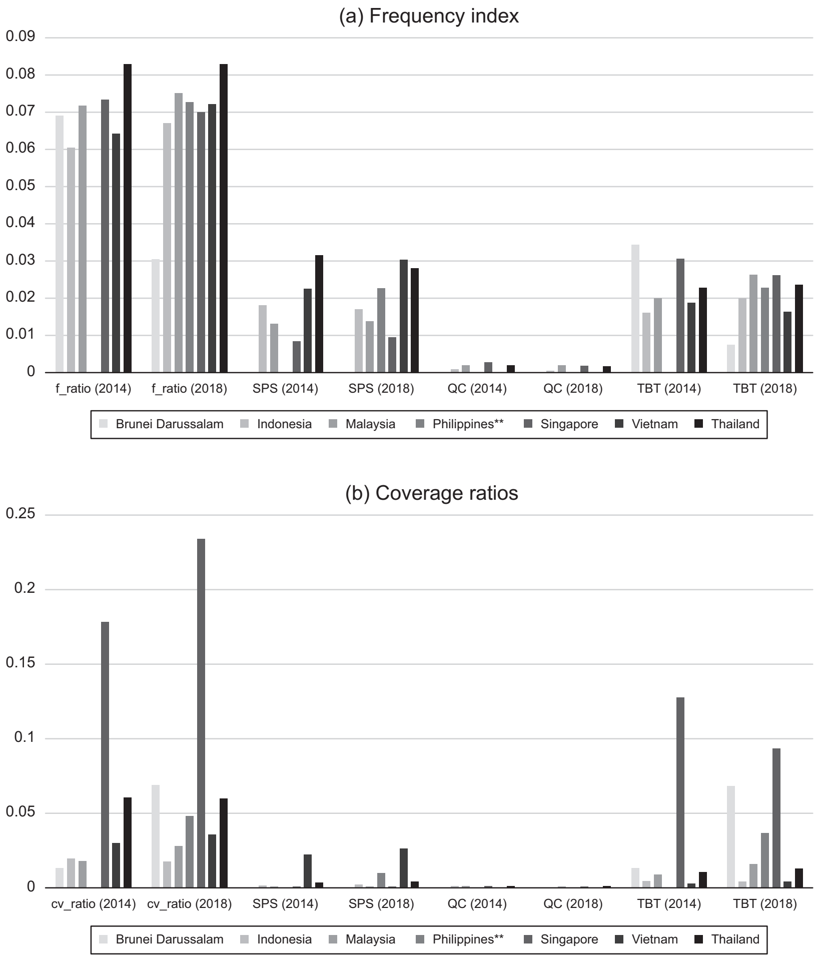

Figure 2.7 The frequency index and coverage ratios of NTMs imposed by the US, 2014 and 2018. Source: Author's calculation, using data from TRAINS (the global database on non-tariff measures)

Drug Administration (FDA) under the Import Refusal Report (IRR). The report clearly provides data on detentions comprising FDA two-digit codes, which can be matched with trade data at the HS two-digit classification.[13] Based on both, the number of detentions and the incidence of detentions, defined as the ratio of detentions divided by exports to the US (detained shipments for every 100 million US$), it seems that the ability of Thai exporters to meet US food safety standards has increased. The incidence of detentions declined from 12.83 in 2012 to 1.98 in 2019 (Figure 2.8), which was lower than observed with other Asian countries.[14] In line with NTM data (Table 2.11), products subjected to detentions were mostly in the categories of fruits and fishery products.

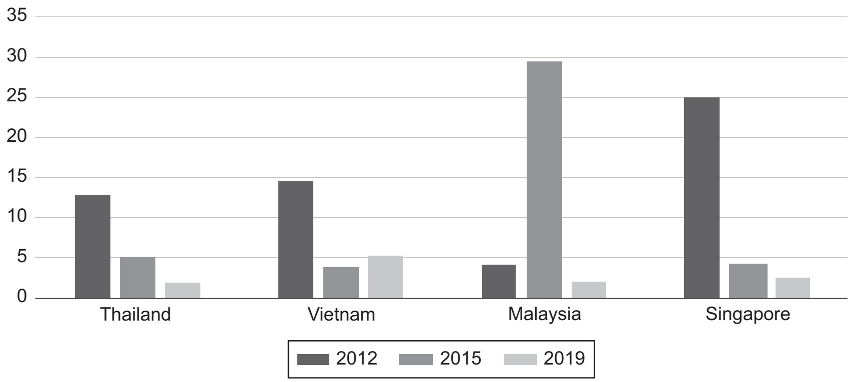

Figure 2.8 Incidence of detentions, SPS measures imposed by the US on food products, 2012–2019. Note: The incidence of detentions, defined as the ratio of detentions divided by exports to the US (detained shipments for every 100 million US$). Source: Author' s compilation from http://www.accessdata.fda.gov/scripts/importrefusals/ for import refusals and http://comtrade.un.org/db/dqBasicQuery.aspx for exports to the US

Table 2.11 The frequency and coverage ratios imposed by the US by product in 2018

	The frequency ratio				*The coverage ratio*			
	Total	*SPS*	*QC*	*TBT*	*Total*	*SPS*	*QC*	*TBT*
Agriculture (HS01-21)	0.25	0.23	0.01	0.01	0.10	0.03	0.00	0.00
Live animals and products (HS01-05)	0.21	0.21	0.06	0.00	0.01	0.01	0.00	0.00
Vegetable products (Hs06-14)	0.40	0.38	0.00	0.03	0.13	0.12	0.00	0.00
Animal and vegetable fats, oils (HS15)	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Prepared foodstuff (HS16-21)	0.07	0.06	0.00	0.00	0.10	0.00	0.00	0.00
Beverage and Tobacco	0.48	0.00	0.00	0.48	0.01	0.00	0.00	0.01
Mineral products	0.10	0.00	0.00	0.03	0.48	0.00	0.00	0.00
Manufacturing (HS28-96)	0.05	0.00	0.00	0.02	0.05	0.00	0.00	0.01
Products of the chemical (HS28-38)	0.20	0.00	0.00	0.08	0.10	0.00	0.00	0.04
Plastics and rubber (HS39-40)	0.34	0.00	0.00	0.08	0.12	0.00	0.00	0.05
Vehicles, aircraft and vessels (HS86-89)	0.14	0.00	0.00	0.04	0.28	0.00	0.00	0.08

Source: Author's calculation, using data from TRAINS (the global database on non-tariff measures).

Interestingly, although the incidence of detentions and coverage ratios in Thailand was lower than in some other Asian countries, the causes of detentions raise some concerns. While the export products of other Asian countries were mostly detained due to misbranding, more than 60 percent of Thai exports were detained due to adulteration,[15] including contamination, unsafe additives, insanitariness, and acidification. Resolving the problems related to the former issue tends to be easier than with those related to the latter, where improvements in whole production processes are crucial, including improving hygiene and contamination testing. This is an area where Thailand still needs to develop, especially in moving toward becoming a food innovation hub in the region. Such improvements driven by SPS measures would potentially upgrade quality standards and market sophistication within the food export sector in the country and eventually enhance firm-level and overall national productivity. Imposing food standards could also improve market performance by reducing transaction costs and trade friction as exporters could potentially use such standards as a guide to help them realize the expectations of importers concerning food quality and safety.

However, suspicions have been provoked that NTMs, especially food safety standards (SPS measures), may be used as a non-transparent, trade-impeding protectionist tool, rather than as a legitimate instrument for the protection of human, plant, and animal health. In particular, developing countries are usually placed at a disadvantage when making use of these procedures, because of their limited capacity to access and absorb best practice technology and information, which is constrained by inadequate resources for challenging perceived inequities. SPS has become a source of tension and friction in international trade negotiations since the demand for more stringent measures tends to increase in accordance with rising income levels and growing health consciousness. A few empirical studies have examined this issue (Baylis et al., 2009; Jouanjean et al., 2015 and Jongwanich, 2016, 2021). These studies reveal the possible use of food safety standards for trade protection motivations. Jongwanich (2016, 2021), instead of using a zero-one dummy variable to examine the probability of import refusals, employed the number of import refusals affecting a particular country–product–year combination and controlled for exports of that country–product–year combination to reduce any biases arising from the different volumes of exports to the US market. The study examines the determinants of US import refusals in the food sector during the period 2002–2014 with an emphasis on the importance of both internal and external factors. The internal factors relate specifically to exporting countries, including income levels, product characteristics, inward foreign direct investment, and the amount of exports of those countries, while external factors pertain to importing nations, especially regarding the demand for trade protection from producers in the US, proxied by the lag of agriculture value added in the US, both level and growth; and food production in the US, both level and growth. It is hypothesized that when the US experiences a decline in agricultural value added/food production, under protectionist circumstances, import refusals tend to rise. While this study includes all developing countries, attention was paid to Thailand in analyzing the factors that drive import refusals. See the model setting, data, and variable measurements in Appendix 2.3.

The key findings from the study show that external factors, especially suspicions concerning the demand for trade protection from producers in the US, are significant in determining import refusals. This could arise because food safety measures tend to be less transparent than tariffs or quotas. Thus, there is ample room for developed countries to tweak the standards to be stronger than necessary for achieving optimal levels of social protection and to adjust the related testing and certification procedures to make their local imports more competitive. In developing countries, evidence is found only in two key food exporting regions, East Asia and Latin America. Thailand is among other developing East Asian countries within which the study finds some suspicious evidence concerning the use of food safety as a de facto trade protection tool. At a product level, our study reveals evidence driving suspicion in the case of fruits and vegetables (both traditional and processed), coffee, tea, the preparation of cereal, and other edible products. Meanwhile, concerning fish and crustaceans and the preparation of fish and crustaceans, suspicious evidence is found only in connection with key exporters of these products to the US, including Thailand, Vietnam, Indonesia, India, and Ecuador. The bilateral/regional trade agreements do not significantly influence the level of US import refusals, while the reputation of exporting countries can come into play in FDA decisions. Furthermore, the US FDA tends to use information from other sources, including past refusals from within a region, in imposing detentions on exporting firms from that region.

With regard to internal factors, income level is found to be crucial in determining import refusals. Conditions related to the agriculture sector, production technology, and local infrastructure tend to improve exponentially in line with rising income levels, thereby reducing the totality of refusals. This finding is revealed in almost all regions. However, in some developing countries, including those in Africa and Europe as well as Thailand, this variable becomes insignificant and even turns out to be positive in some countries/products. In Thailand, this variable is insignificant when all food products are considered together but becomes positive in the case of fish and crustaceans and the preparation of fish and crustaceans. The results imply that factors which constitute an essential path to improving quality, taste, hygiene, and productivity in the agriculture and food sectors in Thailand tend to improve at a slower rate than that of income growth. From examining the US FDA information, most Thai firms whose shipments have been detained are small- and medium-sized companies. This raises issues not only of how to make the improvements to production technology necessary to comply with US food safety standards but also of how to disseminate knowledge and technology improvements to small/medium-sized firms. This issue becomes more serious since in other key food competitors in other developing East Asian nations, income per capita is negative and significant, which is in line with the hypothesis that the development of the agriculture sector, production technology, and infrastructure tends to improve in tandem with rising income levels. This study may explain the still high proportion of adulteration rates among detained shipments of Thai products compared to other countries, as mentioned earlier.

Table 2.12 Causes of import refusals in the US market in selected Asian countries (percent)

Country	*Reason*	*2011–2014*	*2015–2018*	*2019*	*Country*	*Reason*	*2011–2014*	*2015–2018*	*2019*
Thailand	Adulteration	68.3	49.1	63.5	Malaysia	Adulteration	69.1	68.9	24.0
	Misbranding	24.4	17.3	23.0		Misbranding	25.7	25.1	52.0
	Other	7.2	33.6	13.5		Other	5.2	6.0	24.0
	Total	**100.0**	**100.0**	**100.0**		**Total**	**100.0**	**100.0**	**100.0**
Vietnam	Adulteration	80.3	86.9	95.5	Singapore	Adulteration	86.6	23.1	0.0
	Misbranding	16.5	10.2	4.5		Misbranding	12.8	46.2	100.0
	Other	3.1	2.9	0.0		Other	0.7	30.8	0.0
	Total	**100.0**	**100.0**	**100.0**		**Total**	**100.0**	**100.0**	**100.0**

Source: Author's compilation from http://www.accessdata.fda.gov/scripts/importrefusals/ for import refusals and http://comtrade.un.org/db/dqBasicQuery.aspx for exports to the US.

NTMs are likely to be more crucial in response to the COVID-19 pandemic. The number of WTO member notifications relating to COVID-19 had jumped to almost 350 as of April 2021.[16] Brazil was the leading country, followed by the EU and the US. Thailand, the Philippines, and Korea were among the top ten wherein notifications increased to around 15 during the same period. TBT, followed by SPS, QC, and export restrictions, were the most popular measures introduced by the WTO member countries. In Thailand, for example, export restrictions were imposed on bird eggs and masks from March 26, 2020, to April 30, 2020, while technical barriers on some cosmetic products containing alcohol for hand sanitization have been imposed, and such products are not allowed to be produced, imported, or sold. In the US, many notifications to the WTO concerned actions to restrict the import of food and agricultural products, allegedly to prevent the transmission of COVID-19, especially from China. These countries argued that a variety of food and agriculture commodities, including meat, seafood, fresh fruit, and bulk grains, were subject to a 100 percent testing of shipments, despite the absence of any identified risk. In the Philippines, for example, poultry and meats from Brazil were banned from August until December 2020, while in June the authorities argued that cold storage warehouses (CSWs) were critical facilities in maintaining the freshness and safety of imported meat and meat products, so CSW requirements were imposed to ensure proper cold-chain management and the requisite quality of food products. All in all, such NTMs are expected to continue and are likely to become more crucial. Cadot et al. (2015) argued that 'due to the non-trade objectives, NTMs measures are expected to continue and eliminating them may no longer be an option. While the pursuit of domestic policy objective is legitimate, NTMs have the potential to become barriers to trade'.

2.4 Conclusions

Thailand has recently implemented both tariff and non-tariff barriers as trade policy instruments in the manufacturing sector, but historically it has had a greater reliance on tariff rather than non-tariff barriers. A comprehensive plan of tariff reduction and rationalization in Thailand was proposed in 1990 and implemented in 1995 and 1997 as part of WTO commitments. Tariff restructuring received renewed emphasis again in the early 2000s. The tariff rates continued to decline, except in 2011–2013, when the global financial crisis and severe flooding in Thailand caused slight increases in tariff rates. As a consequence of tariff restructuring, there was a continuous shift in the distribution of tariff lines, and around one-third of tariff lines were tariff free. However, despite a series of tariff reductions, the escalating tariff structure still exists. There are also more than a quarter of tariff lines which have not yet been presented in the three rates structure, that is, 0–1, 5, and 10 percent.

The tariff structural reform in the 2000s brought no significant progress in reducing the effective rate of protection (ERP) in various sectors, such as agro-processing, textile products, apparel, leather and footwear products, and electrical appliances. This is an obvious example where tariff reduction during this period tended to emphasize intermediates, thereby widening their ERP estimates with those of finished goods, instead of reducing protection. Interestingly, when export-oriented activities and possible water in tariffs are considered, the less adverse impact of an escalating tariff structure on industrial protection was uncovered. Industrial characteristics and the ideologies of policymakers toward the development path of industry go some way to explaining the revealed effective protection in Thailand.

Although non-tariff barriers have diminished noticeably in Thai manufacturing over the past several decades, this chapter shows that non-tariff measures (NTMs), especially sanitary and phytosanitary (SPS) and technical barriers to trade (TBT), have become more crucial since the early 2000s in the country. SPS measures are mostly imposed on agriculture and food imports, while TBT measures are required more for manufacturing products. Thai exports have also been subject to NTMs, especially SPS and TBT from both developed and developing countries, including ASEAN nations. For ASEAN countries, the NTMS introduced for Thai products tended to be comparable to those introduced for Vietnamese and Indonesian products, while being noticeably higher than those for Singaporean and Malaysian products, particularly when coverage ratios are considered. When developed country markets, such as the US, are considered, although the incidence of detentions and the coverage ratio in Thailand were lower than for some other Asian countries, the causes of detentions raise some concerns as more than 60 percent of Thai exports were detained due to adulteration, including contamination, unsafe additives, insanitariness, and acidification, while export products of other Asian countries were mostly detained due to misbranding.

Appendix 2.1

Classification of non-tariff measures, by chapter

Chapter A on SPS measures refers to measures affecting areas, such as restrictions for substances, hygienic requirements, or other measures for preventing the dissemination of diseases. It also includes all conformity assessment measures related to food safety, such as certification, testing and inspection, and quarantine.

Chapter B on technical measures refers to measures such as labelling and other measures to protect the environment. It also includes conformity assessment that relates to technical requirements such as certification, testing, and inspection.

Chapter C classifies the measures related to pre-shipment inspection and other formalities performed in the exporting country prior to shipment.

Chapter D refers to contingent measures, which are measures implemented to counteract particular adverse effects of imports in the market of the importing country, including measures aimed at unfair foreign trade practices. They include antidumping, countervailing, and safeguard measures.

Chapter E includes licensing, quotas, and other quantity control measures, group measures that have the intention of limiting the quantity traded, such as quotas. It also covers those licenses and import prohibitions which are not SPS or TBT related.

Chapter F includes price control measures, which are those implemented to control or affect the prices of imported goods in order to, inter alia, support the domestic price of certain products when the import prices of these goods are lower; establish the domestic price of certain products because of price fluctuations in domestic markets, or price instability in a foreign market; or to increase or preserve tax revenue. This category also includes measures, other than tariff measures, that increase the cost of imports in a similar manner (para-tariff measures).

Chapter G concerns finance measures, referring to measures restricting the payments of imports, for example when the access and cost of foreign exchange are regulated. This chapter also includes restrictions on the terms of payment.

Chapter H concerns measures affecting competition. These measures grant exclusive or special preferences or privileges to one or more limited groups of economic operators. They refer mainly to monopolistic measures, such as state trading, or sole importing agencies, or compulsory use of national services or transport.

Chapter I concerns trade-related investment measures, group measures that restrict investment by requiring local content or requesting that investment should be related to export to balance imports.

Chapter J includes distribution restrictions, referring to restrictive measures related to the internal distribution of imported products.

Chapter K concerns restrictions on post-sales services, for example, restrictions in the provision of accessory services.

Chapter L contains measures that relate to subsidies that affect trade.

Chapter M containing government procurement restriction measures and refers to the restriction's bidders may find when trying to sell their products to a foreign government.

Chapter N concerns restrictions related to intellectual property measures and intellectual property rights.

Chapter O on rules of origin, groups the measures that restrict the origin of products, or their inputs.

Chapter P includes export measures, grouping the measures a country applies to its exports. It includes export taxes, export quotas or export prohibitions.

Note: Data are available only on Chapters A to I and Chapter P. Measures under Chapters J to O are not collected by TRAINS (The global database on non-tariff measures).

Sources: UNCTAD (2020), Guidelines to Collect Data on Official Non-Tariff Measures, United Nations Conference on Trade and Development, Geneva.

Appendix 2.2

Samples of non-tariff measures

Table Appendix 2.2(a) Samples of non-tariff measures imposed by Thailand, 2011–2018

Country imposing	*Partner affected*	*In force*	*Measure description*	*Product description*
TBT measures				
Thailand	All WTO members	2015-02-10	The packaging of imported sugar shall be in a sack or other container and shall, at least, print the symbol or statement as follows: (1) name of the manufacturer or company manufacturing sugar; (2) trademark; (3) the type of sugar and net weight	Sugar
Thailand	Malaysia	2014-02-21	The following information in the English language must appear on each package i.e., 'Produce of Malaysia', name of exporting company, name of fruit (common name), packinghouse registration number, and vineyard registration number.	Fresh tomato
Thailand	Vietnam	2016-05-13	The following information in the English language must appear on each package i.e., 'Produce of Vietnam', name of exporting company, name of fruit (common name), packinghouse registration number, and vineyard registration number.	Fresh longan, fresh lychee, fresh mango
SPS measures				
Thailand	All WTO members	2015-02-10	The storage location of import sugar with a clear map under this certification shall be disclosed to the Office of Cane and Sugar Board.	Sugar

Thailand	All WTO members	2016-07-11	'Fresh meat' and 'meat products', other than those listed in Clause 3, shall be subject to the following conditions: 1) derived from cattle which have not been fed with meat-and-bone meal or greaves derived from ruminants; (2) Shall not contain or be contaminated with: a) tonsils and distal ileum from cattle of any age; b) brains, eyes, spinal cord, skull, and vertebral column from cattle that were at the time of slaughter over 12 months of age; c) mechanically separated meat from the skull and vertebral column from cattle over 12 months of age; d) nervous and lymphatic tissues exposed during the deboning process.	'Fresh meat' and 'meat products' exclude some products such as milk, milk products, hides and skins; gelatin and collagen prepared exclusively from hides and skins; tallow with maximum level of insoluble impurities of 0.15% in weight and derivatives made from this tallow.
Thailand	All WTO members	2016-07-11	Gelatin and collagen prepared from bones shall be subject to the following conditions: 1) derived from cattle which have passed ante- and post-mortem inspections to determine they are uninfected with BSE or without suspicion of BSE; 2) bones shall be subjected to a process which includes all of the following steps: a) degreasing; b) acid demineralization; c) acid or alkaline treatment; d) filtration; e) elimination of infective agents by sterilization at 138°C or greater for a minimum of 4 seconds.	Gelatin and collagen prepared from bones
Thailand	China	2011-10-20	The following are phytosanitary requirements for packing and labelling of Thailand-imported silkworm egg:(1) imported silkworm egg must be packed in a carton which is free from soil, sand, and contaminating plant materials e.g. leaves, stem, plant debris, or other potential carriers of quarantine pests.(2) imported silkworm egg must be placed on a new and clean flat card, and it must be packed in a new and closed carton.	Silkworm egg

(*Conitnued*)

Table Appendix 2.2(a) Continued

Country imposing	*Partner affected*	*In force*	*Measure description*	*Product description*
Thailand	Indonesia	2014-02-09	The importation of oil palm nut must be free from soil, sand, and contaminating plant materials e.g., leaves, stem, plant debris, or other potential carriers of quarantine pests. For the importation of oil palm nut, a phytosanitary certificate (PC) issued by the Agency for Agriculture Quarantine (Indonesia) is required.	Oil palm shell, from oil palm refining only
Thailand	Indonesia, Malaysia	2011-05-31	The consigned mature dehusked coconut and copra must be randomly selected for inspection for quarantine pests in accordance with appropriate official procedures, prior to commencement of exports. Use of methyl bromide is mandatory with a certain amount of quantity and period of time. The package shall be kept in a hygienic condition. Phytosanitary certificate from the Indonesian Agency for Agricultural Quarantine is required. See further details in the document. Fees are required for testing services in the laboratories by the Department of Agriculture (DOA).	Mature dehusked coconut and copra
Thailand	Malaysia	2015-03-17	The package shall be kept in hygienic conditions, free from dirt and pests. In case of the use of packages made from wood, they shall follow International Standards for Phytosanitary Measures No. 15: Regulation of wood packaging material in international trade. Importers of oil palm seeds, germinated oil palm seeds, and oil palm tissue culture shall obtain an import permit issued by Department of Agriculture (DOA). A phytosanitary certificate from the Malaysian Department of Agriculture, Plant Biosecurity Division is required. Moreover, the following words shall be shown in the certificate: 'The (oil palm seeds/germinated oil palm seeds/oil palm tissue culture in this consignment were produced in Malaysia in accordance with the conditions governing entry of oil palm seeds to Thailand and inspected and found to be free of quarantined pests are absent from Malaysia'. Oil palm seeds, germinated oil palm seeds, and oil palm tissue culture must be inspected before entry is allowed. Records of the pest management plan in the oil palm vineyards should be kept and made available to the Department of Agriculture (DOA) upon request.	Oil palm seeds, germinated oil palm seeds, and oil palm tissue culture

Thailand	Vietnam	2016-12-27	The following are phytosanitary requirements for packing and labelling of Thailand-imported fresh mango: (1) Imported fresh mango must be packed in a carton which is free from soil, sand, and contaminating plant materials e.g., leaves, stem, plant debris, or other potential carriers of quarantine pests. (2) Packing material for imported fresh mango may be made of corrugated fiber-board, plastic, or solid wood material which can be manufactured either from recycled material or virgin material. Only clean, new cartons are allowed. (3) In cases where consignments of fresh mango destined for the Kingdom of Thailand use solid wood packing material, it must comply with the international phytosanitary standards. Importers of fresh mango shall obtain an import permit issued by Department of Agriculture (DOA). For the importation of fresh mango, a phytosanitary certificate (PC) issued by the Plant Protection Department (Vietnam) is required. The original copy must accompany every consignment to the Kingdom of Thailand. Records of growers supplying fruit for export to the Kingdom of Thailand should be kept and made available to Department of Agriculture (DOA) upon request.	Fresh mango (and apply to fresh lychee, fresh longan)

(*Conitnued*)

Table Appendix 2.2(a) Continued

Country imposing	*Partner affected*	*In force*	*Measure description*	*Product description*
QC measures				
Thailand	All WTO members	2015-02-10	The person having the right to submit an application for the certificate illustrating the receipt of right to pay in-quota and out-quota tax rate under the obligations under the WTO Agricultural Agreement, in respect of sugar of B.E. 2558, who wishes to import sugar products and to receive the right to pay in-quota for B.E. 2558 prescribed at the total volume of 13,760 metric tons and for which the in-quota tax rate is 65 percent and out-quota tax rate is 94 percent, shall submit an application for the right to pay in-quota tax rate, with documents under clause 4, to Office of the Cane and Sugar Board, Ministry of Industry. The issuance of a certificate illustrating the receipt of right to pay in-quota and out-quota tax rate under this Notification:	Sugar
Thailand	All WTO members	2013-01-01	The Department of Industrial Works, Ministry of Industry shall allocate the HCFCs import quota to each licensee every year by which the quota will be 85 percent of the imported amount in the previous year.	Hydrofluorocarbons (HCFCs)
EXP measures				
Thailand	China, Russian Federation, Vietnam	2018-03-06	Any person wishing to export aquatic animals and aquatic animal products to Vietnam, Russia, and China for consumption shall submit a health certificate to the officers at Fish Inspection Office.	Aquatic animals or aquatic animal products, for consumption only

Thailand	China	2016-11-25	Rose apples to be exported to China shall be sourced from a production area certified for Good Agriculture Practice (GAP) and certified as a registered production area by the Department of Agriculture (DOA). The consigned fresh rose apples must be inspected by the DOA officer at the packinghouse, prior to commencement of exports. The fee for an export SPS certificate is 200 Baht per copy.	Fresh rose apple (Syzygium samarangense)
Thailand	China	2013-11-15	For exports of plants prescribed as specifically controlled plants, the criteria of tolerance limits in the specifically controlled plants are set as follows: (1) Maximum residue limit (MRL) of Codex is required, except if the purchasing country needs to use its own MRL. (2) Maximum Level (ML) for the additive of Codex is required, except if the purchasing country needs to use its own ML. (3) If there is no Codex maximum residue limit (MRL) or maximum Level (ML), Thailand's MRL or ML is required. Any person who wishes to export plants prescribed as specifically controlled plants shall hold a phytosanitary certificate (PC) issued by the Department of Agriculture (DOA). The fee for an export SPS certificate is set as 100 Baht per copy.	Fresh longan

Source: Author's compilation, using information from TRAINS (the global database on non-tariff measures) https://trains.unctad.org/Forms/Analysis.aspx

Table Appendix 2.2(b) Samples of non-tariff measures imposed by other countries on Thailand, 2011–2018

Country imposing	*Partner affected*	*In force*	*Measure description*	*Product description*
TBT measures				
China	Thailand	2015-08-04	Article 6 section 3: Each container shall be labelled with the English name of the exporter, the type of fruit, the name of the packing plant and its registration number, as well as the name of the orchard and its registration number.	Rose apple (Syzygium samarangense)
China	Thailand	2016-06-17	Article 7: Name and address of exporter and origin of the rice should be labelled in English on the package.	Rice (including brown rice, milled rice, and broken rice)
Indonesia	Thailand (and others)	2011-05-09	Article 3(1c): Any fish farming production facility in the form of fish medicine from Japan to be imported to the territory of the Republic of Indonesia shall be equipped with certificates issued by authorized agencies/institutions in Japan in the form of Certificate of Analysis	Fish farming Production. Fish farming production facilities produce fish drugs and fish feed to support aquaculture activities
Philippines	Thailand (and others)	2018-06-26	Section 9. Warehousing and Monitoring of Imported ‘C’ Sugar. Sugar imported under this Order and classified as ‘C’ shall be stored in an SRA registered warehouse prior to its reclassification and release as ‘B’ sugar.	Sugar

Philippines	Thailand (and others)	2017-05-11	EWBS shall be mandatory for all ISDB-T devices. All SDB-T receivers including One Seg ISDB-T receivers shall, at the minimum, have the capability to support EWBS information. An audible tone shall be generated by ISDB-T receivers, while on stand-by mode, once an EWBS signal is received for its corresponding location. Automatic switch-on from stand-by mode is encouraged for ISDB-T receivers when an EWBS broadcast signal is received. lSDB-T receivers without EWBS function may still be allowed to be sold in the market beyond the 18-month period after effectivity of NTC Memorandum Circular No. 02-03-2016 (Sale and Labeling of ISDB-T Receivers). Appropriate labeling shall be displayed on such units in order to inform the public of the limitations of the same within 6 months upon effectivity of this Circular.	ISDB-T Receivers (Integrated Services Digital Broadcasting - Terrestrial (ISDB-T) is the Japanese standard for the transmission of digital television over-the-air (terrestrial)
SPS measures				
China	Thailand	2016-06-17	Article 3: Imported rice from Thailand shall not contain the following quarantine pests: Callosobruchus maculatus, Carpophilus mutilatus, Solenopsis invicta, Crotalaria spectabilis, Ipomoea lacunosa, Rapistrum rugosum, Sesbania exaltata and Sida spinoda. Article 5: All batches of rice imported to China should be accompanied by an official 'Plant Quarantine Certificate', proving that the imported product meets the hygiene requirement of China. The origin of the rice should also be stated in the 'Plant Quarantine Certificate'. Article 7: Packaging materials for imported rice from Thailand should be clean and new and comply with China's phytosanitary requirements. Article 6: All batches of rice imported to China should be fumigated to make sure that no insects are mixed in with the rice. A fumigation certificate is also required when entering China. Article 8: Transportation equipment used for the shipment of rice cannot be contaminated by quarantine pests.	Rice (including brown rice, milled rice, and broken rice)

(*Continued*)

Table Appendix 2.2(b) Continued

Country imposing	*Partner affected*	*In force*	*Measure description*	*Product description*
Philippines	Australia, China, India, Thailand	2014-02-13	All interested NFA-licensed importers may apply for inclusion in the 2014 MAV-CSQ program. Upon the submission of the requirements, a Certificate of Eligibility is issued which is the basis for payment of advance duties at the Land Bank. After payment of the advance customs duty, the eligible importer notifies NFA about the arrival of the shipment and submits documents to obtain the import permit.	Rice
USA	Thailand (and others)	2016-10-18	(a) No poultry or product subject to the provisions of this part shall be brought into the United States except in accordance with the regulations in this part and part 94 of this subchapter;(b) nor shall any such poultry or product be handled or moved after physical entry into the United States before final release from quarantine or any other form of governmental detention except in compliance with such regulations; provided that the administrator may upon request in specific cases permit poultry or products to be brought into or through the United States under such conditions as he or she may prescribe, when he or she determines in the specific case that such action will not endanger the livestock or poultry of the United States.	Live poultry, hatching eggs from poultry except pigeons, doves, and other Columbiform species
USA	Thailand (and others)	2016-10-18	(a) No poultry or product subject to the provisions of this part shall be brought into the United States except in accordance with the regulations in this part and part 94 of this subchapter; nor shall any such poultry or product be handled or moved after physical entry into the United States before final release from quarantine or any other form of governmental detention except in compliance with such regulations; Provided that the administrator may upon request in specific cases permit poultry or products to be brought into or through the United States under such conditions as he or she may prescribe, when he or she determines in the specific case that such action will not endanger the livestock or poultry of the United States.	Live poultry, hatching eggs from poultry except pigeons, doves, and other Columbiform species

United States of America	Argentina, Brazil, Burkina Faso, China, Côte d'Ivoire, India, Indonesia, Japan, Philippines, Senegal, Thailand, Timor-Leste	2017-01-01	Peanuts are admissible from all countries except PROHIBITED ENTRY from Argentina, Brazil, Burkina Faso, China (People's Republic of), Côte d'Ivoire, India, Indonesia, Japan, Philippines, Senegal, Thailand, and Timor-Leste. Refer to the *Seeds Not For Planting* Manual.	Peanut
QC and EXP measures				
Malaysia	Thailand (and others)	2017-04-01	Goods which are prohibited to be imported into Malaysia except under import license and shall not be applied to specific free zones.	Sugar (including cane and beet sugar, chemically pure sucrose, fructose, and glucose); salt (including table salt and denatured salt)
Malaysia	Thailand (and others)	2017-04-01	Goods which are prohibited for export except under an export license	Sugar; cement clinker

Source: Author's compilation, using information from TRAINS (the global database on non-tariff measures) https://trains.unctad.org/Forms/Analysis.aspx

Appendix 2.3

Model, data and variable measurements: determinants of the US import refusals

This appendix reviews the potential factors determining US import refusals. Based on the previous literature (Jouanjean et al., 2015; Baylis et al., 2009), potential factors triggering import refusals can be allocated into two groups. The first constitutes internal considerations specifically related to an exporting country. The second set of variables relates to importing countries, especially the demand for trade protection in the United States. In the first group, the income of a country could constitute a crucial variable in determining import refusals. High-income countries tend to face a lower risk in exporting qualified products to US market recipients. When a country has a higher income level, improvements in the agricultural sector, such as upgrading land quality and irrigation systems, and upgrading production technology, tend to be evident and widespread. This represents an essential path necessary to improve quality, taste, hygiene, and productivity in the agriculture and food sectors. A negative relationship between income per capita ($income_{jt}$) and the number of detentions is observed.

Certain product characteristics in goods from exporting countries may determine the number of detentions recorded. Storable products are likely to be subject to fewer detentions than perishable products. Commodity perishability can lead to product loss and value decline during transport and storage, thereby increasing the probability of facing detentions. A binary dummy variable for product characteristics ($dumperish_{ijt}$) is introduced, where perishable products are coded as one and zero for storable products. A positive sign is expected for this variable.

Foreign direct investment (FDI_{jt}) is potentially another factor determining the incidence of import refusals emanating from developed countries, but its influence is inconclusive. The involvement of MNEs in a food/agriculture sector could generate positive effects for food industries, particularly exporting firms. MNEs comprise an international production network so that flows of information to a particular home country and other markets may be completed. In addition, they tend to undertake a large proportion of the world's total research and development and are principal bearers of technology across international borders (Borensztein et al., 1998; Lipsey, 2001; Vernon, 2000). With these advantages, one would expect that a country with a high proportion of FDI would face a lower number of detentions. However, the technology and capital involved in producing manufactured food products are mobile within the world food market and the raw materials required for these products are relatively inexpensive to transport. MNEs may, therefore, intend to locate close to consumer markets to minimize distribution costs. Consequently, an increase in *FDI* would not be related directly to the export sector and could not influence import refusals.

Exports ($export_{ijt}$) to the US could be another variable explaining import refusals as more exports will likely result in more violations. Meanwhile, English-speaking countries might find it easier to comply with US food safety standards than non-English-speaking countries. Thus, a binary dummy variable ($dumEnglish_{jt}$) is introduced, in which one represents English-speaking countries and zero, otherwise. We expect a negative relationship between this variable and the number of detentions recorded. Distance ($Dist_{just}$) is also included in the model with the expectation that when all other things being equal, the longer the distance involved in transactions, the greater the number of import refusals will be experienced. This is particularly true for a country where the majority of export products involved is perishable and trade facilitation, especially transport and storage facilities, is not well developed. Bilateral and regional trade agreements (FTA_{jt}) could play a role in influencing import refusals, but the direction of their influence is still inconclusive. Baylis et al. (2009) hypothesized that firms in bilateral or regional trade agreements with the United States may have invested heavily in the processes and knowledge necessary to meet US import requirements. Thus, the agreements could help to reduce import refusals from the US. However, it is possible that a progressive decline in tariff and non-tariff measures under the agreements might result in a higher demand for trade protection within the US.

The second set of variables, related mostly to importing countries, is based on the argument that, in practice, there have been suspicions provoked that food safety standards are being used as a non-transparent, trade-impeding protectionist tool, rather than as a legitimate instrument helping protect human, plant, and animal health. Baylis et al. (2009) and Jouanjean et al. (2015) point out that a greater number of import refusals tend to be observed in industries facing increasing import competition and pressure from domestic producers ($USproducer_{ust}$) seeking to protect their market share of the US market.

In addition, while in principle importers and domestic producers are subject to exactly the same food safety standards, in practice the law allows US FDA to make decisions based not only on physical evidence, such as laboratory results and examinations, but also historical data, labeling and information from other sources. Thus, the reputation of exporting countries can come into play in FDA decisions. Past histories concerning violations from similar products and origins ($Detenhis_{ijt\text{-}k}$) could be the criteria used to justify refusals (Jouanjean et al., 2015). Moreover, as the US FDA uses information from other sources, Jouanjean et al. (2015) show that after controlling for other factors, the probability that a given country's exports of a particular product are subject to refusal by the US FDA depends on past refusals of the same product from neighboring countries ($Detenneigbor_{ijt\text{-}k}$).

All in all, the model determining import refusals is as follows.

$$\begin{aligned} Detention_{ijt} = {} & \alpha_0 + \alpha_1 income_{jt} + \alpha_2 dumperish_{ijt} + \alpha_3 FDI_{jt} + \alpha_5 export_{ijt} \\ & + \alpha_6 dumEnglish_{jt} + \alpha_7 Dist_{just} + \alpha_8 FTA_{jt} + \alpha_9 USproducer_{ust} \\ & + \alpha_{10} Detenhis_{ijt-1} + \alpha_{11} Detenneigbor_{ijt-1} + \alpha_{12} T_t + \varepsilon_{ijt} \end{aligned} \quad (1)$$

where $Detention_{ijt}$ is the number of detentions in sector i, of country j, at time t in the US market

$income_{jt}$ is the income per capita of country j, at time t

$dumperish_{ijt}$ is a binary dummy variable for product characteristics where perishable products are coded as one and 0 for storable products.

FDI_{jt} is the foreign direct investment of country j, at time t

$export_{ijt}$ is the exports in sector i, of country j, at time t into the US market

$dumEnglish_{jt}$ is a binary dummy variable for English-speaking countries, where 1 represents English-speaking countries and 0 otherwise.

$Dist_{just}$ is the distance from country j to the US

FTA_{jt} is the bilateral/regional trade agreements of country j at time t, where 1 is for a country signing the agreement with the US and 0 otherwise

$USproducer_{ust}$ is the agriculture/food supply in the US market

$Detenhis_{ijt-1}$ is the number of past histories of violations in sector i, of country j, at time $t-1$

$Detenneigbor_{ijt-1}$ *is* the number of past refusals from neighboring countries in sector i, of country j, at time $t-1$

T_t and ε_{ijt} are time trend and error time, respectively

Note that the model as shown in Equation (1) is performed for (1) whole countries, which have trade data under the auspices of UN Comtrade; (2) developed and developing countries classified by the World Bank; (3) each region in developing countries, i.e. Asia (East and South Asia), Europe and Central Asia (in short, called Europe), Latin America and Caribbean (in short, called Latin America), Middle East, and Africa; (4) three individual countries in Southeast Asia, including Thailand; Vietnam and Indonesia where food exports, especially fish and crustaceans (HS03) and preparation of fish and crustaceans (HS16) dominate within the US market; and (5) individual products, including fish and crustaceans; preparation of fish and crustaceans; fruits and vegetables (both traditional and processed); and other edible products.

Data, variable measurements, and methodology

To examine the determinants of import refusals, a dataset of US import refusals, which is obtained from Import Refusal Reports (IRRs), during the period 2002–14 is applied. The report provides information on the manufacturer's name, country, products, dates, and the reasons underlying any refusal of admission of the product. The report clearly provides data on detentions comprising FDA two-digit codes, which can be matched with trade data at the HS two-digit classification. Note that import refusals are reported in terms of detained shipments, not in terms of the value of refusals. The analysis is based on an aggregation of import refusals at the country-sector-year level. Data on detentions is used to generate the past history of violations concerning similar products and origins ($Detenhis_{ijt-1}$) and past refusals of the same product from neighboring countries ($Detenneigbor_{ijt-1}$).[17]

As one of the control variables, country income is proxied by GDP per capita and GDP per capita at PPP terms from World Development Indicators. While there is no data on FDI in the food sector for all our countries of interest, we use net FDI inflows as a percentage of GDP to examine the effects of FDI on import refusals. The data is obtained from World Development Indicators. As the number of detentions tends to increase when exports rise, we use US import data at the HS two-digit classification level to control for this variable and the missing import value is replaced with zero to indicate that no trade took place for the given exporter-product-year combination. This is expedited under the assumption that US import data is of high quality. This variable is derived from UN Comtrade.

A binary dummy variable ($dumEnglish_{jt}$), which is one for English-speaking countries and zero otherwise, and distance ($Dist_{just}$) are accessed from CEPII Research and Expertise on the World Economy. Bilateral and regional trade agreements (FTA_{ijt}) stem from the Office of the United States Trade Representative, Executive Office of the Resident. With the binary dummy variable for product characteristics ($dumperish_{ijt}$), we define perishable products as fresh and processed food, while storable products comprise manufactured food. Processed food refers to products that have not undergone major changes from their raw material state. These kinds of products include frozen, canned, and slaughtered animals. Manufactured food refers to goods that have lost the characteristics of their raw materials in the production process, for example confectionary and bakery products. Such transformation includes not only blending and fermentation practices but also cooking. The technology and capital in producing manufactured food products are mobile, and the raw materials for these products, for example, refined sugar, starches, wheat, and other grains, are relatively nonperishable and inexpensive to transport.

We use four variables to proxy suspicions that food safety standards are being used as non-transparent, trade-impeding protectionist tools, rather than as legitimate instruments for the protection of human, plant, and animal health. These are lag of agriculture value added in the US, both level and growth ($USproducer\_1_{ust-1}$ and $USproducer\_2_{ust-1}$) and food production in the US, both level and growth ($USproducer\_3_{ust-1}$ and $USproducer\_4_{ust-1}$). We hypothesize that when the US experiences a decline in agricultural value added/food production, under protectionist circumstances import refusals tend to rise.[18] Note that data on agricultural value added and food production in the US is obtained from World Development Indicators.

Since detained shipments, a count variable, show over-dispersion, the conditional variance exceeds the conditional mean. So, a panel-specific negative binomial regression with random effects is applied. The panel is specified in terms of both country and products. Random effect is applied here since some of our variables of interest are time-invariant. A limitation of the random effect estimator, compared to a fixed-effects estimator, is that it can yield inconsistent and biased estimates if the unobserved fixed effects correlate with the remaining component of the error term. However, this is unlikely to be a serious problem in this case, because the number of explanatory variables (N) is larger than the number of 'within' observations (T). In addition, our study analyzes sub-samples in terms of both region and product. This is done to redress any wariness concerning unobserved fixed effects.

Notes

1 See discussion on the development of trade policy during this period in World Bank (1988).
2 With uniform tariff rates across all sectors, the nominal and effective tariff rates are equal. For example, there is no need to estimate effective rates of protection for the Chilean economy, because that country has a uniform import duty across all sectors.
3 Note that a comparison of ERP across studies must be treated with caution because the ERP estimates from different studies have been based on different types of data and different product definitions. Some have used official tariff rates, whereas others have used tariff rates estimated from customs duty collection or from price comparisons. It is difficult to draw inferences from a direct comparison of the industry's ERP estimates. Nevertheless, a broad comparison would still provide useful information to understand the evolution of the protection structure in Thailand.
4 The related measures include (i) duty drawbacks or refunds under section 19 of Customs Law; (ii) duty relief for goods placed under the Custom Bonded Warehouse scheme; (iii) duty exemption for goods taken into the Free Zones established by Customs; (iv) duty exemption for goods taken into the Export Processing Zones (EPZ); and (V) Duty exemption for goods under the Board of Investment (BOI) scheme. The first three measures are directly under the responsibility of the Thai Custom Department to grant duty drawbacks and duty exemptions. The measures (iv) and (v) are under the control of the Industrial Estate Authority of Thailand and the Office of the Board of Investment, respectively.
5 The interest rates applied to reflect the opportunity costs of exporters are sourced from the weighted average of minimum lending rates (MLR) offered by various commercial banks in Thailand.
6 The Herfindahl-Hirschman Index (*HHI*) and market share of the first five largest plants (*CR5*) are applied to measure an industry concentration in this study.
7 Three alternatives are used to proxy presence of foreign firms in an industry, i.e., the employment share of foreign firms to total industry; the output share of foreign firms to total industry; and the capital share of foreign firms to total industry. The results of all three alternatives resemble each other strongly.
8 Constructing variables of annual output growth, changes in import penetration ratio, export–output ratio, value added, and backward linkages are based on input–output tables in 1995 and 2000, obtained from The National Economic and Social Development Board (NESDB) in Thailand.
9 See more information from Food Intelligence Center Thailand, http://fic.nfi.or.th/foodlaw-detail.php?smid=1289
10 See WTO (2020), Trade Policy Review: Report by the Secretaria, WT/TPR/S/400, https://www.wto.org/english/tratop_e/tpr_e/s400_e.pdf for implementation of non-tariff barriers in Thailand. Note that non-tariff barriers are limited in Thailand. For import prohibitions and import licenses, they are applied generally to protect public morals; national security; human, animal, or plant life; health; and intellectual property rights (IPRs), e.g., used engines, parts, and accessories of motorcycles; ceramic food containers and metal-coated food containers with excessive lead and cadmium exposure. During 1995–2019, 84 antidumping cases were notified to the WTO, mostly of steel or steel alloys; citric acid; and inner rubber tubes for motorcycles. Actions mostly affected prod-

ucts originating in China, Chinese Taipei, the Republic of Korea, and Vietnam. Safeguard measures were imposed on some products, e.g., non-alloy hot-rolled steel flat products, in coils and not in coils, at ad valorem rates of 21, 20.87, and 20.74 percent of the c.i.f. price from June 7, 2017 to June 6, 2020, respectively.

11 The frequency index (*F*j) captures the share of products of country j covered by at least one NTMs. The formula is as follows:

$$F_j = \frac{\sum D_i M_{ij}}{\sum M_{ij}}$$

where D_i is the dummy variable where 1 represents the presence of an NTM in the tariff line item and 0 otherwise.

M_{ij} is imports items of good i to country j.

The coverage ratio (*CV*j) is the share of trade of country j covered by at least one NTMs. The formula is as follows:

$$CV_j = \frac{\sum D_i V_{ij}}{\sum V_{ij}}$$

where D_i is the dummy variable where 1 represents the presence of an NTM in the tariff line item and 0 otherwise.

M_{ij} is import value of good i to country j.

12 Dates signed for MRAs were as follows: ASEAN Sectoral MRA on Electrical and Electronic Equipment (April 5, 2002); Agreement on the ASEAN Harmonized Cosmetic Regulatory Scheme with ASEAN Cosmetic Derivative (September 2, 2003); Sectoral MRA for GMP Inspection of Manufacturers for Medicinal Products (April 10, 2009); ASEAN Medical Device Derivatives (November 21, 2014); ASEAN MRA on Type Approval for Automotive Products (October 23, 2020).

13 Note that import refusals are reported in terms of detained shipments, not in terms of the value of refusals. IRR data also does not provide information on the total number of food shipments offered to the FDA for admission into the US. Hence, we are unable to calculate the share of shipments refused entry. The analysis is based on an aggregation of import detentions at the country-sector-year level.

14 The incidence of detentions faced by Thai exporters in European market also declined, from 6.2 in 2012 to 3.9 in 2019. The incidence in 2019 was lower than other Asian countries, including China and Singapore, but still higher than Malaysia and Vietnam. Key reasons for the detentions of Thai exports were adulterations, i.e., around 80 percent of total detentions. In contrast to the US market, adulterations were the key reasons why other Asian countries' products were subject to import refusals. See information of detained products in the European market from the RASSF Portal, https://webgate.ec.europa.eu/rasff-window/portal/?event=SearchForm&cleanSearch=1.

15 See information from https://www.accessdata.fda.gov/scripts/importrefusals/

16 See more information from World Trade Organization, https://www.wto.org/english/tratop_e/covid19_e/notifications_e.htm.

17 Neighboring countries are defined broadly in this study, i.e., past refusals of the same product for all countries (except its own country) in the region. In Asia, neighboring countries are defined for each sub-region as production bases are widely diversified in the region. For South Asia, neighboring countries are defined as all countries only in South Asia, while in East (and Southeast) Asia, neighboring countries are all countries within these sub-regions, excluding Pacific countries. For Latin America and the Caribbean, we separate neighboring coun-

tries between Latin America and the Caribbean, i.e., for neighboring countries of Latin America, we include only countries in Latin America, not Caribbean nations. Likewise, for Europe and Central Asia, the neighboring countries are different between these two entities, i.e., we include only countries in Europe as neighboring countries for developing European countries and developing countries in Central Asia as neighboring countries within this region.

18 Baylis et al. (2009) used monthly lobby expenditure by US industry to proxy suspicions of trade protectionism, but uncovering this variable seems to have had little effect on refusals, while Jouanjean et al. (2015) applied MFN tariff rates for each HS chapter. They found that tariff rates were able to influence the number of detentions in some regions, such as East Asia and the Middle East. The insignificance of this variable in other regions might be because the MFN tariffs themselves have become irrelevant for these regions since bilateral and/or regional trade agreements have been signed.

3 Free trade agreements and investment policies in Thailand

3.1 Free trade agreements

The slowdown in WTO negotiations resulted in a switch in political attention and negotiating resources in Thailand toward preferential trade agreements and bilateral free trade accords. These processes accelerated as a result of a significant change in the political situation in Thailand between 2001 and 2006, when Thaksin Shinawatra's Thai Rak Thai political party came to power. Thailand signed 15 FTAs initiated during the Thaksin administration period. Between 2006 and May 2011, FTA enthusiasm in Thailand stalled because of a coup d'état, the eleventh since the country's first coup in 1932. Under the new constitution promulgated in 2007, the execution of international trade agreements became subject to country-wide public hearings and parliamentary approval (Article 190) to prevent any rushed conclusion of agreements. This constitutional amendment had a significant impact, as not a single bilateral FTA was ratified between 2006 and May 2011, except those that were instigated within the Association of Southeast Asian Nations (ASEAN) 'plus' format. From May 2011 to May 2014, Prime Minister Yingluck Shinawatra, the younger sister of former Prime Minister Thaksin Shinawatra, began to pay attention to FTA negotiations again. Negotiations of several FTAs such as the Thailand–EFTA (European Free Trade Association), Thailand–Chile, and Thailand–Peru FTAs were resumed and progressed, all of which had been stalled between 2006 and May 2011. In May 2014, the Royal Thai Armed Forces, led by General Prayut Chan-o-cha, launched a further coup d'état. This has stalled all FTA talks involving developed-country FTA partners, including those with the US and European countries, simply because these partners expressed a reluctance to have further negotiations with the ruling junta. Nonetheless, the enthusiasm for signing FTAs again been resumed after Dr. Somkid Jatusripitak, the deputy prime minister of economic affairs, took charge of economic affairs from August 2015 to July 2020.

Table 3.1 presents details of all the FTAs in which Thailand has been involved from the 1990s until December 2020, some of which comprise ongoing negotiations. These amount to a total of 24 FTAs, of which 14 have come into force. Regarding the coverage of tariff cuts, there are only nine FTAs in which tariff cuts

DOI: 10.4324/9781003144076-3

Table 3.1 Free trade agreements in Thailand, 1990–2020

FTA	*Signed*	*Effective*	*Remarks*
1. ASEAN	1990	2003	Tariff reduction started in 2003 and completed in 2010 for original ASEAN members; 2015 for new members
2. ASEAN–China	2003	2003	Early Harvest program was launched to eliminate tariffs on fruit and vegetables (HS 07 and 08) in October 2003. China's tariff reduction – 60% (2009), 90% (2010) Thailand's tariff reduction – 33.3% (2009), more than 90% (2010)
3. India	2003	2004	Early Harvest program was launched to gradually liberalize 82 product items in September 2004 and was completed in 2006. Two tracks are applied for tariff reductions, i.e. normal track and sensitive track.
4. Australia	2004	2005	Australia's tariff reduction – 83% (2005), 96.1% (2010), and 100% (2015) Thailand's tariff reduction – 49.5% (2005), 93.3% (2010), and 100% (2025)
5. New Zealand	2005	2005	New Zealand's tariff reduction – 79.1% (2005), 88.5% (2010), and 100% (2015) Thailand's tariff reduction – 54.1% (2005), 89.7% (2010), and 100% (2025)
6. Peru	2006	2011	Tariff reduction between Thailand and Peru – 50% (2011) and 70% (2015)
7. Chile	2006	2015	Tariff of 90% of product lines was cut to zero by November 2015.
8. Japan	2007	2007	Japan's tariff reduction – 86.1% (2007) and 91.2% (2017) Thailand's tariff reduction – 31.1% (2007) and 97.6% (2017) Currently, there is talk regarding further liberalization known as the Japan–Thailand Economic Partnership Agreement Phase 2.
9. ASEAN–Japan	2008	2008	Japan's tariff reduction – 85.51% (December 2008), 90.16% (April 2018) Thailand's tariff reduction – 30.94% (June 2009), 86.17% (April 2018)
10. ASEAN–Korea	2009	2010	Korea's tariff reduction – 90% (2010) Thailand's tariff reduction – 81% (2010), 83% (2012), 86% (2016), and 90% (2017)
11. ASEAN–Australia–	2009	2010	Australia's tariff reduction – 96.34% (2010), 96.85% (2016), 100% (2020)

Table 3.1 Continued

FTA	*Signed*	*Effective*	*Remarks*
New Zealand			New Zealand's tariff reduction – 82.47% (2010), 88.01% (2016), 100% (2020) Thailand's tariff reduction – 73.05% (2010), 91.11% (2016), 98.89% (2020)
12. ASEAN–India	2009	2010	Tariff reduction began in 2010 with a target of 80% for Brunei Darussalam, Indonesia, India, Malaysia, the Philippines, Singapore, and Thailand by 2016; and by 2021 for new ASEAN members.
13. ASEAN-Hong Kong	2007	2019	Tariff reduction for general products (0% within 3–10 years); sensitive products 90–5% within 12 years) and extremely sensitive products (50% or less within 14 years)
14. Regional Comprehensive (RCEP)	2020	2021	Initiated by August 2006, known as ASEAN+6; changed to RCEP in 2011. Plan to cut tariffs to zero immediately on at least 65% of product lines. The negotiation was expected to be concluded by the end of 2019.
15. Thai–Pakistan	Under negotiation		Official negotiations launched in August 2015.
16. Thailand–Turkey	Under negotiation		Negotiations launched in July 2016.
17. Thailand–European Union	Under negotiation		Initiated by November 2007 under ASEAN–European Union; shift to bilateral agreements with individual ASEAN members in 2009. Four meetings were held from May 2013 to April 2014, but talks stalled because of the 2014 Thai coup.
18. Thailand–European Free Trade Association	Under negotiation		Initiated by October 2005 but stalled because of the 2014 coup.
19. Thailand–Sri Lanka	Under negotiation		Initiated by March 2016 due to slow progress of the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation: BIMSTEC
20. Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation: BIMSTEC	Under negotiation		Waiting for Sri Lanka to submit a tariff reduction schedule.

(*Continued*)

Table 3.1 Continued

FTA	*Signed*	*Effective*	*Remarks*
21. Comprehensive and Progressive Trans-pacific Partnership (CPTPP)	Consideration		
22. Thailand–Canada	Under negotiation		Initiated by March 2012 but stalled because of the 2014 coup.
23. ASEAN–European	Under negotiation		No progress since 2009
24. ASEAN and the Gulf Cooperation Council (GCC)	Under negotiation		In July 2011, senior officials of both sides agreed to develop 'Framework Arrangement'

Source: Author's compilation from Department of Trade Negotiation, Thailand and Association of Southeast Asian Nations.

have been substantial, covering more than 80% of tariff lines and having been offered since 2010. They comprise the ASEAN Free Trade Area (AFTA), the Thailand–Australia FTA (TAFTA), the Thailand–New Zealand FTA (TNFTA), the Japan–Thailand Economic Partnership Agreement (JTEPA), the ASEAN–China FTA (ACFTA), the ASEAN–Australia–New Zealand FTA (AANZFTA), the ASEAN–Japan FTA (AJFTA), the ASEAN–Korea FTA (AKFTA), and the ASEAN–India FTA (AIFTA). For another three FTAs (the Thailand–Peru FTA, the Thailand–Chile FTA, and the ASEAN–India FTA), substantial tariff cuts have taken place only in recent years, specifically in 2015 and 2016.[1]

The FTAs in Table 3.1 mainly focus on goods-market liberalization. The commitments that Thailand made on other issues under these FTAs, except in the case of the AEC, were rather weak and at most in line with WTO commitments. These issues include government procurement; service liberalization (for air transport, professionals, education, health, tourism, marine transport, financial services, and the movement of people); environmental standards; competition policy; sanitary and phytosanitary (SPS) measures; technical barriers to trade; intellectual property protection; labor standards; environmental obligations; agricultural export subsidies; import licensing; and customs procedures. This is especially true for FTAs that Thailand has with developing country FTA partners.

Table 3.2 presents data on the simple (unweighted) averages of the most-favored-nation (MFN) rates and preferential tariff rates received by Thailand from the nine FTAs during 2010–2019. The table also presents information on the distribution of the tariff margins and the differences between MFN and preferential tariff rates. Five remarks can be made regarding Table 3.2. First, the average MFN tariffs of the developed countries involved (Australia, New Zealand, and Japan) were generally lower than those of the developing countries. This

Table 3.2 The most-favored-nation (MFN) rates and preferential tariff rates received by Thailand, 2010–2019 (percent)

MFN tariffs	*AEC*				*Thailand–Australia*	*Thailand–New Zealand*	*Thailand–Japan*	*ASEAN–China*	*ASEAN–Australia–New Zealand*	*ASEAN–Japan*	*ASEAN–Korea*
	Indonesia	*Malaysia*	*Philippines*	*Vietnam*							
2010	6.82	5.60	5.87	11.60	3.57	2.02	3.04	9.84	2.80	3.16	13.19
Preferential tariffs											
2010	1.51	0.11	0.16	4.54	0.41	0.59	2.70	1.20	0.94	1.24	8.00
2015	1.49	0.11	0.15	4.28	0.10	0.13	2.49	1.11	0.48	0.79	7.86
2019	1.49	0.11	0.15	4.28	0.10	0.13	2.42	1.11	0.25	0.68	7.09
Distribution of the margin between general and preferential tariffs (% of total tariff lines)											
$\Delta t = 0$	63.47	78.40	2.67	40.83	78.99	81.64	92.11	14.39	69.80	49.60	46.04
(MFN = 0)	(52.92)	(72.92)	(2.32)	(30.60)	(76.33)	(80.39)	(52.39)	(7.75)	(68.9)	(49.40)	(15.64)
$0<\Delta t \leq 5$	9.36	4.05	68.88	21.45	8.45	17.84	3.35	16.59	10.18	29.32	30.72
$5 < \Delta t \leq 10$	6.93	2.48	15.85	13.16	6.28	0.53	2.45	36.82	16.03	11.36	6.23
$10 < \Delta t \leq 20$	18.04	7.99	10.88	13.66	6.28	0.00	1.82	27.36	2.91	3.48	2.62
$20 < \Delta t \leq 30$	1.14	6.61	0.51	8.16	0.00	0.00	0.27	4.27	0.00	1.52	5.27
$\Delta t > 30$	1.07	0.46	1.21	2.74	0.00	0.00	0.00	0.58	1.08	4.78	9.13

Note: Distribution of the margin between general and preferential tariffs (% of total tariff lines) was calculated in 2019.
A number in parenthesis indicates the percentage of tariff lines whose MFN tariff is zero.
Source: Data based on the author's calculations using official documents from the Department of Trade Negotiation, Thailand.

implies that the magnitude of the tariff margins received from developed countries tends to be smaller. Korea seems to be an outlier, as the average MFN tariff was relatively high by high-income-country standards at 13.2 percent. Second, the preferential tariffs offered in these agreements vary across FTAs, so the tariff margins, comparing MFN tariffs with preferential tariffs, also varied considerably from about 0.6 to about 10 percent. As expected, when analyzing the MFN averages, the tariff margins for the developed countries are smaller – ranging from 0.6 to 6.1 percent. The corresponding range for the developing countries is between 5 and about 10 percent.

Third, in all FTAs, except those with China, more than half of the product lines had tariff margins less than or equal to 5 percent. The proportion of such product lines reaches close to 80 percent or higher for developed countries. On the other hand, the proportion of product lines whose tariff margin exceeded 20 percent is rather small in all cases. Hence, FTA preferential schemes tend to be highly concentrated within certain product lines whose tariff margins are less substantial. In addition, items with MFN tariffs greater than 20 percent (that is, tariff peak items) are less likely to be included in FTA tariff cuts. This is especially true for developing countries whose tariffs, on average, are generally high compared to developed countries. Fourthly, China seems to be an outlier, as it had sizable product lines with tariff margins between 5 and 20 percent. In the case of China, 64 percent of product lines had tariff margins of between 5 and 20 percent. This points to the high potential of using FTAs to stimulate trade between partners.

Finally, there were a sizable number of product lines with zero-tariff margins. These zero-tariff margins could be due to two factors. First, the MFN tariffs could have already been zero, and others were excluded from tariff cuts. Hence, the difference between the items with zero-tariff margins and those with zero MFN tariffs indicates the size of the exclusion list for each FTA. The difference is huge for many developing countries. For example, in the case of Indonesia, 63 percent of product lines had zero-tariff margins, around 80 percent of which were from already zero tariffs. There was another 20 percent whose MFN tariffs were not zero. These exceptions include rice (HS10), sugar (HS13), alcohol (HS 15), and food products (HS25). By contrast, product lines with zero-tariff margins regarding Australia accounted for 79 percent, wherein the tariffs of most of these products were already zero.

The tariff cuts offered by Thailand in each FTA were between 5 and 10 percent, compared to the MFN rate (Table 3.3). The substantial tariff margins were for four FTAs, namely AFTA, Thailand–Australia, Thailand–New Zealand, and ASEAN–Korea, and the least was for ASEAN–Japan and the JTEPA. The distribution of the five tariff margin categories offered by Thailand is not different among the FTAs. In general, about half of the product lines were subject to tariff margins of less than 5 percent. However, for Thailand–New Zealand, ASEAN–Korea, ASEAN–Australia–New Zealand, and ASEAN–Japan, substantial tariff lines were subject to tariff margins of more than 5 percent. Particularly, Thailand–New Zealand and ASEAN–Australia–New Zealand, with about 30 and 26 percent of tariff lines, respectively, were subject to tariff margins of higher

Table 3.3 The most-favored-nation (MFN) rates and preferential tariff rates offered by Thailand, 2010–2019 (percent)

MFN tariffs	*AEC*	*Thailand–Australia*	*Thailand–New Zealand*	*Thailand–Japan*	*ASEAN–China*	*ASEAN–Australia–New Zealand*	*ASEAN–Japan*	*ASEAN–Korea*
2010	8.56	10.61	10.36	10.95	10.22	10.71	10.38	12.04
Preferential tariffs								
2010	0.16	0.42	0.94	4.12	1.97	3.84	5.65	1.97
2015	0.16	0.03	0.41	1.60	1.75	1.18	2.10	1.27
2019	0.16	0.01	0.41	1.14	1.75	0.63	1.01	0.76
Distribution of the margin between general and preferential tariffs (% of total tariff lines)								
$\Delta t = 0$	96.08	72.73	20.63	47.40	55.35	11.26	53.01	41.20
$0 < \Delta t \leq 5$	3.38	20.32	13..56	30.13	29.25	55.67	28.41	23.87
$5 < \Delta t \leq 10$	0.47	4.00	36.50	5.75	5.61	7.02	15.49	27.68
$10 < \Delta t \leq 20$	0.10	0.51	21.27	7.17	2.66	5.69	2.75	4.58
$20 < \Delta t \leq 30$	0.02	0.48	4.56	2.32	2.67	13.71	0.32	0.93
$\Delta t > 30$	0.00	1.97	3.48	7.22	4.85	6.64	0.00	1.75

Sources: Data based on the author's calculations using official documents from the Department of Trade Negotiation, Thailand.

than 10 percent, reflecting the possible potential of using FTAs to stimulate trade among partners in these FTAs.

3.1.1 Concentration of products traded under FTA preferential trade schemes

Table 3.4 presents the cumulative share of preferential trade figures of the top 10 and top 15 products during 2011–2019 to indicate the extent of concentration of the products traded under FTA preferential trade schemes. This is to examine whether the benefits from FTA goods-market liberalization are well distributed or highly concentrated. Note that the calculations were undertaken at the 6-digit Harmonized System (HS) level, which consists of more than 5,000 product items. Both exports from and imports into Thailand are reported in Table 3.4.

3.1.1.1 Export side

On the export side, products from Thailand that applied for FTA schemes were highly concentrated with noticeably increasing trends in 2014–2015. The top 10 and top 15 export items from Thailand to other ASEAN members through the AEC scheme in 2011–2012 accounted for 26.8 and 33.2 percent of trade, respectively. The cumulative shares of the top 10 and top 15 export items virtually doubled to 54.7 and 62.2 percent in 2014–2015, respectively, and slightly declined to 47.8 and 54.5 percent in 2018–2019. For the original ASEAN members, the corresponding shares were marginally higher. For example, in 2018–2019, the cumulative share of the top 15 export items was 55 percent for the original ASEAN members, compared to 53.7 percent for new ASEAN members. There were no large differences in the top 15 export products from Thailand to each ASEAN member. The products were dominated by five subsections – completely built-up (CBU) vehicles, auto parts, electrical appliances (air conditioning, washing machines), tires, and primary petrochemical products (Kohpaiboon and Jongwanich, 2015 Appendix 1).

For non-ASEAN members, the degree of product concentration was even higher in the cases of Australia and New Zealand, most of whose tradable products were already subject to zero-tariff lines. For example, the top 10 and top 15 products for Australia were 75.7 and about 80 percent, respectively, in 2018–2019. These intensively used FTA items were dominated by CBU vehicles, electrical appliances (air conditioning, washing machines), and primary petrochemical products.

In contrast, the degree of product concentration of the other non-ASEAN partners declined slightly between 2011–2012 and 2018–2019. This was perhaps due to the trend of trade rebalancing within East Asian economies, as well as the gradual liberalization process within the FTAs under consideration. For example, the cumulative shares of the top 10 and top 15 products in 2018–2019 for Japan were 49 and 56 percent, respectively, falling from 50.9 and 58.2 percent in 2011–2012. The top 15 preferential exports from Thailand to Japan were dominated by

Table 3.4 The cumulative share of preferential trade of the top 10 and top 15 products in Thailand, 2011–2019

	Top 10				*Top 15*					*Top 10*				*Top 15*			
	2011–2012	*2014–2015*	*2016–2017*	*2018–2019*	*2011–2012*	*2014–2015*	*2016–2017*	*2018–2019*		*2011–2012*	*2014–2015*	*2016–2017*	*2018–2019*	*2011–2012*	*2014–2015*	*2016–2017*	*2018–2019*
Exports									***Imports***								
AEC	*26.8*	*54.7*	*50.9*	*47.8*	*33.2*	*62.2*	*57.2*	*54.5*	AEC	*34.9*	*53.7*	*43.9*	*43.7*	*40.1*	*61.3*	*51.4*	*50.9*
Original AEC	*33.2*	*52.8*	*53.0*	*48.6*	*40.7*	*59.9*	*59.2*	*55.0*	Original AEC	*35.9*	*51.2*	*39.2*	*41.9*	*42.2*	*58.5*	*46.8*	*48.9*
Brunei Darussalam	*58.2*	*70.5*	*76.7*	*84.8*	*66.1*	*77.2*	*82.3*	*89.0*	Brunei Darussalam	*100.0*	*62.2*	*50.0*	*100.0*	*100.0*	*69.6*	*50.0*	*100.0*
Indonesia	*41.6*	*38.2*	*54.0*	*46.1*	*48.4*	*46.0*	*59.7*	*52.2*	Indonesia	*52.4*	*37.2*	*28.2*	*34.9*	*60.3*	*45.5*	*35.8*	*41.5*
Malaysia	*29.1*	*38.3*	*36.9*	*36.0*	*36.3*	*45.3*	*45.0*	*44.8*	Malaysia	*32.6*	*37.7*	*29.7*	*31.0*	*39.5*	*44.7*	*35.4*	*37.2*
Philippines	*45.9*	*52.6*	*54.4*	*55.3*	*53.3*	*59.0*	*61.0*	*61.0*	Philippines	*71.7*	*52.6*	*60.6*	*60.6*	*77.5*	*58.9*	*68.8*	*69.1*
Singapore	*50.0*	*64.1*	*74.4*	*78.6*	*56.4*	*71.8*	*78.3*	*81.7*	Singapore	*65.1*	*66.5*	*65.6*	*67.1*	*76.3*	*74.0*	*76.5*	*75.8*
New AEC	*21.8*	*56.6*	*46.0*	*46.3*	*28.5*	*64.5*	*52.3*	*53.7*	New AEC	*51.2*	*56.3*	*56.2*	*48.4*	*57.7*	*64.1*	*63.3*	*56.0*
Cambodia	*79.6*	*62.5*	*64.2*	*62.8*	*88.8*	*71.3*	*70.4*	*69.3*	Cambodia	*76.0*	*62.4*	*93.5*	*87.1*	*76.6*	*71.2*	*95.5*	*91.3*
Lao PDR	*71.1*	*55.7*	*67.6*	*57.0*	*82.8*	*64.5*	*74.2*	*65.3*	Lao PDR	*136.5*	*55.6*	*81.0*	*76.9*	*99.1*	*64.3*	*87.8*	*84.5*
Myanmar	*88.8*	*71.0*	*58.0*	*43.3*	*92.3*	*77.4*	*65.8*	*51.6*	Myanmar	*97.6*	*71.0*	*88.3*	*83.7*	*98.6*	*77.4*	*91.7*	*88.4*
Vietnam	*22.6*	*37.3*	*41.4*	*43.7*	*29.6*	*44.8*	*47.6*	*51.1*	Vietnam	*36.7*	*36.1*	*41.9*	*35.0*	*45.1*	*43.4*	*50.4*	*43.5*
Australia	*50.1*	*66.2*	*75.0*	*75.7*	*57.5*	*71.6*	*79.3*	*80.1*	Australia	*67.7*	*67.8*	*66.2*	*68.1*	*72.0*	*74.2*	*71.9*	*73.8*
New Zealand	*73.3*	*61.1*	*76.5*	*57.0*	*78.4*	*67.3*	*81.2*	*65.2*	New Zealand	*79.3*	*61.1*	*75.7*	*76.8*	*85.4*	*67.3*	*82.6*	*83.3*
China	*59.3*	*48.8*	*46.3*	*46.8*	*68.8*	*56.7*	*52.8*	*54.5*	China	*12.8*	*48.8*	*13.4*	*13.9*	*16.8*	*56.7*	*17.1*	*17.5*
India	*49.5*	*36.3*	*30.0*	*30.4*	*55.9*	*43.2*	*38.2*	*38.5*	India	*24.2*	*36.3*	*40.7*	*39.6*	*29.2*	*43.2*	*47.1*	*46.3*
Japan	*50.9*	*42.4*	*53.1*	*49.0*	*58.2*	*50.4*	*60.3*	*56.0*	Japan	*40.6*	*51.8*	*32.4*	*34.0*	*47.7*	*61.6*	*40.8*	*42.5*
Korea	*41.4*	*29.5*	*29.8*	*31.1*	*48.4*	*36.4*	*36.6*	*38.3*	Korea	*26.5*	*29.5*	*35.4*	*36.1*	*30.4*	*36.5*	*43.1*	*44.8*

Sources: Author's calculations from official data sources: preferential exports from the Bureau of Preferential Trade, Ministry of Commerce, preferential imports from the Customs Department, Ministry of Commerce.

processed foods and processed shrimp. Others included petrochemical products, auto parts, jewelry, and aluminum products. In the case of China, the top 15 items were diverse, ranging from primary food-related products (such as cassava, fresh fruits, and natural rubber products) to primary petrochemical products and primary chemical products. The top 15 preferential exports for Korea were more diverse than for China and Japan. They included natural rubber products, petroleum products, primary petrochemical products, sugarcane molasses, compressors for refrigerators, processed foods, and air-conditioning products.

All in all, the analysis of the product concentration suggests that the common products traded under FTA preferential schemes are automotive products (both vehicles and auto parts), electrical appliances, petrochemical products, and processed food – all of which share some common characteristics, including the dominance of large firms within these sectors; having a high level of local content, to a certain extent; and having a relatively high tariff margin (Athukorala and Kohpaiboon, 2012; Kohpaiboon and Jongwanich, 2015; Jongwanich and Kohpaiboon, 2017).

3.1.1.2 Import side

On the import side, non-ASEAN members like Australia and New Zealand had a higher degree of product concentration than ASEAN members. Within the ASEAN members, the top 10 and top 15 cumulative shares in 2018–2019 were 43.7 and 50.9 percent, respectively. Brunei registered the highest cumulative share, whereas in Indonesia, Malaysia, and Vietnam, the cumulative share was moderate, within a rather narrow range of 31–35 percent. The cumulative share of the other newer ASEAN members was higher than the original members, indicating the higher concentration of products applying for the FTA preferential schemes in those countries.

Product details in the top 15 preferential imports varied across partners. The most important product among the top 15 was coal, accounting for 22.4 percent of the total preferential imports of Thailand from Indonesia. The others were CBU vehicles, certain auto parts, shovels, and excavators. The structure of the top 15 preferential imports into Thailand from Malaysia included electronics (other color reception apparatus for television, automatic controlling equipment), petrochemical products, CBU vehicles, air-conditioning units, foods, lumber, and plastic products. In the Philippines, auto parts and transmissions for motor vehicles, as well as CBU vehicles, were among the top 15 preferential imports. The preferential imports from Cambodia to Thailand were dominated by garment products (HS 61 and HS 62) and primary agricultural products, such as cassava, maize, and sesame seeds. Agricultural products are supposed to be traded at the border. Vietnam's preferential imports covered a wide range of products – from primary agricultural products (such as coffee, cuttlefish, cashew nuts, and wheat) to steel, textiles, and motorcycles. The high product concentration for Myanmar and Lao PDR was driven by the import of copper cathodes, which accounted for 39 and 79 percent of total preferential imports with Thailand, respectively.

For non-ASEAN members, the degree of product concentration also varied. It was highly concentrated for Australia and New Zealand, where the cumulative shares of the top 10 preferential imports were 68.1 and 76.8 percent, respectively, in 2018–2019. The cumulative shares of their top 15 preferential imports slightly increased to 73.8 percent for Australia and 83.3 percent for New Zealand. The former was dominated by primary products, such as copper, bituminous, aluminum, and zinc. In the latter, milk and cream powder alone accounted for 34.1 percent of the total preferential imports between the two countries.

Similar to Vietnam, Thailand's preferential imports from China covered a wide range of products – from fresh fruit (mandarin oranges and apples) to steel, textiles, electrical appliances (DVD players), and auto parts. Despite the relatively low product concentration, the preferential imports from Japan to Thailand were dominated by steel (HS 72), mainly used in the automotive sector, and auto parts. Preferential imports from Korea were dominated by steel, petroleum products, petrochemical products, textiles, and auto parts.

All in all, an analysis of Thailand's top 15 preferential imports from its major FTA partners suggests that the nature of the country's preferential imports comprises fresh agricultural products and raw materials/intermediates for further uses. Interestingly, the relative importance of raw materials/intermediates in preferential imports might explain to a certain extent the lower FTA utilization rate than on the export side. Raw materials/intermediates are eligible for the tariff exemption schemes that have long been available for export businesses. Hence, firms have many options for bypassing tariffs in addition to applying for FTA preferential trade schemes. This is different from preferential exports from Thailand, which are largely finished products for direct consumption. Another important trend is that the top 15 preferential imports from major FTA partners exhibited a relatively high tariff margin. This finding confirms our earlier finding, based on preferential export analysis, that complying with the RoO is costly.

3.1.2 FTA utilization in Thailand

To illustrate FTA uses in Thailand, certificates of origin records are utilized. In Thailand, the Trade Preference Division, Department of Foreign Trade, Ministry of Commerce is the government office in charge of collecting on the export side. On the import side, the Customs Department, Ministry of Finance, is responsible. In general, certificate of origin records is classified according to the HS classification. The value of preferential exports (imports), as well as their share as a percentage of total exports (imports), or the so-called FTA utilization, are both illustrated to analyze FTA uses in Thailand.[2]

3.1.2.1 The use of Thai exporters

Table 3.5 displays the values of preferential exports between 2006 and 2019. The dollar value of preferential exports for both ASEAN member and non-ASEAN

Table 3.5 The FTA utilization rates from Thai exports, 2006–2019

	2006–2010			*2011–2015*			*2016–2019*		
	Value of preferential exports (billion US$)	*Share in total preferential exports (percent)*	*FTA utilization (the value of preferential exports to total exports) (percent)*	*Value of preferential exports (billion US$)*	*Share in total preferential exports (percent)*	*FTA utilization (the value of preferential exports to total exports) (percent)*	*Value of preferential exports (billion US$)*	*Share in total preferential exports (percent)*	*FTA utilization (the value of preferential exports to total exports) (percent)*
ASEAN	9.58	46.10	26.64	17.56	37.09	30.90	26.15	40.72	38.87
Original countries	7.22	34.74	27.18	12.94	27.33	34.26	16.58	25.81	42.78
Brunei Darussalam	0.00	0.00	9.16	0.00	0.00	15.88	0.03	0.04	38.85
Indonesia	3.06	14.73	57.08	6.14	12.97	62.30	7.88	12.26	75.93
Malaysia	2.18	10.49	25.38	3.28	6.93	27.00	3.15	4.90	27.34
Philippines	1.66	7.99	48.08	3.12	6.59	58.84	4.85	7.55	62.76
Singapore	0.32	1.54	3.56	0.48	1.01	4.92	0.68	1.05	6.97
New countries	2.34	11.26	25.22	4.62	9.76	23.98	9.58	14.91	33.42
Cambodia	0.02	0.10	1.32	0.24	0.51	5.76	0.85	1.32	12.16
Lao PDR	0.04	0.19	3.10	0.14	0.30	3.96	0.50	0.78	10.75
Myanmar	0.00	0.00	1.08	0.30	0.63	7.22	0.80	1.25	16.44
Vietnam	2.22	10.68	48.88	3.94	8.32	51.58	7.50	11.68	59.15
Non-ASEAN members	11.20	53.90	22.14	29.78	62.91	43.58	38.08	59.28	46.58
Australia	4.32	20.79	n.a.	6.70	14.15	n.a.	8.50	13.23	n.a.
Thailand–Australia	4.32	20.79	61.38	6.44	13.60	68.78	7.53	11.72	74.24

ASEAN–Australia–New Zealand	0.00	0.00	n.a.	0.26	0.55	n.a.	1.03	1.60	n.a.
New Zealand	0.00	0.00	n.a.	0.04	0.08	n.a.	0.15	0.23	n.a.
Thailand–New Zealand	0.00	0.00	0.40	0.04	0.08	3.72	0.15	0.23	9.89
ASEAN–Australia–New Zealand	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
China	3.28	15.78	18.78	11.98	25.31	46.30	15.20	23.67	49.24
India	0.58	2.79	17.68	2.44	5.15	45.62	3.88	6.03	52.80
Japan	2.82	13.57	n.a.	6.48	13.69	n.a.	7.63	11.87	n.a.
Thailand–Japan	2.82	13.57	15.34	6.46	13.65	29.28	7.33	11.41	30.29
ASEAN–Japan	0.00	0.00	n.a.	0.00	0.00	n.a.	0.28	0.43	n.a.
Korea	0.18	0.87	4.90	2.14	4.52	47.90	2.63	4.09	52.79
Total	**20.78**	**100.00**	**24.00**	**47.34**	**100.00**	**37.94**	**64.23**	**100.00**	**53.31**

Sources: Author's calculations from official data source: preferential exports from Bureau of Preferential Trade, Ministry of Commerce; trade data from UNComtrade.

member countries increased significantly in 2006–2019. For ASEAN members, the dollar value of exports rose to US$26.2 billion in 2016–2019 from only US$9.6 billion in 2006–2010 and US$17.6 billion in 2011–2015. Interestingly, although the export value through the AEC rose in 2011–2015, its share in the total value of preferential exports dropped from 46.1 percent in 2006–2010 to 37.1 percent in 2011–2015, before slightly expanding to 40.7 percent in 2016–2019. Among the original members, Indonesia accounted for the largest share, that is, 12.3 percent, of total preferential exports, followed by the Philippines (7.6 percent) and Malaysia (4.9 percent) in 2016–2019. Nonetheless, the relative importance of original countries in the AEC declined slightly in 2011–2019 due to the growth of preferential exports to new ASEAN member markets, especially Vietnam. The dollar value of preferential exports to new ASEAN member markets increased from US$2.3 billion in 2006–2010 to US$4.6 billion in 2011–2015 and US$9.6 billion in 2016–2019. The share increased to 14.9 percent of total preferential exports in 2016–2019 from 11.3 percent in 2006–2010.

For non-ASEAN member countries, China had become the most important non-ASEAN FTA partner in terms of the value of preferential exports. The certificate records of Thai corporate exports to China increased rapidly from US$3.3 billion in 2006–2010 to about US$12 billion in 2011–2015 and US$15 billion in 2016–2019. Such a pronounced surge in preferential exports to China was due to the progress of trade liberalization through the ASEAN–China FTA. In addition, there were a sizable number of product lines (70% of total product lines) with substantial tariff margins of more than 5 percent stimulating the use of this FTA (see Table 3.2). This worked over and above the spectacular growth performance of the Chinese economy during the past two decades. Until 2013, Japan was the first runner-up after China in terms of the value of its preferential exports. Their value increased from US$2.8 billion in 2006–2010 to around US$7.6 billion in 2016–2019. From 2013, preferential exports to Australia overtook Japan and it became the first runner-up. Its preferential export value increased from US$6.7 billion in 2011–1015 to US$8.5 billion in 2016–2019.

As mentioned earlier, there has been a growing number of newly launched FTAs in addition to the already signed FTAs. There are three export destinations in this category: Australia, Japan, and India.[3] Interestingly, firms are unlikely to apply for entry into the newly launched FTAs. For example, in the case of Australia, the Thailand–Australia (TAFTA) and ASEAN–Australia–New Zealand FTA (AANZFTA) were in effect from 2006 and 2010, respectively. Hence, from 2010 onwards, firms were free to choose either the TAFTA or AANZFTA. In 2016–2019, the total preferential exports to Australia from Thailand amounted to US$8.5 billion, of which US$7.5 billion was under the auspices of the TAFTA. Similar to the Australian case, the total preferential export value from Thailand to Japan was US$7.6 billion in 2016–2019. Transactions through the ASEAN–Japan FTA (AJFTA) were negligible, comprising less than 1% of the total preferential export value of goods flowing from Thailand to Japan. Such a pattern inevitably draws policy attention. Even though the regional-wide FTAs, such as the AJFTA and AANZFTA, allow for the accumulation of inputs across regions, they fail to function effectively from a business point of view. While in theory such accumulation clauses are beneficial to firms, our analysis suggests they are not practical for firms and, as such, are relatively unattractive to prospective companies.

The pattern observed in India is the opposite as the ASEAN–India FTA (AIFTA) has dominated over the use of the Thailand–India FTA (TIFTA) due to the limited tariff cuts in the latter. Such cuts took place under the early harvest program of TIFTA, covering 82 product lines, in 2006. Since then, there has not been any progress in negotiations. By contrast, in 2010, the AIFTA was in effect with a clear time schedule concerning tariff cuts, comprising 80 percent in 2016 for India and the original ASEAN members. As a result, firms, in turn, used the AIFTA instead of the TIFTA.

To illustrate the use of FTAs, the ratio of preferential exports to the actual export value is calculated. When all partners are combined, the utilization rate was increasing during 2006–2019, but remained relatively low, averaging 50 percent, in 2016–2019. The utilization rates vary across FTA partners. Among ASEAN members, Indonesia had the highest utilization rate, followed by the Philippines and Viet Nam. The low utilization rate for Singapore is not surprising given the fact that the country is tariff-free. Hence, most transactions reflect the increasingly important role of Singapore as the location of many multinational enterprises' regional headquarters. Turning to Cambodia, Lao PDR, and Myanmar, utilization rates have been increasing and have started registering at higher than 10 percent since 2017. This was due to their gradual adjustment to tariff reductions. Compared to ASEAN member countries, utilization rates were higher for non-ASEAN partners. Utilization rates were the highest for Australia, reaching 74.2 percent in 2016–2019. For other non-ASEAN FTA partners, utilization rates exhibited a continuously upward trend, especially for China and India.

3.1.2.2 The use of Thai importers

Table 3.6 presents the patterns regarding certificates of origin records on the import side between 2006 and 2019. The dollar value of preferential imports grew rapidly. The value increased from US$6.8 billion in 2006 to US$42.2 billion and US$46 billion in 2011–2015 and 2016–2019, respectively. The dollar value of preferential imports from non-ASEAN partners grew noticeably and reached on average US$34 billion in 2016–2019 from US$2.5 billion in 2006–2010. The largest non-ASEAN FTA partner on the import side was China. In 2016–2019, its dollar value was about US$14 billion, accounting for around 30 percent of total preferential imports. The first and second runners-up were Japan and Australia, whose preferential imports grew noticeably.

Regarding ASEAN member countries, the share of total preferential import value declined noticeably during 2006–2019, from 62.4 percent in 2006–2010 to 37.7 and 25.9 percent in 2011–2015 and 2016–2019, respectively, due to an increase in the number of FTAs signed. Among the ASEAN members, Indonesia

Table 3.6 The FTA utilization rates from Thai imports, 2006–2019

	2006–2010			*2011–2015*			*2016–2019*		
	Value of preferential imports (billion US$)	*Share in total preferential imports (percent)*	*FTA utilization (the value of preferential imports to total imports) (percent)*	*Value of preferential imports (billion US$)*	*Share in total preferential imports (percent)*	*FTA utilization (the value of preferential imports to total imports) (percent)*	*Value of preferential imports (billion US$)*	*Share in total preferential imports (percent)*	*FTA utilization (the value of preferential imports to total imports) (percent)*
ASEAN	4.22	62.43	15.46	15.90	37.71	20.24	11.93	25.85	24.11
Original countries	3.76	55.62	16.74	11.86	28.13	22.50	8.55	18.53	24.32
Brunei Darussalam	0.00	0.00	0.00	0.00	0.00	6.38	0.00	0.00	2.51
Indonesia	1.52	22.49	33.46	5.16	12.24	35.60	3.18	6.88	37.84
Malaysia	1.02	15.09	10.96	3.12	7.40	22.22	2.95	6.39	22.26
Philippines	0.66	9.76	30.46	2.64	6.26	27.56	0.73	1.57	20.95
Singapore	0.58	8.58	9.10	0.96	2.28	15.50	1.68	3.63	19.61
New countries	0.44	6.51	9.28	4.02	9.54	16.90	3.35	7.26	24.38
Cambodia	0.00	0.00	11.34	0.22	0.52	18.88	0.50	1.08	35.52
Lao PDR	0.14	2.07	21.88	0.32	0.76	23.94	0.33	0.70	13.08
Myanmar	0.00	0.00	0.66	0.30	0.71	4.96	0.18	0.38	6.70
Viet Nam	0.30	4.44	22.06	3.22	7.64	31.62	2.35	5.09	38.77
Non-ASEAN members	2.54	37.57	3.90	26.24	62.24	18.88	34.25	74.23	24.56
Australia	0.46	6.80	n.a.	5.10	12.10	n.a.	8.23	17.83	n.a.
Thailand–Australia	0.46	6.80	10.70	4.86	11.53	20.32	8.18	17.72	18.46
ASEAN–Australia–New Zealand	0.00	0.00	n.a.	0.24	0.57	n.a.	0.10	0.22	n.a.

New Zealand	0.16	2.37	n.a.	0.20	0.47	n.a.	0.48	1.03	n.a.
Thailand—New Zealand	0.16	2.37	38.42	0.20	0.47	29.76	0.03	0.05	50.95
ASEAN–Australia–New Zealand	0.00	0.00	n.a.	0.00	0.00	n.a.	0.40	0.87	n.a.
China	0.14	2.07	0.84	10.98	26.04	18.10	13.88	30.07	24.70
India	0.00	0.00	1.72	1.70	4.03	19.32	0.73	1.57	19.31
Japan	1.66	24.56	n.a.	6.50	15.42	n.a.	8.50	18.42	n.a.
Thailand–Japan	1.64	24.26	5.12	6.38	15.13	16.76	8.20	17.77	22.87
ASEAN–Japan	0.00	0.00	n.a.	0.12	0.28	n.a.	0.33	0.70	n.a.
Korea	0.10	1.48	1.28	1.78	4.22	18.60	2.50	5.42	27.42
Total	**6.76**	**100.00**	**7.36**	**42.16**	**100.00**	**18.70**	**46.14**	**100.00**	**24.22**

Sources: Author's calculations from official data source: preferential exports from Bureau of Preferential Trade, Ministry of Commerce; trade data from UNComtrade.

and Malaysia were the most important sources of preferential imports, accounting for around 6.9 and 6.4 percent of total preferential imports in 2016–2019. While the dollar value of preferential imports from the relatively new ASEAN members increased from 2006 to 2019, these mainly came from Vietnam.

Regarding the FTA utilization for imports from 2006 to 2019, it increased gradually from 7.4 percent in 2006–2010 to 24.2 percent in 2016–2019. The ratios on the import side were much lower than those on the export side. As mentioned earlier, the relative importance of raw materials/intermediates in preferential imports explains the fact that their FTA utilization rate was lower than those on the export side. The ASEAN utilization rate on imports increased, and there was not much difference in the utilization rates between the original and new ASEAN members. Indonesia, the Philippines, Vietnam, and Lao PDR were top in terms of utilization for imports. Cambodia's utilization reached 35.5 percent in 2016–2019 partly owing to the increasing importance of cassava imports to Thailand in recent years. For the Philippines and Indonesia, the high utilization was due to the operation of the global production network of multinational automotive companies, where each country is assigned to specialize in a certain vehicle segment (such as pickup trucks or passenger vehicles) and then export to the rest of the region. For example, Indonesia has been positioned as a production base for multipurpose vehicles (including Toyota Innova, Toyota Avanza, and Honda HRV). Indonesia produces these vehicles and sells them to other countries in Southeast Asia and Oceania.

The utilization rate also increased noticeably for non-ASEAN members during 2006–2019. Interestingly, the rate varied significantly across individual partners. New Zealand was top in terms of FTA utilization, following by Korea, China, and Japan. Its utilization rate exceeded 50 percent, dominated by milk and dairy products. Import values from New Zealand were rather small, averaging under US$1 billion a year. For other FTA partners, the utilization rate exhibited an increasing trend and fluctuated around 20–30 percent.

Jongwanich and Kohpaiboon (2017), who empirically examined the determinants of FTA utilization using administrative records of FTA implementation at the product level from Thai exporters during 2001–2015,[4] revealed four key factors affecting FTA usage in Thailand, namely tariff margins, the ability to comply with RoOs,[5] and the economic fundamentals driving trade, and trade under the production networks of multinationals. The statistical significance of tariff margins suggests that applying for such tariff concessions is costly to a certain extent. Companies whose products have a high local content are likely to apply for FTA preferential schemes. The statistical significance of prior-actual export values points to the fact that products must be traded substantially before being able to become involved with FTAs. It is unlikely that joining an FTA will create new export opportunities for companies whose products are either previously untraded or involve relatively low sales volumes. While tariff margins could influence a firm's decision to employ FTAs, their influence is more likely to come into play once the sound economic fundamentals underlying trade have already been established. There is no statistical difference between products traded under MNE production networks and other manufacturing products in terms of the decision to apply for entry into FTA preferential schemes. As long as there are adequate tariff margins to cover the costs incurred by the RoOs, and the economic fundamentals are supportive, these products are likely to be traded through preferential schemes like FTAs. In this study, the estimated cost of complying with RoOs averages at around 8.6 percent of tariff equivalence. The lowest figure is close to zero and is found among developed countries. The cost is substantially higher for developing countries. In some cases, such as with Vietnam and China, the cost estimate reaches double digits, at 12.6 and 14.1 percent, respectively.

3.2 Investment policies governing foreign investment

Thailand has pursued a 'market-friendly' approach toward foreign investors in manufacturing. There have not been major discriminatory policies against foreign investors, and foreign investors are usually guaranteed the same rights as domestic ones, especially in terms of guarantees against expropriation and nationalization. The government permits freedom to export and freedom to remit investment capital, profits, and other payments in foreign currency. Despite the presence of capital control measures in some periods, such as during the pre–1990 era and the late 1990s, in practice the repatriation of the foreign capital related to direct investment (such as investment capital, profit or dividends, interest and principal of foreign loans, royalties and payments on other obligations) has not been restricted.

Foreign investors have been able to become involved in almost any business in Thailand, particularly in the manufacturing sector, except for some businesses covered in the Foreign Business Act. The Foreign Business Act was a law enacted by the National Legislative Assembly of Thailand in 1999 to limit foreign ownership of certain Thai industries.[6] This Act replaces the Alien Business Law passed by a military junta in 1972. The 1999 Act divides industries into three categories, based on the level of restrictions placed on each industry. The first category, called List One, includes businesses in which foreign investors are prohibited from participating due to strategic or religious reasons, such as newspaper and radio stations, as well as making or casting Buddha images and alms bowls. For List Two, foreign companies, with no less than 40 percent of shares and positions on the board of directors being held by Thai nationals,[7] may operate businesses upon obtaining a license from the Minister in the Government Gazette with approval from the cabinet.[8] There are three groups on List Two, namely (1) businesses related to national safety or security, e.g., manufacturing of repair or distribution of firearms and ammunition; (2) businesses related to traditional arts and culture, for example wood carving, silkworm rearing, and the manufacture of Thai silk; and (3) businesses affecting natural resources or the environment, such as the manufacture of sugar from cane and the mining of rock salt.

List Three includes a wide range of businesses, from construction to legal services, in which Thai nations are not yet ready to compete with foreigners, including rice milling and flour production from rice, legal services, architecture, engineering, and construction. Businesses included in this list require a foreign business license from the director-general of the Commercial Registration Department with the approval of the foreign business committee, and then there is no requirement for any Thai shareholders. The 1999 Act was amended several times, in particular excluding some service businesses from List Three. For example, in 2013, security businesses and other businesses according to securities and stock exchange laws, and future trading businesses according to futures trading laws were exempted from the list. The former includes, for example, investment advisors, security dealing, mutual fund management, venture capital management, and so on, while the latter consists of being representatives of loan shareholders, warrantor futures trading contracts, becoming advisors for futures trading contracts, and so on. In 2016–2017, in promoting 'Thailand 4.0', the regulations relating to the banking and financial sectors and infrastructure projects were loosened. According to the amendment, instead of obtaining permission from the foreign business committee and obtaining licenses from the director-general, foreign investors can directly approach the government agency dealing with that specific sector. For example, businesses related to banking sectors can obtain approval directly from the Bank of Thailand. The amendment also allows foreign companies to bid for infrastructure projects, especially government projects related to infrastructure, such as airport power plants, petroleum exploration businesses, rail, and the sky train. It is noteworthy that the act requires foreigners who are allowed to operate businesses in Thailand to invest more than 3 million Baht in the restricted business activity, with the exception of cases where an industry at the time of entry is being promoted by the Board of Investment.

There have been restrictions on land ownership and the hiring of foreign migrants by foreign investors. In general, according to the Land Code (1954), foreign-owned firms are generally not allowed to own land, and according to the Alien Occupation Law, passed in 1973 and amended in 1978, foreigners require a work permit to operate. Since January 2012, the Land Code law has been relaxed, and foreign investors can now own land with certain conditions. Through the Board of Investment (BOI), for example, a foreigner can own land not exceeding one rai, or 1,600 square meters, for residential purposes when those foreign investors invest at least 40 million Baht in Thailand in specific assets or government bonds that will help boost the Thai economy. The BOI, under approval from the Minister of Interior, allows foreign investors with an investment of at least 1 million Baht in Thailand for no minimum prescribed period of time to buy up to 20 rai if the land is for the residential purposes of employees. In addition, foreigners holding executive and director positions titles under a company with Thai shareholders owning at least 51 percent of total company shares can buy up to 20 rai of land for employee residential purposes. The Thailand Land Code Amendment Act of 1999 allows a foreigner married to a Thai spouse to legally own land. Regarding work permits, the Alien Occupation Law requires all foreigners to obtain a work permit prior to starting work in Thailand, but when they are applying under the Investment Promotion Law, they can delay up to 30 days before applying for a work permit.[9] Hence, this, to a certain extent, implicitly encourages foreign investors to apply for BOI promotion privileges, which are discussed in the following section.

3.2.1 The investment promotion regime

To encourage foreign investors, the Board of Investment was established in 1966 as an independent office that would decide which firms received promotion privileges.[10] Investment promotion measures included both tax-based incentives, such as tax concessions on imported machinery, equipment, and raw materials inputs, and non-tax-based incentives, especially the permission to recruit skilled personnel and experts to work in invest promoted activities and give permission to own land. In 1977, the Investment Promotion Act, B.E. 2520 was passed and came into force. Privileges provided under the 1977 Act were, for example, exemption from corporate income taxes for 3–8 years, with carry-forward of losses for up to 5 years after the end of the exemption period, a reduction of up to 90 percent of import duties on imported materials, and exemption or reduction of up to 50 percent of import duties on imported machinery (World Bank, 1980). In the 1970s, BOI privilege promoted activities which were in line with the trade regime gearing toward import-substitution industries. Multinational enterprises during this period were directed more to consumer import-substituting industries (Kohpaiboon, 2006). While not all foreign firms were required to be BOI-promoted, some of the BOI privileges, especially the non-tax incentives such as special rights to own land and foreign worker permits, implicitly forced foreign businesses to apply for the investment incentives. In addition, under the 1977 Act, the BOI was able to impose import surcharges on competing imports or request the Ministry of Commerce to ban such imports. In 1978–1979, there were 30 products and product groups subjected to import surcharges, and for more than 14 products and product groups, import surcharges were applied for more than 1 year. The rate of the surcharges ranged from 5 to 30 percent, but the rates applied on most were in the range of 20–30 percent (World Bank, 1980). These charges strengthened the restrictive impact derived from the trade policy regime in favor of import-substituting industries.

In the 1980s, there was a clear shift in the investment-policy setting from emphasizing import-substituting activities to a focus on the export promotion regime. The BOI began to provide tariff exemptions on imported raw materials to export-oriented promoted firms, that is, those with exports-sales ratios of more than 30 percent, in addition to the existing two tariff exemptions for these firms, the tariff exemptions/drawbacks (Section 19 of the Customs Laws) given by the Department of Customs and the tax rebate schemes given by the Fiscal Policy Offices (FPO). Note that there are another three alternatives in granting duty drawbacks and duty exemptions to export-oriented firms. The first is duty relief for goods placed under the Custom Bonded Warehouse scheme. Second is duty exemption for goods taken into the free zones established by Customs, and third is duty exemption for goods taken into Export Processing Zones (EPZ) under the control of the Thai Customs Department to grant duty drawback. Compared to these alternatives, the BOI offers a prior exemption scheme that is less burdensome than the two existing schemes. After receiving approval from the BOI, export-oriented promoted firms are automatically allowed to access their imports without any delay in order to calculate and pay levies. This, to a certain extent, reduces custom procedures that were considered unusually cumbersome and imposed costs on importers. The World Bank (1988) showed that the BOI-tariff exemption on imported inputs in 1983–1987 accounted for around 60 percent of total foregone revenues from all tariff exemption schemes, indicating the relative significance of the BOI scheme compared with alternatives. The shift in the investment policy tended to make Thailand an attractive location for export-oriented labor-intensive FDI by East Asian investors. The timing of such a change was in line with alterations in the global environment whereby many East Asian manufacturers started losing their international competitiveness in labor-intensive products.

To promote industrial decentralization, investment privileges were granted more to remote areas outside of Bangkok and its surroundings. Under the 1987 investment promotion criteria, the promoted zones were clearly classified into three locations: (1) Bangkok and Samut Prakarn, (2) Bangkok's four neighboring provinces (Nakhom Pathona, Nontaburi, Pathumthani and Samut-Sakhon), and (3) another 67 provinces referred to as investment promotion zones (IPZs). Firms located in Bangkok and Samut Pakarn received the lowest privileges compared to those located in the four neighboring provinces and the IPZs. For example, firms located IPZs received exemptions regarding import duty and business tax on machinery imports, while firms located in the four neighboring provinces to Bangkok received a 50 percent tax reduction from the BOI. Firms located in Bangkok and Samut Pakarn did not receive any exemptions from the BOI. The setting of BOI privileges during this period was in line with the plan set in the Fifth and Sixth National Economic and Social Plans (the long-term economic plan of Thailand), which aimed to promote prosperity in remote areas outside Bangkok and its surroundings.

The promoted zones were reclassified in 1989 to strengthen and promote manufacturing activities in remote areas. Three investment promotion zones were established, Zones 1, 2, and 3. Zone 1 has six provinces, including Bangkok and its neighboring areas; Zone 2 covers ten provinces in central and eastern parts of Thailand; and all the other provinces fall into Zone 3.[11] The fewest investment incentives were granted for projects in Zone 1 and the most for Zone 3. For example, export-oriented projects in Zone 1 received a 50 percent reduction in import duties on machinery, while in Zone 2, the 50 percent reduction was applied to all projects and in Zone 3, import duties were exempted for all projects. Exemptions from corporate income tax were applied for export-oriented projects in Zone 1 for 3 years, for 3–5 years for all projects in Zone 2, and for 6–8 years for Zone 3. Special privileges for projects in the Investment Promotion Zones (IPZs) continued, such as a 50 percent reduction on corporate income tax for 5 years after the exemption period and the double deduction of water, electricity, and transportation costs from taxable income for 10 years. This new classification widened the difference in the privileges granted between Bangkok, the central areas, and the remote zones. In addition, in 1993–2000, the BOI provided additional incentives for enterprises to relocate their factories to remote locations, for example, from Zone 1 to Zone 2; the corporate income tax exemption for 3 years was extendable to 7 years; and for relocation to Zone 3, corporate income tax exemption could be 8 years with a 50 percent reduction on the tax for another 5 years. In 2000, further groups were identified within Zone 3 and granted additional privileges to strengthen industrial decentralization.[12] Although there was a rationale for encouraging firms to locate in Zone 3, resting on the lower incomes of the provinces concerned, poor infrastructure prevented the relocation of significant manufacturing development in those provinces. The incentives offered were not sufficient to overcome this drawback.

In the 1980s, there was another important development related to industrial development in Thailand, i.e., the creation of a new industrial cluster, the so-called 'Eastern Seaboard' (ESB) as the 'new economic zone'. The ESB is composed of two major areas, (1) the Map Ta Phut area, which is a heavy-chemical industry base utilizing natural gas from the Gulf of Thailand, and (2) the Laem Chabang area, which is an export-oriented light-industry base involved with industries such as automobiles and electronics. The available infrastructure includes deep seaports, highways, and industrial estates. This area has a geographical advantage as it is close to the Laem Chabang commercial port. Warr and Kohpaiboon (2018), in examining the factors leading to the success of the automotive sector in Thailand, showed that the infrastructure development in the Eastern Seaboard, rather than local-content requirement policies, contributed significantly to the development of the industry, though this development helped reduce poverty only slightly. However, the establishment of the new economic zone (ESB) tended to conflict with aims set by BOI in strengthening industrial decentralization, as mentioned earlier. Industrial and economic development in the ESB was far greater than in other areas in Thailand, except for Bangkok and its vicinities. For example, GDP per capita in ESB increased enormously from around 35,000 Baht in 1991 to about 121,000 Baht in 1995, while GDP per capita growth average per year was around 7.6 percent. In other areas in 1995, GDP per capita was in a range between 16,000 and 50,000 Baht, and GDP per capita growth on average per year was only around 2.5–4.0 percent. In Bangkok and its vicinities, GDP per capita jumped to 150,000 Baht in 1995 from about 63,000 Baht in 1981, with the annual growth rate at around 2.2 percent.

It is noteworthy that in 1991, the Investment Promotion Act, B.E. 2520 was amended to become the Investment Promotion Act, B.E. 2534 mainly due to the change from a business tax to a VAT system, so that some privileges – for example, the special privileges granted to projects, including those in the IPZ, in terms of reductions in business tax – were cancelled. In addition, in 1999, the privileges granted to promote export-oriented activities were abolished according to the WTO commitment on trade-related investment measures (TRIMs) agreement, and the BOI lifted the restriction on foreign ownership to 49 percent for promoted activities in Zones 1 and 2 to attract more foreign direct investment inflows during the onset of the 1997 crisis. In 2001, the Investment Promotion Act, B.E. 2534 was amended to become the Investment Promotion Act, B.E. 2544.

The 2001 amendment allowed the BOI to play a more active role in cushioning the adverse effects of the 1997 financial crisis, implementing measures such as an increased exemption of juristic person income tax on the net profits derived from promoted activities (for a period of not more than 8 years from the date income was first derived from such activities), and prioritizing activities related to alternative energy, energy conservation, technology and innovation, agricultural equipment, and environmentally friendly products from 2000 to 2013 due to the price hike in petroleum products worldwide. For example, in 2004 (announcement No. Sor10/2547), the manufacture of alcohol or fuel from agriculture products, public utilities and basic services, and the production of electricity or steam power were classified as priority activities of special importance and benefit to the country, so projects would not be subject to the cap on the amount of corporate income tax (CIT) exemption. In 2009 (announcement No. 6/2552), to encourage activities for the development of skills, technology, and innovation, firms engaged in existing promoted activities were entitled to an exemption from CIT and were able to apply for additional rights and privileges, although the revenue was not recognized. In 2009 and 2012 (announcement No. 10/2552 and Sor1/2556), investment incentives were provided to eco-car manufacturing in terms of import duty exemption on machinery and raw materials and essential parts, regardless of zone, for 2 years, or for the period approved by the board, as well as CIT exemption for 6 years regardless of zone. In addition, during this period, the BOI provided privileges to assist manufacturers on some special occasions. For example, in 2011 (announcement No.1/2554), in order to assist existing companies in ten industries[13] affected by the strengthening of the Baht, the companies involved were eligible for special rights and benefits provided by the BOI, in particular CIT exemption for one year. In addition, to receive the benefits from the strengthening of the Baht (announcement No. 3/2554), the BOI provided privileges in terms of exemption from import duties on machinery and a 3-year CIT exemption on the revenues from existing projects, to promote the upgrading of machinery for both BOI and non-BOI-promoted projects. Furthermore, in 2011–2012, the BOI implemented measures to help promote those companies affected by flooding. An exemption from import duty on the machinery to replace that damaged by the severe flooding was provided to the promoted companies (announcement No. 4/2554).

In 2013, the BOI announced a new 5-year strategy plan (2013–2017) to promote investment in Thailand. There were at least six major features announced. First, promoted sectors were prioritized instead of simply a broad-based promotion. Second, privileges were adjusted to provide incentives to activities, which were useful to the country's competitiveness, especially in research and development (R&D) and environment-related industries. Third, instead of using geographic (zones) as a criterion in providing privileges, new incentives aimed to promote regional clusters with an emphasis on border areas. Fourth, facilities, especially in terms of the procedures involved in accessing privileges and human capital, were improved. Fifth, outward direct investment from Thai firms was encouraged to improve the country's competitiveness. Lastly, Key Performance Indicators (KPIs) were applied on each application to ensure the effectiveness of the BOI's investment promotion.

Under the new 5-year strategic plan, only ten industries formed the key focus areas of the BOI, namely (1) logistics-related industries, (2) basic industries, (3) medical and science equipment, (4) renewable energy and environment-related industries, (5) technology-supporting industries, (6) high-technology related industries, (7) food and food-related industries, (8) hospitality and wellness, (9) automotive and auto parts industries, and (10) electronics and electrical appliances. Privileges were reclassified into two main groups, namely groups A and B, which were applied differently for each project in each area, according to its technology sophistication, or the so-called activity-based incentives. Table 3.7 summarizes the privileges in these two main groups. The key difference between the groups was that a privilege in terms of corporate income tax (CIT) exemption was applied only with group A. Privileges pertaining to re-investment were lower than those for new investment. Note that the non-tax incentives included permits to own land, permits to transfer money out of Thailand, and permission to import foreign workers. Interestingly, the BOI also provided additional privileges, named merit-based incentives. Activities where R&D expenditure to total sales exceeded a certain rate were able to receive additional privileges in terms of CIT exemption, that is, when R&D expenditure to total sales was equal to 1 percent or less than 150 million Baht, investors received 1 additional year; at 2 percent or less than 300 million Baht, they received 2 additional years; at 3 percent or less than 450 million Baht, they were eligible for 3 additional years. Furthermore, activities receiving ISO14000 or Carbon Footprint received an additional 1 year CIT exemption privilege.

There are two remarks to be made concerning the new strategic plan of the BOI. First, even though one highlight under the new plan was that promotion would be more selective instead of broad-based, the industry coverage (the ten major sectors mentioned above) was still very wide. This might cast doubt on its effectiveness as a targeted industry strategy. Out of almost 130 activities (under these ten major sectors) listed to be promoted by the BOI, 100 received privileges under category A, the highest one, especially in A2 and A3, accounting for 60 percent. They included petrochemicals, paper and machinery, electronics and electrical appliances, and alternative energy, as well as food industries. Only around 25 activities received privileges under category B. There comprised 80 activities that were dropped from the promotion list, including hydroponics plantations, slaughterhouses, primary rubber processing, glassware, household

Table 3.7 Privileges from BOI for activities classified under groups A and B, 2013–2017

Group	*No. of activities*	*Corporate income tax exemption*		*Exemption for raw materials*		
		New investment	*Re-investment*	*Exemption for tariff of machinery*	*Exemption for tariff of raw materials*	*Non-tax*#*
A1*	10	8 years (no cap)	8 years (no cap)	Y	Y	Y
A1	22	8 years (with cap)	8 years (with cap)	Y	Y	Y
A2	35	5 years (with cap)	3 years (with cap)	Y	Y	Y
A3	34	3 years (with cap)	1 years (with cap)	Y	Y	Y
B1	8	–	–	Y	Y	Y
B2	9	–	–	Y	-	Y
B3	2	–	–	–	Y	Y
B4	4	–	–	–	–	Y
Exit group	80					

Note: Investors can receive another 50% tax exemption for another 5 years after the periods of full tax exemption shown in the table. A1* includes activities, which are highly important for the country's economic restructuring, mostly in service activities supporting industrial sectors and electronics and electrical appliances. *# Non-tax incentives include permits to own land, to transfer money out of Thailand and permission to import foreign workers.
Source: Board of Investment, Thailand.

plasticwares, household paper products, cosmetic accessories, snacks, and housing for the poor.

Second, privileges provided by Thailand's BOI during 2013–2017 were more or less in line with other Asian countries (Table 3.8). The periods of corporate income tax exemption provided in these countries were around 5–15 years. Singapore tended to provide the longest periods of tax exemption, reaching 15 years, followed by Thailand, with 8 years for full exemption and a 50 percent exemption for 5 years. However, in contrast to Singapore and Malaysia, Thailand does not provide privileges in terms of investment allowances and grants for R&D/training. In the former countries, investors can receive an investment allowance of up to 100 percent of the total investment fund. Note that the corporate income tax rate in Thailand, at 20 percent, is still lower than that of the Philippines (30 percent), Malaysia, Indonesia, and Vietnam (25 percent), albeit slightly higher than that of Singapore (17 percent). The rate of personal income tax, by contrast, tends to be the highest (35 percent) among these Asian countries.

A major change took place in 2017 in the wake of an amendment included in the BOI investment promotion plan (2015–2021). Generally, the main purpose of the amendment was to promote activities enhancing national competitiveness through R&D and innovation. Additional incentives were granted to support the new policy package known as Thailand 4.0. Thailand 4.0 represents a combination of promoting industrial transformation and establishing an economic corridor in eastern Thailand beyond relying on the Eastern Seaboard. Ten newly targeted industries were selected to hopefully serve as new and more sustainable growth engines, including (1) new-generation automotive; (2) smart electronics; (3) affluent, medical, and wellness tourism; (4) agriculture and biotechnology; (5) food for the future; (6) manufacturing robotics; (7) medical hub; (8) aviation and logistics; (9) biofuels and biochemicals; and (10) digital industries.[14] The first five are usually referred to as the five S-curve industries and the others as the five new S-curve industries. To support such an industrial transformation, the Eastern Economic Corridor (EEC) was established in 2017. The EEC straddles three eastern provinces – Chonburi, Rayong, and Chachoengsao – located off the Gulf of Thailand and covering 13,285 square kilometers.

There are two sub-incentive schemes as during 2013–2017 provided by the BOI for the newly targeted industries, one involves activity-based incentives and the other merit-based. However, the activities in each category are different (Table 3.9). In terms of the former, the list of activities is divided into seven categories (A1*, A1–A4, and B1–B2), according to their involvement in technology and innovation. A1*, for example, refers to activities classified as support-targeted technology, that is, nanotech, biotech, advanced material, and digital; A1 includes knowledge-based activities focusing on R&D and design; and A2 represents incentives for infrastructure activities using advanced technology to create value-added benefits. For the merit-based incentives, additional incentives are stipulated when activities add additional value to the economy in three areas, namely competitiveness enhancements, decentralization, and industrial area developments. Incentives for investors come in the form of CIT exemption (up

Table 3.8 Privileges provided by the BOI in selected Asian countries during 2013–2017

	Thailand	*Malaysia*	*Singapore*	*Indonesia*	*Philippines*	*Vietnam*
CIT rate	20%	25%	17%	25%	30%	25%
PIT rate (highest)	35%	26%	20%	30%	32%	35%
Privileges (CIT exemption)	8 years and 50% exemption for 5 years	5–10 years	15 years	5–10 years and 50% for 2 years	8 years	2–4 years and 50% for not more than 9 years
Investment allowance	–	60%–100% of investment fund	Not more than 100% of investment fund	Not more than 30% of investment fund	–	–
Grants	–	R&D/training	R&D/training	–	–	–
Negotiation for privileges	–	Yes	Yes	–	–	Yes

Source: Board of Investment, Thailand.

Table 3.9 Privileges from BOI for activities classified under Groups A and B, 2017 onwards

	Activity-based incentives				*Merit-based incentives*		
	Exemption from corporate income tax	*Exemption from import duty from machines*	*Exemption from import duty on raw materials*#*	*Non-tax incentives***	*Competitiveness enhancement****	*Decentralization*****	*Industrial area development******
A1*	10 years (no cap)	✓	✓	✓	1–3 years	3 years	1 year
A1	8 years (no cap)	✓	✓	✓	1–3 years	–	–
A2	8 years	✓	✓	✓	1–3 years	–	–
A3	5 years	✓	✓	✓	1–3 years	3 years	1 year
A4	3 years	✓	✓	✓	1–3 years	3 years	1 year
B1	–	✓	✓	✓	1–3 years	3 years	–
B2	–	X	✓	✓	–	–	–

Note: A1* refers to activities classified as support-targeted technology, including nanotech, biotech, advanced material, and digital. *# This is applied for activities relating to R&D and exports; **Non-tax incentives include permits to own land and to transfer money out of Thailand and permission to import foreign workers. ***Additional cap as a percentage of investment or expenses increases up to 300 percent and additional corporate income tax exemption is provided, i.e., 1 percent or less than 200 million Baht, investors receive 1 year additional; 2 percent or less than 400 million Baht, they receive 2 years additional; 3 percent or less than 600 million Baht, they receive 3 years additional. ****The 20 provinces with the lowest per capita income include Kalasin, Chaiyaphum, Nakhon Phanom, Nan, Bueng Kan, Buri Ram, Phrae, Maha Sarakham, Mukdahan, Mae Hong Son, Yasothon, Roi Et, Si Sa Ket, Sakhon Nakhon, Sa Kaew, Sukhothai, Surin, Nong Bua Lamphu, Ubon Ratchatani and Amnatcharoen. *****Industrial area development includes Bangkok, Samut Prakan, Samut-Sakhon, Pathum Thani, Phra Nakhon Si Ayutthaya, Saraburi, Sing Buri, Phichit, Rayong, Chachoengsao, Chonburi, Prachinburi, Phetchaburi, Ratchaburi, Chiang Rai, Lamphun, Nakhon Ratchasima, Nong Khai, Udon Thani, Songkhla.
Source: Board of Investment, Thailand.

to a maximum 13 years),[15] exemption of import duties on machinery and raw materials used in R&D and/or exports, and non-tax incentives, such as access to long-term land leases and work visas.[16] The adjusted incentive package provided by the Thai BOI tends to be the most generous in Southeast Asia (Table 3.8).

All lists of activities eligible for the promotion are classified into the eight categories shown in Table 3.10. Most eligible activities in all sections, except Section 8 (Technology and Innovation Development), receive privileges under A3 and A4 levels, comprising around 50 percent of total activities in the corresponding section. For the eligible activities in Section 8, all receive privileges at level A1*, while those in section 7, about 30 percent of all activities, obtain a promotion at level A1. Activities receiving A1 and A1* include those related to knowledge-based activities focusing on R&D and design to enhance the country's competitiveness, while those categorized in A3 and A4 are related to high-tech or low-tech activities but are seen as adding value to domestic resources and strengthening supply chains. Interestingly, although the country includes agriculture and biotechnology, food for the future, smart electronics, and biofuels and biochemicals in the ten newly targeted industries, the proportion of eligible activities in Sections 1, 4, 5, and 6 corresponding to privileges at A1* and A1 is noticeably small. This casts doubt on the ultimate effectiveness of such incentives in promoting the targeted industries.

Table 3.10 Eligible activities for BOI promotion, 2017 onwards

Section	*Proportion of eligible activities (percent of total eligible activities)*					
	*A1**	*A1*	*A2*	*A3*	*A4*	*B1, B2*
Section 1: Agriculture and agricultural products	0.0	4.0	24.0	40.0	24.0	8.0
Section 2: Mining, ceramics, and basic metals	0.0	0.0	17.9	28.6	17.9	35.7
Section 3: Light industry	0.0	4.2	8.3	12.5	37.5	37.5
Section 4: Metal products, machinery, and transport equipment	0.0	3.2	35.5	22.6	19.4	19.4
Section 5: Electronic industry and electric appliances	2.1	6.4	12.8	34.0	31.9	12.8
Section 6: Chemicals, paper, and plastics	0.0	0.0	23.8	33.3	23.8	19.1
Section 7: Services and public utilities	7.8	28.1	10.9	31.3	4.7	17.2
Section 8: Technology and innovation development	100.0	0.0	0.0	0.0	0.0	0.0
Total	**4.1**	**9.8**	**17.2**	**29.1**	**20.1**	**19.7**

Source: Author's calculation from information provided by the Board of Investment, Thailand.

As mentioned earlier, to support industrial transformation toward Industry 4.0, the Eastern Economic Corridor (EEC), connecting three eastern provinces, Chonburi, Rayong, and Chachoengsao, was established in 2017. The promoted projects located in these three provinces receive an additional 50 percent reduction from the normal rate of corporate income tax on the net profits derived from the promoted activities for a period of 5 years from the expiring date of the corporate income tax exemption, special deductions for research and development in certain areas, and an income tax cap of 17 percent.[17] In addition to the ten targeted industries, projects aiming to support infrastructure systems and logistics development, tourism, research and development, and technology-enabling services in the EEC receive additional privileges as described above. According to an announcement of the Board of Investment No. 6/2561 Investment Promotion Measures in Eastern Economic Corridor (EEC), the promoted zone for specific industries, including EEC-A (Airport City), is located near U-Tapao International Airport, Rayong province, which includes activities related to an aviation training center, freight center and free-trade-zone; EEC-D (Digital Park) in Sriracha, Chonburi province, was built to support digital business innovators; and EEC-I (Corridor of Innovation) in Wangchan Valley, Rayong province, was constructed to help develop industrial technological innovation.[18] In 2020, the government announced another two promoted industrial estates, EEC-MD (Medical Hub) in Bang Lamung District, Chonburi province, planned to be Thailand's first medical hub to service medical tourists and Thailand's aging population; and EEC-H (High-Speed Rail), which is designed to connect Don Mueang, Suvarnabhumi, and U-Tapao International Airports. Announced on March 19, 2021, the genomics promotion zone, at Burapha University (Bang Saen) was specified as the new promoted zone in EEC.

Eligible activities for promotion in the EEC account for around 56 percent of all eligible activities classified in Section 1–7 (Table 3.11). In EEC, most eligible activities are in Section 4–8, with the proportion of such eligible activities being more than 70 percent of total activities. Combined with the promotion level shown in Table 3.10, which mostly are in levels A3 and A4, this implies that some eligible activities in the EEC remain low-tech, though they could add value to domestic resources and strengthen supply chains. In addition, it seems that the proportion of eligible activities relating to agriculture and agricultural products is relatively low at around 40 percent of total eligible activities in EEC and only 24 percent in EEC-I. As pointed out earlier, the low numbers of eligible activities for promotion in this area lead to concerns about the effectiveness of using BOI privileges in attracting investors into areas where Thailand has a comparative advantage, like agriculture and biotechnology and food as classified in the ten targeted industries.

Note that the Thai government announced additional privileges in 2019, i.e., offering additional 50 percent CIT reduction for another 5 years for firms with a real investment of at least 1 billion Baht ($32.61 million) and who apply for the incentive by 2021. The aim of this additional privilege was to attract relocation of foreign investors, stimulated by the trade tension between the US and

Table 3.11 Eligible activities for BOI promotion in EEC, 2018 onwards

Section	*Proportion of eligible activities (percent of total eligible activities)*			
	EEC	*EEC-A*	*EEC-I*	*EEC-D*
Section 1: Agriculture and agricultural products	40.00		24.00	
Section 2: Mining, ceramics, and basic metals	10.71			
Section 3: Light industry	16.67			
Section 4: Metal products, machinery, and transport equipment	77.42	16.13	16.13	
Section 5: Electronic industry and electric appliances	63.83		21.28	10.64
Section 6: Chemicals, paper, and plastics	71.43		4.76	
Section 7: Services and public utilities	71.88	3.13	12.50	14.06
Section 8: Technology and innovation development	100.00		100.00	25.00
Total	**55.74**	**2.87**	**13.93**	**6.15**

Source: Author's calculation from information provided by the Board of Investment, Thailand.

China. However, other Southeast Asian countries competed to draw windfalls from the US–China trade tension by offering additional privileges. For example, Malaysia offered tax breaks as well as financial subsidies under a batch of incentives worth around 1 billion ringgit ($240 billion) annually over 5 years. In Indonesia, deregulation measures, including corporate tax exemption, were planned.[19] The effectiveness of BOI privileges and the establishment of the EEC in attracting foreign investment as well as in moving the country toward Industry 4.0 is still in question. Chapter 4 analyzes trends and patterns of foreign direct investment and sheds light on the effectiveness of BOI privileges and the establishment of the EEC.

3.3 Conclusions

The Thai government has been active in signing FTAs, and as of the end of 2020, 14 FTAs have been in effect and another 5 are under negotiation. The preferential tariffs offered in these agreements to Thailand vary across FTAs, so the tariff margins, that is, comparing MFN tariffs with preferential tariffs, have varied considerably among FTAs. As expected, the tariff margins for developed countries are smaller than the corresponding range for developing countries.

FTA preferential schemes tend to be highly concentrated within certain product lines whose tariff margins are less substantial. The substantial tariff margins were observed within four FTAs, namely AFTA, Thai–Australia, Thai–New Zealand, and ASEAN–Korea, and the least were for ASEAN–Japan and the JTEPA. The distribution of the five tariff margin categories offered by Thailand is not different among the FTAs.

The products often traded under an FTA preferential trade scheme are highly concentrated in a few product categories. On the export side (Thailand's exports to FTA partners), automotive products (both vehicles and auto parts), electrical appliances, petrochemical products, and processed foods are the top products, while Thailand's preferential imports from its FTA partners are usually perishable/unprocessed agricultural products and basic manufacturing intermediates. When all partners are combined, the utilization rate for Thai exports was increasing during 2006–2019 but was still relatively low, averaging 50 percent in 2016–2019. The utilization rates vary across FTA partners and tend to be higher for non-ASEAN partners, especially Australia. Among the ASEAN members, Indonesia had the highest utilization rate, followed by the Philippines and Vietnam. Regarding FTA utilization for imports, it increased gradually during 2006–2019, but the rate was much lower than on the export side. The relative importance of raw materials/intermediates in preferential imports explains why their FTA utilization rates are lower than those on the export side. Tariff margins, the ability to comply with RoOs, the economic fundamentals driving trade, and trade under the production networks of multinationals explain the use of FTAs in Thailand.

Regarding the investment policies governing foreign investment, Thailand has pursued a 'market-friendly' approach toward foreign investors in manufacturing. The Board of Investment (BOI), established in 1966 as an independent office, is responsible for providing investment incentives. The direction of investment promotion has been amended several times. The promoted zones were established and reclassified in 1989 to strengthen and promote manufacturing activities in remote areas. The Eastern Seaboard (ESB) was also established as the 'new economic zone', which is an export-oriented light-industry base for industries such as automobiles and electronics. Infrastructure, including deep seaports, highways, and industrial estates, was constructed. In 2013, the BOI announced a new 5-year strategy plan (2013–2017) for promoting investment in Thailand. Promoting sectors were prioritized instead of a broad-based approach, and ten industries comprised the key focus areas of the BOI. Instead of using geographic (zones) as a criterion in providing privileges, new incentives were intended to promote regional clusters with a particular emphasis on border areas.

A major change took place again in 2017 with the BOI investment promotion plan (2015–2021). Generally, the main purpose of the amendment was to promote activities enhancing national competitiveness through research and development (R&D) and innovation. Additional incentives were granted to support the new policy package known as Thailand 4.0, and ten newly targeted industries were selected to hopefully serve as new and more sustainable growth engines. To support such an industrial transformation, the Eastern Economic Corridor (EEC), connecting three eastern provinces, Chonburi, Rayong, and Chachoengsao, was established in 2017. The Thai government announced additional privilege again in 2019 to draw windfalls from the US–China trade tension. However, other Southeast Asian countries also competed to draw windfalls from the US–China trade tension by offering additional privileges. Thus, the effectiveness of BOI privileges and the establishment of the EEC in attracting foreign investment as well as in moving the country toward Industry 4.0 is still in question.

Notes

1 The Regional Comprehensive Economic Partnership (RCEP) is the latest free trade agreement, which was signed in November 2020 and became effective in 2021. Countries included in the agreement comprise ten Southeast Asian countries, and an additional five countries, i.e., South Korea, China, Japan, Australia, and New Zealand. It is still early to judge the benefits of RCEP, compared to other existing FTAs in Thailand. However, from tariff schedules released, there have been no significant differences between those in RCEP and those in the existing FTAs, including AFTA, the Thailand–Australia FTA (TAFTA), the Thailand–New Zealand FTA (TNFTA), the Japan–Thailand Economic Partnership Agreement (JTEPA), the ASEAN–China FTA (ACFTA), the ASEAN–Australia–New Zealand FTA (AANZFTA), the ASEAN–Japan FTA (AJFTA), and the ASEAN–Korea FTA (AKFTA). The benefits of the deal could be marginal. However, including more countries with one agreement would probably help to redress possible trade diversion and to better harness our comparative advantages through supply chain networks. For more information on RCEP's tariff schedules and a summary of the agreement, see https://www.dtn.go.th/th/negotiation/category/5cff753c1ac9ee073b7bd27d.

2 It is noteworthy that to calculate FTA utilization at the aggregate level, this study uses the total value of exports (imports) where zero-tariff items values are included. This is in contrast with some studies, e.g., Plummer, Cheong, and Hamanaka (2010), that use the value of non-zero-tariff items only. The zero-tariff lines are included here for two key reasons. First, the appropriate definition of non-zero-tariff items remains unclear when other tariff exemption schemes exist. A clear example is an export processing zone, where the tariffs of inputs used for export can be exempted. As the argument in favor of using only non-zero-tariff items goes, such exempted items should be excluded from the denominator. However, it is extremely difficult to exclude them in practice as it is not clear how much import values are subject to tariff exemption schemes. Second, negotiation in designing RoOs is done in all HS items regardless of their existing MFN tariff. If zero-tariff items are not relevant for FTA use, RoO negotiations should focus on non-zero-tariff items only.

3 Note that data captured concerning New Zealand was exceptionally low as the records accounted for only transactions under AANZFTA preferential schemes. There are no records for the TNZFTA signed in 2005 due to the paperless system adopted under the TNZFTA. Hence, the figures reported here are likely to underestimate the actual transactions under these FTAs.

4 Eight major partners were covered in the analysis as tariff cuts under corresponding FTAs covered more than 80 percent for the period before 2010, including Australia, Indonesia, Malaysia, the Philippines, Vietnam, Japan, China, and Korea under their corresponding effective FTAs. Note that data on TAFTA and JTEPA

are used for Australia and Japan, respectively. Other ASEAN members (that is, Brunei, Cambodia, Laos, and Singapore) are excluded, mainly because of the negligible value of their preferential exports. New Zealand is excluded because of the absence of data as a result of the adoption of a paperless system. In the cases of India, Chile, and Peru, their tariff cuts began with items that have high potential to be traded under FTA preferential schemes, so including them in the sample could result in an upward bias on the effect of tariff margins on firms' decision making

5 Some studies (e.g., Vermulst and Waer 1990; Bhagwati et al. 1999; Krueger 1999; Falvey and Reed 2002; Estevadeordal and Suominen 2004; James 2005 and Krishna 2005) argue that RoOs have been used as policy instruments to benefit special interest groups, and that the rules are too complicated to be handled by small and medium size firms, so that this variable is crucial in determining FTA utilization.

6 According to the Foreign Business Act, a business is considered foreign under the following criteria: (1) the business is established under foreign law; (2) foreigners own capital at 50 percent or higher; (3) foreigners invest 50 percent or higher even if more than 50 percent of the capital is owned by Thai nationals (put in place to block the use of Thai nominee shareholders).

7 Note that the shareholding percentage may be reduced to 25 percent in some cases, with the authorization of the relevant ministers.

8 See details in http://www.thailawforum.com/laws/Foreign%20Business%20Act.pdf

9 Note that a decree was passed in 1979 which prohibited foreigners working in Thailand, such as work in agriculture, animal husbandry, forestry, or fishery, excluding specialized work in each particular branch or farm supervision; bricklaying, carpentry, or other construction work; wood carving; driving mechanically propelled carried or driving non-mechanically-propelled vehicles, excluding international aircraft piloting; shop attendants; providing legal services or engaging in legal work, except arbitration work; and work relating to defense of cases at arbitration level. See more information at https://www.thailandlawonline.com/translations/foreign-employment-working-of-aliens-act

10 It is noteworthy that the BOI started its operation in 1959 and began to promote selected industries in 1962 (Akira, 1996) under the amended Industrial Investment Promotion Act B.E. 2503 (1960). In 1962, 123 industries were promoted, and most were classified as capital-intensive industries and modern industries. In other words, most industrial investment during the 1960s involved import-substitution type industries (Akira, 1996, p. 181).

11 The five areas surrounding Bangkok are Samut Prakarn, Samut Sakorn, Nakorn Pathom, Nonta Buri, and Pathum Thani. Zone 2 covers Samut Songkhram, Ratchburi, Suphan Buri, Ang Thong, Ayutthaya, Saraburi, Nakhon Nayok, Chachoengsao, Chon Buri, and Map Ta Phut Industrial Estate.

12 In 2000, provinces in Zone 3 were furthered divided into (1) 40 provinces where level of development tended to be higher, consisting of Krabi, Kamphaeng Phet, Khon Kaen, Chanthaburi, Chai Nat, Chaiyaphum, Chumphon, Chiang Rai,Chiang Mai, Trang, Trat, Tak, Nakhon Rachasima, Nakhon Si Thammarat, Nakhon Sawan, Prachuab Khiri Khan, Prachin Buri, Phangnga, Phattalunk, Pichit, Phitsanulok, Phetchaburi, Phetchabun, Mukdahan, Mae Hong Son, Ranong, Lop Buri, Lamphang, Lamphun, Loei, Songkhla, Sa Kaew, Sing Buri, Sukhothai, Surat Thani, Nong Khai, Udon Thani, Uttaradit, Uthai Thani, and Ubon Ratchathani; and (2) another 18 provinces, consisting of Kalasin, Nakhon Phanom, Narathiwat, Nan, Buri Ram, Pattani, Phayao, Phrae, Maha Sarakham, Yasothon, Yala, Roi Et, Si Sa Ket, Sakhon Nakhon, Sathun, Surin, Nong

Bualamphu, and Amnat Charoen. Additional privileges were granted to projects locating in 18 provinces, in particular deduction from net profit of 25 percent of the project's infrastructure installation or construction cost for 10 years from the date of first sale, in addition to corporate income tax exemption for 8 years (project with capital investment of 10 million Baht or more, excluding cost of land and working capital) and 50 percent reduction of corporate income tax for 5 years after the exemption period.

13 The ten industries include ready-to-wear garments, leatherwear, footwear, furniture, textiles, toys, sports equipment, jewelry, the production of lenses, and printing.

14 Interestingly, the COVID-19 tends to cause Thai government, under the Gen Prayuth Administration, to rethink about the targeted industries. The government has started to emphasize the Bio-Circular-Green Economy (BCG) Model, instead of all ten targeted industries. Thailand's four strategic areas for the BCG model are (1) food and agriculture; (2) medical and wellness; (3) energy, material, and biochemicals; and (4) tourism and creative economy. It is claimed that focusing on these areas, Thailand would achieve comprehensive security in food, health, energy, employment and sustainable natural resources and environment.

15 Note that under the Competitiveness Enhancement Act, section 24, CIT exemption for targeted industry could be extended to 15 years, based on the judgment of the Board of Investment.

16 In addition to the BOI incentives, the government committed infrastructure investment projects in the EEC area. This includes launching a third international airport (U-Tapao), expanding the Laem Chabang seaport (Laem Chabang Phase 3), and extending the communications network (high-speed trains, double-track railways, highways) in the EEC area, representing a total investment of $43 billion between 2019 and 2025.

17 See Announcement of the Board of Investment No. 4/2560 Investment Promotion Measures in the EEC.

18 It is noteworthy that the eligible activities under the EEC-A include, Section 4: Metal products, machinery, and transport equipment, i.e., manufacture or repair of aircraft, or aerospace devices, and equipment (section 4.11) and Section 7: Service and public utilities, including air transportation services (excluding services by airlines) (section 7.3.4), aircraft or aerospace industrial zones or industrial estates (section 7.9.1.7). For EEC-I, the eligible activities include Section 1: Agriculture and agricultural products, e.g. plant or animal breeding (only those that are not eligible for biotechnology activity) (section 1.2), manufacture of modified starch or starch made from plants that have special properties (section 1.9); Section 4: Metal products, machinery and transport equipment, e.g., automation machinery and/or automation equipment with engineering design (section 4.5.1), machinery, equipment and parts, and/or repair of mold and die (section 4.5.2); Section 5: Electronics and electrical appliances industry, e.g., manufacture of electrical products (section 5.1), manufacture of advanced technology electrical products (section 5.1.1), manufacture of advanced technology electrical products with product design (section 5.1.1.1), manufacture of advanced technology electrical products without product design (section 5.1.1.2); Section 6: Chemicals, paper, and plastics, e.g., manufacture of eco-friendly chemicals or polymers or products from eco-friendly polymers (section 6.2); Section 7: Service and public utilities, e.g., production of electricity or electricity and steam from renewable energy, such as solar energy, wind energy, biomass or biogas, etc. except from garbage or refuse derived fuel (section 7.1.1.2); Section 8: Technology and innovation development. For EEC-D, activities include those in Section 5: Electronics and electrical appliances, e.g., electronics design (section 5.6), embedded soft-

ware development (section 5.7.1), enterprise software and/or digital content development (section 5.7.2); Section 7: Service and public utilities, e.g., digital park (section 7.9.2.2), data center (section 7.9.2.3), innovation incubation center (section 7.9.2.4), cloud service (section 7.10), Section 8: Technology and innovation development, i.e., digital technology development (section 8.1.4).

19 See Nikkei Asia, November 19, 2019 https://asia.nikkei.com/Economy/Southeast-Asian-nations-compete-to-redraw-supply-chain-map.

4 Trade and foreign direct investment in Thailand

4.1 Trade in Thailand

As mentioned in the previous chapters, between the 1960s and the mid-1980s, Thailand implemented an import-substitution strategy with relatively high tariff levels, together with a cascading structure which tended to alter relative prices in favor of producing goods for the domestic market, instead of targeting export opportunities. The share of the manufacturing sector to gross domestic product (GDP) increased from 14 percent in the 1960s to around 20 percent in the early 1980s. Figure 4.1 shows that the degree of openness, measured by the sum of exports and imports of goods and services as a percentage of GDP, was around 50 percent, while it was 20 percent when measured only by the exports of goods and services over GDP in the early 1980s. To eliminate excess supply in the domestic market, exports during this period were dominated by agricultural raw materials. However, as argued in Krueger (1992: p. 43–4), the rapid expansion of import-substituting industries is typically short-lived; manufacturing growth in Thailand bottomed out in 1985, while the manufacturing share in GDP did not increase, but rather remained more or less the same at around 22 percent between 1976 and 1985. The successive balance of payment deficits between the late 1970s and the early 1980s gradually caused the government to shift their industrialization strategy to favor exports.

In the 1980s, there was a clear shift in emphasis from import-substituting activities to export promotion, and various exemption schemes aimed to promote Thailand as an export platform for multinationals. Domestic firms were able to be export-oriented and apply for exemption schemes in order to mitigate any adverse effects of input tariffs. However, exports started to increase noticeably in the late 1980s mainly due to two key driving forces. The first factor involved a series of currency devaluations made during the first half of the 1980s to improve external imbalances (Warr and Nidhiprabha, 1996: 206). In particular, the Baht was devalued by around 36 percent in 1985. The second favorable factor was that East Asian investors, Japanese in particular, were seeking export bases abroad to maintain their international competitiveness in labor-intensive products in the mid-1980s. The erosion of their home countries' international competitiveness was the outcome of wage increases and currency appreciation in the mid-1980s. In addition, the imposition and gradual tightening of quantitative restrictions by

DOI: 10.4324/9781003144076-4

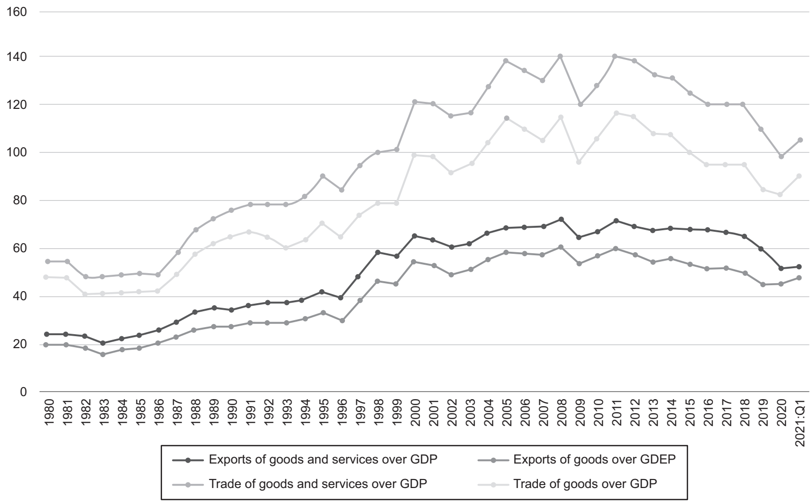

Figure 4.1 The degree of trade openness in Thailand, 1980–2021 Q1 (percent). Source: Bank of Thailand for trade data and Office of the National Economic and Social Development Council (NESDB) for gross domestic product (current prices)

developed countries constrained certain labor-intensive exports, mostly textiles, garments, and footwear, from these East Asian exporters (Wells, 1986). In the electronics industry and other durable consumer goods industries, technological innovations began to allow these investors to slice up the value chain of their production process, relocating labor-intensive segments rather than entire industries to benefit from the cheap labor available abroad (Krugman, 1995). The economy experienced a rapid growth in manufacturing exports, increasing from 11 percent in the first half of the 1980s to 41 and 18 percent during the periods of 1986–1990 and 1991–1996, respectively. Table 4.1 shows that labor-intensive manufacturing products, such as clothing, footwear, leather products, and electronics, dominated exports from Thailand in the lead up to the 1997 economic crisis. The export markets in 1995 were dominated by the US (about 18 percent of total exports), followed by Japan (17 percent), the EU (16 percent), and Singapore (14 percent) (Table 4.2). Interestingly, the share of manufacturing in the world market showed a declining trend during 1992–1998, mainly due to a significant decline in the share of apparel (Figure 4.2). The share of electronics and computers as well as machinery and equipment, in contrast, improved in the world market during the early 1990s. A growing supply from other Asian countries, especially China, caused a dramatic drop in apparel exports from Thailand.

The average annual growth of manufacturing output jumped to 15 percent during the period 1986–1990 and declined slightly to 10.5 percent during the period 1991–1996. As a result, the share of the manufacturing sector in GDP

Table 4.1 Goods exports in Thailand during 1992–2020

	Proportion in total exports (percent)									
	1992–1995	*1996–2000*	*2001–2005*	*2006–2010*	*2011–2015*	*2016*	*2017*	*2018*	*2019*	*2020*
Food (HS01-21)	21.64	14.24	13.36	12.50	12.76	12.51	12.60	12.61	12.73	13.05
Beverages (HS22)	0.18	0.20	0.20	0.25	0.54	0.71	0.69	0.75	0.83	0.82
Tobacco (HS24)	0.26	0.13	0.09	0.06	0.05	0.05	0.05	0.08	0.10	0.07
Manufacturing (HS28-98)	75.92	80.59	81.69	82.28	78.89	81.84	81.77	80.32	81.35	80.98
Chemicals (HS28-38)	1.83	3.49	3.12	4.20	5.25	4.45	4.63	5.34	5.03	4.74
Plastics (HS39)	3.29	3.28	4.46	4.83	5.46	5.29	5.31	5.74	5.42	5.13
Rubber (HS40)	4.89	3.47	5.03	6.70	7.29	5.64	6.87	6.13	6.23	6.70
Wood and wood products (HS44-47)	0.85	1.10	1.04	0.89	1.00	1.21	1.28	1.12	1.02	1.07
Paper and paper products (HS48-49)	0.51	0.89	0.94	1.48	0.63	0.68	0.67	0.68	0.64	0.62
Textiles (HS50-60)	3.62	3.20	2.86	2.17	1.86	1.74	1.71	1.71	1.63	1.41
Apparel (HS61-62)	9.49	4.41	3.94	2.15	1.30	1.13	1.01	0.99	1.06	0.92
Leather and footwear (HS64-67)	3.74	1.55	1.13	0.64	0.38	0.33	0.31	0.29	0.30	0.25
Basic metal (HS72-83)	2.23	4.92	3.76	5.07	4.59	4.42	4.58	4.78	4.60	4.60
Machinery and equipment (HS84)	12.32	18.06	16.60	18.11	16.31	17.25	16.99	16.96	16.30	16.28
Electronics/computer (HS85)	16.09	20.39	20.60	16.00	13.15	13.80	14.39	13.83	13.72	14.74
Motor vehicles (HS87)	1.25	3.00	5.40	8.69	10.70	12.63	12.05	12.04	11.81	10.40
Other transportation (HS86, 88-89)	1.12	1.11	0.81	1.07	1.10	1.24	1.27	0.92	0.99	1.40
Total	100	100	100	100	100	100	100	100	100	100

	Growth (percent)									
	1992–1995	*1996–2000*	*2001–2005*	*2006–2010*	*2011–2015*	*2016*	*2017*	*2018*	*2019*	*2020*
Food (HS01-21)	9.47	46.75	5.23	15.03	2.78	–0.29	10.72	6.95	–1.69	–3.66
Beverages (HS22)	27.05	5.21	12.37	25.58	19.74	6.26	7.40	15.46	8.91	–7.24
Tobacco (HS24)	–25.57	8.22	0.51	8.45	0.85	7.55	13.16	55.56	29.48	–33.34
Manufacturing (HS28-98)	24.09	5.85	10.88	12.99	1.67	2.95	9.77	5.00	–1.39	–6.44
Chemicals (HS28-38)	37.63	66.07	17.50	18.27	3.43	–2.56	14.27	23.24	–8.36	–11.48
Plastics (HS39)	81.00	11.08	17.97	10.77	5.67	–2.74	10.36	15.36	–8.02	–11.06
Rubber (HS40)	31.15	67.51	20.22	22.38	-1.06	–0.87	33.80	–4.71	–1.02	1.13
Wood and wood products (HS44-47)	22.86	20.57	6.45	12.74	6.00	12.62	16.73	–6.78	–10.86	–1.99
Paper and paper products (HS48-49)	81.99	28.86	9.16	31.21	–12.99	5.11	8.12	8.80	–7.50	–9.11
Textiles (HS50-60)	18.70	0.19	8.50	7.82	–1.20	–2.75	8.55	6.93	–7.32	–18.94
Apparel (HS61-62)	6.88	531.48	1.09	-1.09	–3.87	–7.86	–2.13	4.61	4.25	–18.03
Leather and footwear (HS64-67)	26.84	214.46	0.96	-0.90	–2.95	–6.46	0.79	0.97	–0.03	–19.43
Basic metal (HS72-83)	29.59	70.65	16.98	13.04	2.70	1.25	13.86	11.55	–6.28	–6.13
Machinery and equipment (HS84)	31.48	9.06	11.16	13.21	2.06	0.31	8.18	6.73	–6.40	–6.14
Electronics/computer (HS85)	27.60	11.94	6.70	8.19	0.30	1.45	14.51	2.77	–3.41	0.95
Motor vehicles (HS87)	60.90	56.63	27.62	21.78	8.16	2.62	4.82	6.88	–4.53	–17.23
Other transportation (HS86, 88-89)	45.97	33.49	200.81	5.29	7.59	58.59	12.82	–22.45	4.58	32.79
Total	20.52	4.59	10.19	12.73	2.31	0.50	9.86	6.90	–2.64	–6.01

Source: UN Comtrade database.

Table 4.2 Export destinations in Thailand during 1995–2020

	Proportion in total exports (percent)										Growth (percent)								
	1995	*1996–2000*	*2001–2005*	*2006–2010*	*2011–2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*1996–2000*	*2001–2005*	*2006–2010*	*2011–2015*	*2016*	*2017*	*2018*	*2019*	*2020*
Japan	16.79	14.90	14.22	11.23	9.92	9.51	9.33	9.86	9.96	9.88	2.46	8.31	7.50	0.12	2.13	7.74	13.01	−1.66	−6.72
NAFTA	19.01	22.08	18.94	13.23	11.82	13.31	13.09	12.83	14.57	16.51	8.44	3.23	4.97	4.50	1.98	8.09	4.72	10.61	6.52
Canada	1.09	1.13	1.10	0.83	0.68	0.62	0.60	0.63	0.65	0.67	5.27	5.89	7.23	−0.39	−1.67	6.55	10.58	0.46	−3.01
Mexico	0.09	0.39	0.54	0.50	0.85	1.31	1.26	1.12	1.20	1.01	52.58	5.28	17.77	23.24	5.06	5.64	−5.39	4.50	−20.56
United States	17.83	20.57	17.30	11.89	10.29	11.37	11.23	11.09	12.73	14.84	8.20	3.08	4.42	3.59	1.84	8.45	5.53	11.80	9.55
EU	16.51	16.99	15.05	12.79	10.13	10.24	10.07	9.91	9.58	8.95	4.07	6.24	9.07	0.39	0.45	7.99	5.21	−5.92	−12.13
United Kingdom (UK)	2.87	3.54	3.12	2.22	1.72	1.79	1.72	1.61	1.56	1.33	8.13	3.64	6.38	0.95	0.87	5.98	−0.31	−5.39	−19.78
EU (excluding UK)	13.64	13.45	11.92	10.57	8.41	8.46	8.34	8.30	8.01	7.62	3.19	6.96	9.71	0.30	0.36	8.42	6.35	−6.02	−10.63
Germany	2.90	2.60	2.07	1.78	1.81	2.08	2.13	2.04	1.84	1.76	0.54	4.22	11.76	5.72	4.41	12.66	2.30	−12.09	−10.23
Netherlands	3.19	3.47	2.77	2.24	1.97	1.96	2.01	2.06	1.92	1.87	4.83	4.84	7.12	3.91	−1.08	12.82	9.25	−9.09	−8.74
ASEAN	21.73	19.90	20.98	21.90	25.35	25.43	25.20	27.10	25.52	23.96	3.04	13.24	14.38	4.89	−0.66	8.88	14.93	−8.32	−11.73
Brunei Darussalam	0.11	0.09	0.06	0.07	0.07	0.04	0.03	0.04	0.05	0.05	−7.85	12.09	14.13	−1.44	−24.52	1.77	30.04	9.88	−1.74
Indonesia	1.43	1.86	2.97	3.28	4.41	3.80	3.74	4.05	3.70	3.31	13.07	24.88	18.22	3.03	4.46	8.16	15.89	−11.15	−15.98
Malaysia	2.75	3.80	4.89	5.27	5.42	4.47	4.37	4.60	4.21	3.77	15.67	16.61	14.76	0.04	−5.51	7.44	12.58	−11.04	−15.69
Philippines	0.73	1.39	1.89	2.11	2.35	2.97	2.94	3.13	2.81	2.18	22.23	13.64	21.30	4.39	6.75	8.60	13.87	−12.56	−26.96
Singapore	14.03	9.81	7.46	5.53	4.70	3.82	3.50	3.68	3.60	4.11	−3.80	5.43	4.52	0.47	−6.05	0.75	12.24	−4.62	7.17
Cambodia	0.59	0.57	0.79	1.06	1.80	2.17	2.24	3.01	2.90	2.63	1.44	21.83	24.03	16.76	−5.78	13.33	43.92	−6.22	−14.80

Lao People's Democratic Republic	0.63	0.65	0.62	0.98	1.64	1.85	1.67	1.63	1.56	1.45	1.74	15.80	23.63	15.26	–5.71	–1.13	4.43	–6.73	–12.66
Myanmar	0.61	0.67	0.58	0.83	1.62	1.94	1.82	1.83	1.77	1.64	9.60	10.37	24.42	15.72	0.15	3.17	7.35	–5.72	–12.95
Vietnam	0.83	1.06	1.72	2.78	3.34	4.38	4.90	5.12	4.92	4.82	14.09	24.13	20.78	9.22	5.85	22.89	11.87	–6.53	–7.85
Middle East	4.50	3.40	3.72	5.09	4.99	4.14	3.58	3.34	3.45	3.18	–3.28	16.52	17.59	2.04	–15.13	–4.97	–0.05	0.43	–13.30
Australia	1.38	1.93	2.57	4.49	4.20	4.79	4.44	4.26	4.15	4.25	16.48	15.65	24.93	1.67	5.54	1.90	2.58	–5.07	–3.92
China	2.91	3.41	6.75	9.96	11.51	11.05	12.47	11.98	11.84	12.85	13.13	27.79	19.27	2.53	0.28	23.98	2.75	–3.78	2.00
India	0.52	0.60	0.95	1.91	2.38	2.39	2.74	3.02	2.98	2.37	17.02	27.07	24.75	4.17	–2.63	25.65	17.77	–3.77	–25.21
Korea South	1.42	1.64	1.98	1.95	2.01	1.89	1.97	1.95	1.92	1.83	14.83	12.41	11.57	3.30	–0.73	14.39	6.01	–4.30	–10.26
New Zealand	0.16	0.22	0.36	0.40	0.50	0.67	0.69	0.66	0.63	0.54	15.34	24.58	11.84	10.64	8.84	14.53	1.52	–7.30	–19.16
Taiwan	2.40	3.11	2.81	1.84	1.62	1.57	1.70	1.57	1.63	1.64	12.56	3.51	6.06	2.80	–4.49	18.97	–0.92	0.93	–5.55
Total exports	100	100	100	100	100	100	100	100	100	100	4.59	10.19	12.73	2.31	0.50	9.86	6.90	–2.64	–6.01

Source: The Bank of Thailand.

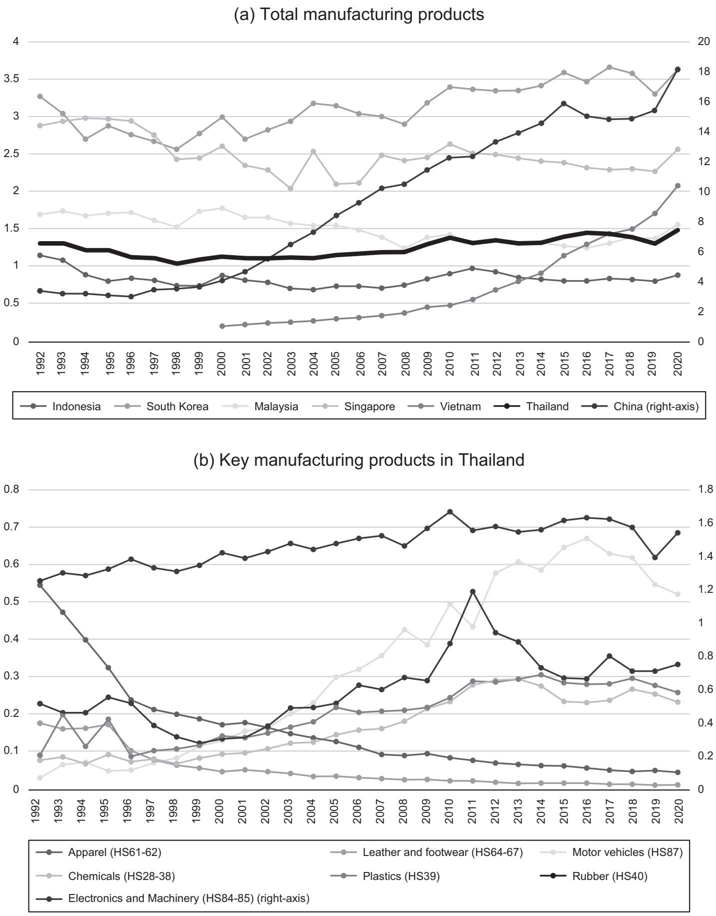

Figure 4.2 World market share of manufacturing products (percent). Source: UN Comtrade database. A. Total manufacturing products. B. Key manufacturing products in Thailand

increased from 22 percent in the first half of the 1980s to 27 percent in the decade ending in 1996. The annual economic growth rate between 1988 and 1996 averaged out at 9.3 percent. This represents a classic example of the export-led growth phenomenon. Imports also noticeably increased during this period in response to export and economic expansion. Raw materials and intermediate products were crucial items within imports as imports during 1992–1995 were dominated by basic metal, machinery, electronics and computers, chemicals, fuel, and related products (Table 4.3). The relatively high proportion of machinery, electronics, and computers to a certain extent reflected the fact that Thai firms started participating in global value chains (GVCs), partly from relocating labor-intensive segments of firms in North-east Asia to produce in Thailand. Some parts needed

Table 4.3 Goods imports in Thailand during 1992–2020

	Proportion in total imports (percent)									
	1992–1995	*1996–2000*	*2001–2005*	*2006–2010*	*2011–2015*	*2016*	*2017*	*2018*	*2019*	*2020*
Food (HS01-21)	3.50	3.73	3.72	3.64	4.33	5.61	5.18	4.91	5.37	6.53
Beverages (HS22)	0.29	0.18	0.18	0.15	0.16	0.19	0.16	0.17	0.18	0.16
Tobacco (HS24)	0.18	0.18	0.14	0.08	0.07	0.10	0.10	0.11	0.13	0.13
Manufacturing (HS28-98)	85.61	83.53	80.36	75.53	75.20	80.24	79.52	77.04	77.77	78.12
Chemicals (HS28-38)	8.32	8.35	8.54	8.42	7.71	8.27	8.26	8.26	8.19	8.77
Plastics (HS39)	3.47	3.89	3.90	3.63	3.48	4.10	3.87	3.86	3.87	4.11
Rubber (HS40)	0.66	0.75	0.82	0.90	1.06	1.12	1.14	1.10	1.15	1.17
Wood and wood products (HS44-47)	2.34	1.45	1.10	0.77	0.58	0.61	0.62	0.57	0.54	0.51
Paper and paper products (HS48-49)	1.25	1.05	0.96	0.92	0.81	0.94	0.83	0.80	0.83	0.94
Textiles (HS50-60)	3.98	3.46	2.91	1.90	1.64	1.68	1.52	1.50	1.52	1.37
Apparel (HS61-62)	0.07	0.16	0.18	0.21	0.30	0.50	0.46	0.53	0.58	0.54
Leather and footwear (HS64-67)	0.14	0.12	0.09	0.13	0.15	0.24	0.21	0.26	0.32	0.29
Basic metal (HS72-83)	12.66	11.54	11.56	13.57	12.27	12.62	12.67	12.60	12.41	11.88
Machinery and equipment (HS84)	18.42	16.20	15.71	13.55	13.18	13.40	12.19	11.82	12.43	12.46
Electronics/computer (HS85)	17.39	23.14	21.87	18.51	16.19	19.68	18.84	18.29	18.16	20.82
Motor vehicles (HS87)	7.49	3.70	3.67	3.45	4.20	4.51	4.09	4.11	4.49	4.56
Other transportation (HS86, 88-89)	2.40	2.87	1.55	1.05	2.38	2.24	2.59	1.61	1.46	1.07
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

(*Continued*)

Table 4.3 Continued

	Growth (percent)									
	1992–1995	*1996–2000*	*2001–2005*	*2006–2010*	*2011–2015*	*2016*	*2017*	*2018*	*2019*	*2020*
Food (HS01-21)	5.76	0.35	13.00	14.29	9.23	5.95	5.84	5.44	4.70	6.16
Beverages (HS22)	7.44	2.55	11.77	8.15	8.20	–1.83	–3.45	18.78	3.60	–23.42
Tobacco (HS24)	8.06	4.84	2.20	1.52	6.03	16.74	11.63	21.62	15.34	–13.89
Manufacturing (HS28-98)	22.67	–1.91	12.60	11.75	2.63	–0.69	13.67	7.65	–3.27	–12.29
Chemicals (HS28-38)	20.06	–0.85	12.29	13.44	1.64	–1.20	14.54	11.15	–5.01	–6.51
Plastics (HS39)	19.48	2.83	10.52	12.78	2.49	2.55	8.17	10.80	–3.96	–7.14
Rubber (HS40)	24.33	1.99	12.85	18.51	3.94	3.31	16.88	7.35	–0.43	–10.79
Wood and wood products (HS44-47)	20.73	–7.81	6.69	7.14	–1.53	–4.81	16.64	2.56	–9.75	–17.60
Paper and paper products (HS48-49)	20.53	–4.60	11.52	12.01	1.38	0.19	0.51	7.41	–0.08	–1.90
Textiles (HS50-60)	7.11	–0.31	3.89	7.83	–0.21	–1.85	3.55	10.00	–2.97	–21.38
Apparel (HS61-62)	33.51	20.34	10.02	19.48	14.73	16.00	6.76	26.71	5.19	–19.05
Leather and footwear (HS64-67)	10.82	–4.11	7.70	29.29	7.85	13.30	2.94	32.86	19.52	–21.43
Basic metal (HS72-83)	21.77	–5.68	21.61	14.88	0.17	–1.32	15.19	10.51	–5.59	–16.43
Machinery and equipment (HS84)	22.81	–2.12	12.95	8.70	3.05	–3.86	4.32	7.82	0.73	–12.51
Electronics/computer (HS85)	31.01	3.99	8.88	8.51	2.64	2.23	9.81	7.86	–4.87	0.11
Motor vehicles (HS87)	28.01	10.69	15.09	17.86	2.93	9.76	3.91	11.59	4.77	–11.26
Other transportation (HS86, 88-89)	15.28	–2.28	26.00	–1.64	59.57	–10.33	32.67	–30.81	–13.06	–35.93
Total	20.47	–0.57	14.32	11.50	2.62	–3.05	14.71	11.12	–4.18	–12.69

Source: UN Comtrade database.

to be imported in order to be assembled in Thailand and then exported to other countries (see more information below about GVCs in Thailand). Not surprisingly, Thailand imports from various countries, including Japan, South Korea, Taiwan, Singapore, and Malaysia as well as the US and EU countries (Table 4.4). As a result of the rise in both exports and imports, the degree of openness, measured by total trade of goods over GDP, rose to 70 percent in 1995 (and 90 percent when the total trade of goods and services was considered) (Figure 4.1). As mentioned in Chapter 2, the comprehensive plan of tariff reduction and rationalization in Thailand during 1990–1995, as part of the World Trade Organization (WTO) commitments, seemed to help spur Thai trade. The average tariff rates for overall products declined from around 40 percent in 1989–1993 to 22 percent in 1995, with the reduction of tariffs being higher for manufacturing products than primary and for capital and intermediate goods than finished products.

The high-growth performance ended in 1997 when the country experienced the financial crisis. The economic growth dropped dramatically to –1.4 and –10.5 percent in 1997 and 1998, respectively. The economy recovered gradually and achieved an annual growth rate of 7 percent by 2003. The model simulation in Jongwanich (2007) points to the capital account opening that speeded up in the early 1990s as the main cause of the 1997–1998 crisis. The dramatic currency depreciation during the onset of the crisis had helped catalyze exports, though some manufacturing exporters were restrained by the credit crunch in the financial sector.

Since the Asian financial crisis, Thailand has experienced a slight slowdown in growth. The annual growth rate during this period was around 4.4 percent on average during 2000–2013. However, exports performed relatively well during 2000–2008 as the average growth rate of exports during this period was around 13 percent, while the degree of trade openness, measured either in terms of total trade or exports, also continued to rise. Interestingly, after 2008, export performance, especially of goods, became relatively poorer due to both internal and external factors interplaying.[1] These included political unrest starting in 2005, the deteriorating global situation (that is, the global financial crisis beginning in 2008 and the European crisis), and the 2011 great floods in Thailand. The average growth rate of manufacturing exports was around 5 percent during 2011–2017 (Table 4.1). The share of exports of goods over GDP declined, but thanks to the export of services, especially the tourism sector, total exports over GDP during 2011–2017 remained relatively stable. The total trade of goods and services over GDP dropped noticeably from 140 percent in 2011 to around 109 percent in 2017 (Figure 4.1). The same picture is revealed when the total trade of goods is considered. The noticeable drop in trade openness during this period resulted mainly from a decline in the imports of goods in response to sluggish domestic demand, especially concerning investment. The share of imports of goods over GDP dropped from 56 percent in 2011 to 44 percent in 2017, while the share of private investment and consumption declined from 21 and 53 to 16 and 49 percent during the same period, respectively.[2] The declining degree of openness, investment, and consumption over GDP somewhat differs from the WTO report

Table 4.4 Import partners of Thailand during 1995–2020

	Proportion in total imports (percent)										*Growth (percent)*								
	1995	*1996–2000*	*2001–2005*	*2006–2010*	*2011–2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*1996–2000*	*2001–2005*	*2006–2010*	*2011–2015*	*2016*	*2017*	*2018*	*2019*	*2020*
Japan	30.55	25.34	23.03	19.67	17.08	15.79	14.47	14.20	14.05	13.43	−3.29	11.85	10.64	−2.87	−1.80	4.50	9.99	−5.84	−16.60
NAFTA	12.95	13.89	9.86	7.20	6.68	6.97	7.30	6.69	8.05	7.90	−1.63	4.50	6.98	5.80	−11.79	19.57	2.62	14.47	−14.28
Canada	0.68	0.65	0.53	0.48	0.42	0.47	0.35	0.40	0.41	0.37	−2.98	9.20	15.70	0.82	−2.42	−13.22	25.33	−2.10	−20.32
Mexico	0.26	0.26	0.20	0.19	0.27	0.30	0.27	0.26	0.32	0.35	−4.14	10.85	20.85	9.66	6.74	1.88	9.14	16.90	−5.77
United States	12.01	12.98	9.13	6.54	5.99	6.20	6.68	6.03	7.32	7.18	−1.40	4.24	6.11	6.10	−13.15	22.90	1.15	15.45	−14.32
EU	16.43	13.09	10.69	8.38	8.44	9.32	9.30	8.97	8.85	8.39	−8.55	11.17	5.90	6.42	0.00	13.83	8.13	−6.13	−17.32
United Kingdom (UK)	2.06	1.79	1.31	1.10	1.15	1.04	1.32	1.20	1.02	0.87	−4.07	7.44	8.61	7.89	−20.95	45.31	1.38	−18.64	−25.99
EU (excluding UK)	14.37	11.30	9.38	7.28	7.29	8.28	7.98	7.78	7.83	7.52	−9.13	11.85	5.57	6.41	3.44	9.88	9.25	−4.20	−16.19
Germany	5.30	4.07	3.40	2.59	2.51	3.02	2.74	2.72	2.66	2.53	−9.76	11.01	9.60	4.03	5.80	3.48	11.31	−6.99	−17.08
Netherlands	0.99	0.96	0.74	0.59	0.46	0.51	0.45	0.41	0.42	0.44	−3.30	6.63	7.65	0.82	1.75	−0.16	3.61	−2.54	−9.23
ASEAN	13.32	14.75	16.97	17.62	17.22	18.81	18.57	18.23	18.98	19.00	3.96	16.72	8.09	5.28	−4.97	12.62	9.98	−0.92	−12.63
Brunei Darussalam	0.41	0.31	0.47	0.07	0.22	0.31	0.26	0.34	0.23	0.18	129.31	−12.00	−11.34	64.17	−14.48	−3.88	44.58	−35.83	−31.16
Indonesia	0.95	1.81	2.41	2.90	3.23	3.26	3.30	3.20	3.06	2.81	15.14	19.92	16.30	3.88	−3.63	15.44	8.91	−9.21	−19.78
Malaysia	4.57	5.06	5.86	6.09	5.49	5.56	5.23	5.33	5.40	4.92	3.38	20.59	6.50	2.41	−9.45	7.33	14.31	−3.57	−20.54
Philippines	0.82	1.30	1.70	1.41	1.13	1.40	1.46	1.38	1.36	1.46	14.85	11.91	6.30	0.15	15.00	19.23	6.28	−6.26	−6.27
Singapore	5.88	5.50	4.47	4.12	3.37	3.35	3.56	3.10	3.21	3.63	−1.74	10.88	3.96	3.21	−9.12	21.21	−2.63	−1.33	−1.29
Cambodia	0.23	0.06	0.02	0.06	0.18	0.48	0.40	0.31	0.96	0.56	−31.91	38.92	59.74	28.09	46.67	−4.62	−14.13	195.81	−49.49
Lao People's Democratic Republic	0.10	0.10	0.15	0.37	0.58	0.97	1.00	1.05	1.07	1.44	10.72	27.93	37.84	15.65	27.57	18.28	17.71	−2.87	17.21

Myanmar	0.31	0.22	1.37	1.79	1.62	1.21	1.12	1.21	1.37	1.36	21.05	61.26	11.86	5.44	−33.98	5.15	21.68	7.76	−13.86
Vietnam	0.06	0.38	0.51	0.82	1.42	2.27	2.24	2.29	2.30	2.64	59.61	29.16	10.32	25.04	8.99	12.25	14.94	−4.42	−0.14
Middle East	3.79	7.91	10.56	13.38	12.47	7.52	8.22	9.78	8.27	6.50	22.91	21.31	12.03	0.89	−20.33	24.60	33.42	−19.59	−31.41
Australia	1.86	1.98	2.34	2.87	2.46	1.76	1.99	2.37	1.67	1.61	−0.69	23.95	16.13	−3.95	−18.82	29.22	33.00	−32.66	−16.32
China	2.96	4.19	7.94	11.88	16.09	21.64	19.97	20.11	21.28	24.16	12.67	27.36	18.44	11.58	2.35	5.26	12.80	0.74	−0.93
India	0.89	0.95	1.15	1.34	1.34	1.32	1.76	1.96	2.03	2.08	2.14	15.68	15.57	4.59	−2.12	51.40	24.90	−1.19	−10.73
Korea South	3.50	3.56	3.65	4.01	3.70	3.75	3.61	3.58	3.66	3.72	0.16	12.73	18.48	−2.13	3.46	9.82	10.99	−2.46	−11.42
New Zealand	0.29	0.35	0.28	0.28	0.27	0.30	0.29	0.29	0.31	0.34	−0.18	5.51	25.07	4.28	−1.05	8.81	12.46	2.29	−6.06
Taiwan	4.83	4.70	4.19	3.77	3.33	3.67	3.68	3.48	3.42	4.00	−1.91	9.78	10.67	2.23	−5.43	14.33	6.07	−6.46	2.05
Total exports	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	−0.19	14.23	11.42	2.88	−4.17	14.07	12.05	−4.81	−12.74

Source: The Bank of Thailand.

(2020: p.26), where it was claimed that a decline in trade openness occurred due to 'Thailand's policy to maintain potential economic growth while expanding the domestic economy and reducing its high dependency on international trade'. A decline in imports driven by weak domestic demand, particularly investment, to a certain extent, raised some concerns over ensuring sustained economic growth and moving Thailand toward Industry 4.0. Interestingly, although manufacturing exports slowed down during this period, their share in the world market remained relatively stable, with some countries in Asia, such as Malaysia and Singapore, encountered a declining trend (Figure 4.2). This to a certain extent reflects the fact that Thailand was able to maintain the competitiveness of her exports amid both the tough external environment and the rapid expansion of some neighboring countries, especially Vietnam. Export destinations noticeably changed, especially after the recent global financial crisis. ASEAN countries and China have increasingly become crucial export destinations for Thailand, and the share of these countries jumped from 20 and 3.4 percent of total Thai exports in 1996–2000 to around 25.2 percent and 12.5 percent in 2017, respectively. The share of developed countries like the US and EU dropped noticeably from 21 and 17 percent to 11 and 10 percent during the same period, respectively (Table 4.2).

Jongwanich (2020) using detailed trade information for 2002–2016 shows that the state of exports in Thailand was mostly explained by intensive margins (exports of traditional (existing) products), while the impact of extensive margins (exports of new products or exports to new market) was still limited, with a slight increase after 2014.[3] The importance of intensive margins was found both in agriculture and manufacturing and their subsectors. Extensive margins in terms of new markets tended to be more important than those in new products, as reflected by the higher share of such margins in the world market. Note that although the countries were still relying more on intensive margins, this study shows that such margins still play an important role in boosting economic growth in Thailand, particularly in electronics, automotive, processed food, and textiles and apparel. The role of extensive margins, both in terms of new products and new market destinations, in promoting growth is still limited. The limited role of extensive margins raises some concerns in swiftly moving toward Industry 4.0 without sufficient fundamental readiness. Extensive margins should be promoted, but it should be done simultaneously with improving traditional products. Particularly, excess profit as a result of enhancing competitiveness in traditional products could form the core internal financial resource to drive ventures into new products, especially in high value-added exports, new markets, or both.

The slow growth episode after the Asian financial crisis has been often claimed as representing the symbol of the middle-income trap in Thailand (for example, Warr, 2011; Jitsuchon, 2012; Tangkitvanich and Bisonyabut, 2015; and World Bank, 2016). Some believe that it was an economic consequence of the global integration of Thailand and that of the export-led growth model adopted through the export-led growth strategy, particularly the unsuccessful upgrading to the level of sophistication of Thailand's medium and high-tech exports. Whether Thailand has been trapped among the middle-income countries remains debatable, but these causes were taken into account by Thailand's policymakers. As revealed in Chapter 3, the Thailand 4.0 Policy, which intends to transform the economy by promoting activities enhancing national competitiveness through research and development (R&D) and innovation, has been set up. The Eastern Economic Corridor (EEC), a special economic zone, was established, and ten newly targeted industries were selected to hopefully serve as new and more sustainable growth engines in 2017.

Export growth improved in 2017 in response to the expansion in (foreign) investment, which was probably influenced by the Thailand 4.0 policy announcement (see the next section on foreign direct investment). However, external environmental factors, like the US–China trade war and COVID-19, resulted in a significant decline in exports in 2018–2020. As mentioned in the introduction, the tension between the US and China has simmered since February 2018 when the US implemented 'global safeguard tariffs' whereby a 30 percent tariff was placed on solar panel imports and a tariff of 20 percent on washing machines. The tensions escalated in 2018 as the US levied tariffs on several Chinese products under Lists 1 to 3, including electronics, machinery and auto parts, railway-related equipment, and railroads, while China retaliated by levying a range of additional tariffs on US goods, including a variety of food products such as grains, seafood, beef, pork, and fruits, as well as large passenger cars, buses, and motorcycles. The US–China trade war tended to create both positive and negative consequences for the Thai economy. As both countries are key export destinations for Thailand, though the importance of the US has declined over the past decade, the growth slowdown in both countries due to the trade war resulted in a decline in demand for Thai exports from both countries. In addition, as Thailand has been in the supply chains of Chinese production processes, weakening demand from the US – the key export destination of Chinese products – negatively affected intermediate exports from Thailand, especially electronics and electrical appliances like integrated circuits (ICs), printed circuit boards (PCBs) and sensors, plastic pellets, rubber, and auto parts. However, on the positive side, the trade war encouraged the US and China to find new sources for their import products. This generates opportunities for Thai organizations to serve those markets through trade diversion, such as more Chinese demand for food products from Thailand and more US demand for some Thai electrical appliances. The trade war stimulated more Chinese and other foreign investors to invest in Southeast Asian countries, including Thailand. In 2018, foreign direct investment, especially from China, increased noticeably (see the next section), and this would probably help encourage exports from Thailand.

Nevertheless, in the short term, it seems that the negative impacts dominated over the positive in Thailand. Manufacturing exports to the Chinese market plunged to –0.7 percent in 2018 from around 27 percent in 2017, especially within electronics, machinery and equipment, automotive products, and rubber. Exports of agricultural goods and food as well as apparel slightly improved but were unable to compensate for the losses in manufacturing exports. Consequently, total Thai exports to the Chinese market dropped to 2 percent in 2018 from around 25 percent in 2017 (Table 4.5). All Asian countries encountered the same situation,

Table 4.5 Export growth from Thailand and other selected Asian countries to China, 2017–2020 (percent)

Exports to the Chinese market from	*Thailand*				*Vietnam*				*Indonesia*			
	2017	*2018*	*2019*	*2020*	*2017*	*2018*	*2019*	*2020*	*2017*	*2018*	*2019*	*2020*
Agriculture and food (HS1-21)	11.61	15.02	21.57	16.99	30.01	–3.97	–4.98	–1.10	20.54	4.42	15.05	6.62
Manufacturing (HS28-98)	26.76	–0.67	–6.80	–0.78	80.92	22.80	0.24	24.29	52.33	7.78	1.44	46.40
Rubber (HS40)	57.09	–17.93	–15.68	1.41	44.04	–3.72	12.01	18.58	134.53	–53.23	–22.40	51.14
Textiles (HS50-60)	10.04	2.42	–8.64	–25.27	26.41	10.34	7.44	–11.24	28.55	–3.89	0.56	–26.98
Apparel (HS61-62)	8.43	16.25	22.37	–14.58	26.19	41.57	2.40	–13.73	40.79	18.28	–16.61	–20.79
Machinery (HS84)	22.98	4.49	–7.97	3.72	26.41	11.00	–2.73	38.11	46.98	24.15	16.86	–0.17
Electronics (HS85)	9.79	0.94	–9.24	6.98	158.06	29.78	–0.09	34.83	2.10	–8.67	–13.29	39.23
Vehicles (HS87)	52.23	–14.44	32.43	29.05	25.43	–0.77	21.15	12.23	29.22	–6.18	–26.68	22.38
Total	23.98	2.75	–3.78	2.00	61.25	16.87	0.16	19.22	35.88	18.94	2.76	13.99
Exports to Chinese market from	*Malaysia*				*Philippines*				*Singapore*			
	2017	*2018*	*2019*	*2020*	*2017*	*2018*	*2019*	*2020*	*2017*	*2018*	*2019*	*2020*
Agriculture and food (HS1-21)	–3.25	0.00	21.51	21.90	30.31	82.71	29.27	–16.05	–12.61	–10.65	10.44	–3.21
Manufacturing (HS28-98)	20.58	21.88	–2.44	16.45	7.02	12.95	1.79	2.22	17.24	–5.33	4.00	0.59
Rubber (HS40)	62.89	–21.69	–9.73	22.07	27.85	46.55	12.16	–28.49	37.19	–19.12	–19.34	–18.24
Textiles (HS50-60)	29.83	53.12	–17.38	–17.80	5.01	–8.39	25.47	62.27	–5.32	38.83	–14.64	0.88
Apparel (HS61-62)	22.83	–6.40	30.95	–5.70	1.30	25.04	15.84	–49.78	25.32	–28.19	–14.65	67.93
Machinery (HS84)	1.91	2.33	–35.51	–12.84	–11.24	–0.14	–12.09	–30.81	15.54	9.38	7.59	23.05
Electronics (HS85)	21.66	17.78	–4.50	19.28	18.71	10.06	11.38	18.69	2.71	–19.38	1.43	15.62
Vehicles (HS87)	–19.54	25.14	–35.72	13.23	–31.74	2.01	–26.36	–6.81	–10.95	18.14	–20.42	8.23
Total	23.59	17.35	–1.27	11.09	12.92	24.40	10.69	–0.07	21.90	–6.76	2.40	–0.25

Exports to Chinese market from	*South Korea*				*Taiwan*				*Japan*			
	2017	*2018*	*2019*	*2020*	*2017*	*2018*	*2019*	*2020*	*2017*	*2018*	*2019*	*2020*
Agriculture and food (HS1-21)	–10.81	7.27	14.36	0.75	18.40	32.45	1.68	–20.06	9.51	1.18	10.54	23.95
Manufacturing (HS28-98)	13.31	12.73	–16.33	–2.04	20.42	8.57	–5.08	13.77	17.20	8.44	–7.44	4.13
Rubber (HS40)	9.55	–0.35	–11.10	–1.95	18.30	–8.20	–6.01	8.84	8.54	1.03	–6.02	–8.69
Textiles (HS50-60)	–4.19	–2.30	–12.03	–22.67	4.60	–0.01	–18.67	–20.85	0.49	0.81	–5.08	–20.41
Apparel (HS61-62)	–11.25	4.17	–15.91	20.37	2.91	–4.29	–21.63	–23.13	5.36	17.11	1.61	41.12
Machinery (HS84)	14.68	37.68	–10.69	–11.13	37.64	17.11	–6.79	4.42	27.10	19.18	–11.57	2.87
Electronics (HS85)	27.75	14.15	–22.55	5.46	24.71	9.96	3.35	27.43	12.30	0.44	–11.36	7.00
Vehicles (HS87)	–41.70	–18.35	–28.67	–20.33	2.43	–4.85	–17.07	15.73	9.81	11.57	–0.69	8.36
Total	14.21	14.08	–15.99	–2.67	20.29	8.85	–5.06	12.93	16.64	8.37	–6.45	5.11

Source: UN Comtrade database.

except the Philippines. In the Philippines, exports of rubber, apparel, and auto parts, as well as food products, increased in the Chinese market and overall export growth jumped from 13 percent to 24 percent in 2017–2018. In South Korea, Taiwan, and Japan, some groups of exports improved in the Chinese market, such as machinery and equipment exports from South Korea and automotive products from Japan, but overall, their total exports slowed down to the Chinese market.

In addition, Thai producers were unable to increase access into the US market, while other Asian countries were able to achieve this successfully. The export growth of Thai products in the US market dropped from around 9 percent in 2017 to around 5 percent in 2018, while those of other Asian countries, including Vietnam, Malaysia, the Philippines, South Korea, and Japan showed an increasing trend during this period (Table 4.6). Electronics and electrical appliances and rubber were areas where Thai exports noticeably declined, while machinery and equipment showed a mild decline. Textile, apparel, and automotive items were groups of products where Thai exports grew in the US market in response to the US–China trade war. For the other Asian countries mentioned above, the export growth of electronics/electrical appliances[4] expanded, while machinery and equipment exports only increased in Singapore (Table 4.6). Exports of automotive products and textiles also expanded in other Asian countries, including Vietnam, Malaysia, the Philippines, and Singapore, as in Thailand. Apparel exports increased in the US market, not only from Thailand, but also from Vietnam and Malaysia. The decline in overall exports to the US market reflected to a certain extent the fact that windfalls from the US–China trade war, especially from possible trade diversion, were limited in Thailand, though some exports, especially electronics/electrical appliances, and machinery and equipment, diverted to ASEAN countries, and their share increased slightly from 25 percent in 2017 to 27 percent in 2018 (Table 4.2). The limited windfalls in Thailand probably reflect some fundamental problem in the country, especially the relatively low investment for a certain period and the unattractiveness of new BOI incentives for existing firms, particularly those in electronics/electrical appliances and machinery and equipment, in expanding production at their established locations outside of the EEC.

Thai exports continued to stall in 2019–2020 due to the COVID-19 pandemic. Almost all export categories nosedived, especially in the Chinese market, in 2019. Although some products increased in 2019, such as food products, including processed fish and crustaceans and cereals and flour, beverages, pharmaceuticals, and chemical products, the huge decline in Thailand's main export products, like machinery and equipment, electronics and electrical appliances, and automotive products brought about a noticeable slowdown in exports during this period. Manufacturing and total export growth dropped to around –2 percent and –2.6 percent in 2019, respectively, from 5 and 7 percent the year earlier. In 2020, electrical machinery and equipment (HS85) gained momentum in response to the growing demand for electronics and electrical appliances caused by COVID-19. However, other products, particularly automotive products, textiles and apparel, chemicals, and plastics, dropped dramatically so that manufacturing and total export growth plunged to –6.4 and –6.1 in 2020. Agriculture and food products

Table 4.6 Export growth from Thailand and other selected Asian countries to the US, 2017–2020 (percent)

Exports to the US market	*Thailand*				*Vietnam*				*Indonesia*			
	2017	*2018*	*2019*	*2020*	*2017*	*2018*	*2019*	*2020*	*2017*	*2018*	*2019*	*2020*
Agriculture and food (HS1-21)	2.77	–1.84	3.89	10.53	2.02	4.47	–11.69	27.90	15.62	–5.59	–7.15	11.12
Manufacturing (HS28-98)	9.66	5.49	14.12	8.29	8.51	15.51	32.73	28.28	7.38	5.61	1.64	4.39
Rubber (HS40)	27.70	11.89	20.28	7.04	47.28	10.51	24.73	23.33	12.24	–11.11	–3.47	–5.60
Textiles (HS50-60)	10.85	34.93	0.19	2.73	5.04	26.89	31.37	9.19	–11.34	9.53	19.34	–20.05
Apparel (HS61-62)	–5.09	9.80	6.77	–17.89	7.23	11.51	8.27	–3.58	14.18	9.19	–2.31	–18.10
Machinery (HS84)	7.67	5.15	2.81	12.15	18.28	–9.89	30.37	104.27	11.91	–14.27	–3.74	30.92
Electronics (HS85)	10.89	–7.92	4.08	36.34	3.78	25.95	78.74	49.62	–16.98	–18.74	22.57	77.68
Vehicles (HS87)	0.10	6.93	10.62	85.53	14.67	35.55	41.19	24.46	–7.53	–3.00	24.91	16.87
Total	8.45	5.53	11.80	9.55	8.00	14.51	29.05	28.38	10.17	3.62	–4.23	5.52

(*Continued*)

Table 4.6 Continued

Exports to the US market	*Malaysia*				*Philippines*				*Singapore*			
	2017	*2018*	*2019*	*2020*	*2017*	*2018*	*2019*	*2020*	*2017*	*2018*	*2019*	*2020*
Agriculture and food (HS1-21)	0.03	−10.90	5.05	14.35	6.52	−11.77	−14.97	4.79	6.45	1968.15	0.65	13.34
Manufacturing (HS28-98)	6.45	10.00	3.98	11.13	6.13	19.08	11.74	−16.73	8.59	17.76	8.53	19.55
Rubber (HS40)	16.24	16.12	3.40	75.07	1341.94	39.48	5.12	−11.33	13.80	−1.51	29.12	−27.46
Textiles (HS50-60)	16.59	29.41	56.42	−10.21	106.10	−7.67	−41.77	−42.34	−13.20	55.44	−48.14	292.89
Apparel (HS61-62)	−4.57	−6.11	1.79	−24.09	−3.28	−15.14	−8.19	−27.75	9.27	−8.94	−28.86	−28.22
Machinery (HS84)	13.64	3.64	−12.36	31.38	19.69	0.38	23.81	4.59	9.63	31.90	18.30	−8.20
Electronics (HS85)	1.18	3.59	8.73	−1.65	−8.61	21.87	2.76	−18.05	12.09	11.03	1.20	10.95
Vehicles (HS87)	−5.36	14.53	9.89	−7.06	−58.94	26.77	−21.84	38.63	−12.19	16.95	−15.03	−5.16
Total	6.47	9.02	3.51	11.50	6.24	14.56	8.69	−15.20	8.47	30.59	8.44	17.80

Exports to the US market	*South Korea*				*Taiwan*				*Japan*			
	2017	*2018*	*2019*	*2020*	*2017*	*2018*	*2019*	*2020*	*2017*	*2018*	*2019*	*2020*
Agriculture and food (HS1-21)	8.91	9.41	9.33	24.15	11.89	–1.40	12.10	8.01	1.56	5.48	5.84	–1.81
Manufacturing (HS28-98)	2.19	5.55	–0.32	3.66	10.27	6.23	19.34	9.28	3.41	3.44	–0.93	–15.17
Rubber (HS40)	–3.86	–0.86	–3.90	–13.65	18.08	4.05	9.23	6.45	–0.06	6.23	2.48	–16.01
Textiles (HS50-60)	–4.60	14.38	–0.56	–7.71	–5.22	–2.01	–0.30	–6.70	8.42	7.55	–0.94	–10.22
Apparel (HS61-62)	–5.19	–1.17	–7.56	–17.48	–10.00	–9.99	–8.02	–11.66	11.50	12.95	1.27	–19.73
Machinery (HS84)	26.40	17.92	–9.72	11.88	20.59	18.38	52.44	14.44	7.54	3.96	4.65	–20.23
Electronics (HS85)	–8.91	5.80	–4.67	14.45	6.72	–3.43	20.75	13.89	1.09	2.84	–4.55	–6.45
Vehicles (HS87)	–9.32	–3.20	12.47	–2.26	7.96	6.42	4.96	0.17	1.77	0.57	–5.03	–16.40
Total	3.23	5.99	0.86	1.05	10.45	6.29	18.76	9.31	3.62	3.92	–0.17	–15.45

Source: UN Comtrade database.

declined, except vegetables and fruits, both fresh and processed, which went up in response to growing demand from East Asian countries, particularly China. In 2020, Thai export growth expanded only in the US, Singapore and Chinese markets, by around 10, 7, and 2 percent, respectively. Interestingly, although exports in Thailand dropped significantly during this period, the world market share of all products in Thailand went up, including processed fish and crustaceans (HS16) (from 2.2 in 2019 to 15.7 in 2020); and electronics and machinery (from 0.8 to 1.4). An increase in world market share was also revealed in other Asian countries, particularly in China, Vietnam, South Korea, and Singapore, where COVID-19 was handled relatively well (Figure 4.2). This, to a certain extent, reflects that the impact of COVID-19 in disrupting supply in other regions tended to be more pronounced than in Thailand and some other Asian countries.

4.1.1 Trade in global production networks

The structure of production and trade in the region, particularly in East and Southeast Asia, has changed over the past two decades. The cross-border dispersion of component production/assembly within vertically integrated production processes, the so-called international product fragmentation, has dominated production and trade patterns in the region. In this subsection, trade in GVCs is analyzed to reveal the trends and patterns of the parts and components trade in Thailand compared to other ASEAN countries.

The involvement of ASEAN countries in GVCs dates back to 1968 when two US-based electronics companies, National Semiconductors and Texas Instruments, set up production bases in Singapore for assembling semiconductor devices (Grunwald and Flamm, 1985; Lee, 2000). Subsequently, Singapore-based multinational enterprises (MNEs) began to relocate some low-end assembly activities to Malaysia, Thailand, and the Philippines in response to their local rapid growth in wages and land prices. Many newcomer MNEs to the region also set up production bases in these countries, bypassing Singapore, particularly after the mid-1980s, when East Asian investors were seeking export bases abroad to maintain their international competitiveness in labor-intensive products. Jongwanich (2017: chapter 3), using detailed trade data, showed that parts and components (P&C) exports to total manufacturing exports in Thailand jumped from 28.7 percent in 1992 to 31.4 in 2000. Such evidence was also revealed in other Asian countries like Malaysia, Singapore, and the Philippines. The share of P&Cs in their manufacturing exports increased during this period from 40.0, 37.5, and 38.4 percent, respectively, in 1992 to 45.6, 42.8, and 68.9 percent in 2000. The increasing trend of P&Cs in imports was evident in these countries.

By the new millennium, Thailand and other ASEAN countries continued to participate in GVCs, as shown by the relative importance of P&Cs in the total manufacturing trade (Table 4.7).[5] However, GVC participation varied significantly across countries. The P&C share to total manufacturing trade remained substantial for GVC firstcomers in ASEAN, that is, Malaysia, Singapore, Thailand and the Philippines, despite a slightly declining trend being observed in recent

Table 4.7 Share of P&Cs in manufacturing trade (percent), 2002–2020

	Exports								*Imports*							
	2002–2005	*2006–2010*	*2011–2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*2002–2005*	*2006–2010*	*2011–2015*	*2016*	*2017*	*2018*	*2019*	*2020*
Brunei Darussalam	15.7	28.5	22.3	27.9	18.1	19.6	19.0	n.a.	17.8	17.8	17.1	19.4	25.3	26.9	18.1	n.a.
Cambodia	0.2	0.2	1.7	4.4	4.1	4.0	3.8	n.a.	8.4	8.5	10.2	13.4	13.3	12.2	13.4	16.3
Indonesia	17.8	16.5	15.6	18.0	14.6	14.4	14.4	14.0	24.3	25.0	25.7	26.6	25.8	25.6	24.8	n.a.
Lao People's Dem. Rep.	n.a.	8.3	7.3	12.0	7.1	7.8	7.8	n.a.	n.a.	21.4	23.4	27.2	27.9	31.5	26.9	20.5
Malaysia	48.8	44.5	44.3	43.1	27.4	23.7	24.1	24.5	57.1	50.2	44.4	43.8	30.2	28.2	29.5	25.5
Myanmar	n.a.	0.5	1.8	17.8	4.1	3.7	2.2	10.4	n.a.	13.9	10.8	13.2	13.6	12.7	12.5	23.4
Philippines	65.4	59.3	55.5	45.1	37.6	39.4	28.3	n.a.	68.4	61.5	44.8	41.9	32.2	33.2	25.6	21.3
Singapore	48.9	55.5	54.4	45.8	25.0	26.7	28.2	27.0	50.8	53.5	53.9	49.2	29.3	31.8	33.9	n.a.
Thailand	32.1	28.0	26.0	33.1	24.1	23.6	22.7	24.0	38.4	35.2	32.3	36.6	29.0	28.6	27.8	29.4
Vietnam	11.7	13.3	31.3	48.1	37.0	38.3	37.1	38.7	15.9	19.3	30.9	37.3	27.1	26.9	26.7	n.a.
ASEAN6	47.3	43.9	41.9	37.6	25.2	25.0	24.5	24.3	53.7	46.3	41.7	41.0	29.2	29.5	29.7	31.5
ASEAN10	45.6	41.8	40.3	39.1	27.1	27.2	26.8	27.8	50.7	43.6	39.7	39.5	28.4	28.6	28.6	29.6
China	21.6	22.6	24.5	26.4	25.3	25.7	24.8	24.0	38.8	41.6	41.5	45.1	22.3	21.3	20.8	28.4
Japan	32.5	31.4	31.1	31.7	27.8	27.2	26.5	26.4	27.1	27.5	27.0	28.7	25.5	25.0	24.2	29.4
Korea	35.6	34.2	34.5	37.8	22.7	22.5	24.3	23.7	34.9	30.5	30.8	32.3	20.6	20.5	22.6	29.2
Northeast Asia	28.6	27.0	27.4	34.5	25.4	25.5	25.0	25.9	34.3	36.1	36.6	36.5	22.7	22.0	21.8	15.9
EU27	23.8	22.6	22.0	22.2	21.6	21.5	21.3	20.5	24.0	23.3	23.4	23.6	25.2	24.5	24.2	23.7
NAFTA	33.2	29.6	27.4	27.8	25.8	26.7	28.2	n.a.	25.5	25.0	26.3	26.3	23.6	23.6	23.5	22.8

Note: List of P&Cs is from a careful disaggregation of trade data based on the Revision 3 of the Standard International Trade Classification (SITC, Rev 3) extracted from the United Nations trade data reporting system (UN Comtrade database) (Kohpaiboon, 2010; Jongwanich, 2011, 2017). Concordance between SITC and Harmonized system (HS code) is applied to obtain parts and components exports and imports.
Source: UN Comtrade database.

years. Malaysia and Singapore intensively participated in GVCs as P&C suppliers. They imported and exported a considerable amount of P&Cs so that their import and export shares were virtually the same, exceeding 40 percent during the period under consideration (Table 4.7). GVC trade played an important role in manufacturing in the Philippines. For example, P&C imports and exports accounted for 32 percent and 38 percent in 2017–2018, respectively. The relative importance of P&C exports reflects the fact that the Philippines plays a role as a P&C supplier in GVC networks. This is different from Thailand, where the import share has always been greater than the export. For example, P&C exports accounted for 24 percent of total manufacturing exports in 2017–2018, whereas its corresponding share on the import side was 29 percent. The lopsided importance of P&C trade reflects the position of Thailand in GVCs in producing finished products, while sourcing P&Cs from elsewhere. Interestingly, the gap between Thai P&C exports and imports has narrowed. This picture is similar to China, where parts and components account for a larger share of imports compared to exports, reflecting its status as a final product assembler using parts and components procured from countries in the region, including Thailand.

The continued attraction of Thailand and other countries in ASEAN as a location of GVCs seems to have been underpinned by a number of factors. First, wages in these countries, except Singapore, remain lower than or comparable to emerging market economies in Europe and Latin America (Kohpaiboon and Jongwanich, 2021). In addition, as wage differences virtually take place in a continuous manner between Southeast and East Asian countries, this enables firms to slice up their value chains, where capital-intensive activities will be located in higher-wage countries (such as Korea, Taiwan, and Singapore) and less capital-intensive tasks will be undertaken in lower-wage economies (for example, Malaysia, Thailand, the Philippines, and Vietnam). Second, the relative factor cost advantage has been supplemented by relatively more favorable trade and investment policy regimes and better trade-related infrastructure (ports and communication systems) (Athukorala and Hill, 2010). This has facilitated cross-border production sharing among these countries by reducing the cost of maintaining 'service links' (Jones and Kierzkowski, 2001) within production networks. Efficient and speedy service links are vital for the smooth functioning of production networks and are a key determinant of scale economies in global production sharing.

Third, as firstcomers in this area of international specialization, Southeast Asian countries (in particular Malaysia, Singapore, and Thailand) seem to offer considerable agglomeration advantages for companies that are already located there. The presence of other key market players in a given country or neighboring countries strongly influences the site-selection decisions of MNEs operating in assembly activities. Against the backdrop of a long period of successful operation in the region, many MNEs, particularly US-based MNEs, have assigned global production responsibilities to affiliates located in Singapore, and more recently also to those located in Malaysia and Thailand (Athukorala and Kohpaiboon, 2014). In sum, the experience of Thailand and other ASEAN countries seems to support the view that MNE affiliates have a tendency to become increasingly embedded in host countries the longer they are present there, and the overall investment climate of the host country becomes more conducive over time.

Note that the slightly declining trend observed during the periods under consideration indicates a reflection of price deflation in GVC intensive products instead of the relatively lesser importance of GVCs. This is reflected by the US import price indices of machinery and mechanical appliances (HS84) and electrical machinery and equipment (HS85), which exhibited a continuously declining trend from 2000 to 2019 (Figure 4.3). This was different from the overall import price index, which showed an upward trend. In 2019, the price indices of HS84 and HS85 were 85.4 and 73.6, compared to the overall import price index of 122.2 (2000 is the base). Holding the quantity share constant, their value share in 2019 declined by 32 and 41 percent, respectively. In particular, the price of electrical appliances dropped rapidly due to technological changes. For example, the price of TV sets dropped by 33 percent annually. All other things being equal, therefore, the observed decline in the value share of TVs to total manufacturing does not necessarily imply their relative diminished importance in real terms (see comparable evidence in Obashi and Kimura (2017) and Gaulier et al. (2020])). Note that compared with other regions, GVCs play a more important role in ASEAN. This is especially true for Europe and North America, as revealed in Table 4.7. Both the import and export shares of P&Cs in total manufacturing in Europe and North America were relatively lower as opposed to in ASEAN, but the gap has become narrower.

The US–China trade war and COVID-19 have disrupted the parts and components trade in Thailand and other Asian countries. Parts and components (P&C) exports and imports dropped noticeably in 2018 to 5.6 percent and 7.1 percent, respectively, from 14 percent and 12.6 percent in 2017 (Tables 4.8 and 4.9).

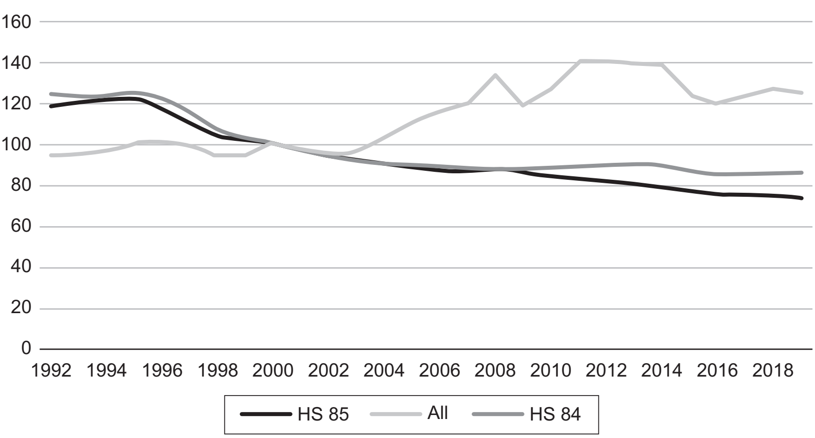

Figure 4.3 US import price indices of selected products, 1992–2019 (2000 = 100). Note: HS84 is machinery and mechanical appliances and HS85 is electrical machinery and equipment. Source: US Bureau of Labor Statistics available at https://www.bls.gov/web/ximpim/harmimp.htm

Table 4.8 Parts and components exports, by main export destination, 2002–2020

	Proportion of P&Cs exports, by destinations in 2020	*Growth (percent)*							
		2002–2005	*2006–2010*	*2011–2015*	*2016*	*2017*	*2018*	*2019*	*2020*
World	100.00	12.5	10.4	3.5	2.8	14.0	5.6	–13.2	2.6
United States	16.82	9.4	4.1	7.2	7.7	16.1	–5.6	6.3	34.7
Japan	14.48	9.9	6.0	1.4	–0.2	26.4	16.9	–9.9	–1.8
China	11.15	16.7	14.5	7.3	14.8	13.9	–6.7	–7.4	12.4
Hong Kong	5.04	9.6	14.8	5.7	–4.4	13.5	–2.1	–21.4	9.2
Malaysia	4.93	29.6	10.6	4.2	–13.2	0.5	9.2	–29.0	–5.0
Vietnam	4.80	27.2	21.5	8.9	17.0	11.8	–7.5	–0.9	9.8
Indonesia	3.19	35.3	23.4	0.3	3.0	22.1	11.3	–22.2	–33.5
Singapore	3.01	0.1	–4.0	–6.4	–0.4	11.8	25.3	–33.9	2.7
South Africa	2.74	77.1	14.2	8.0	25.8	11.2	14.2	–8.2	–14.7
India	2.40	50.4	25.2	8.1	–17.2	7.1	15.9	–17.8	–19.2
Taiwan	2.27	–12.5	12.8	7.7	–11.7	5.9	5.2	–14.4	33.9
Mexico	2.14	–24.8	35.2	18.5	23.7	7.8	–14.1	7.7	–9.4
Netherlands	2.05	–2.3	13.5	2.7	30.6	45.6	–1.3	–17.5	24.3
Philippines	2.03	17.3	11.3	7.5	15.0	2.6	–3.5	–2.9	–30.5
Germany	1.61	7.1	11.4	10.5	18.0	2.1	17.6	–15.1	–15.6
Cambodia	1.61	45.3	17.9	27.3	–21.1	7.8	35.6	0.7	–3.5
Australia	1.54	22.9	22.0	2.8	–0.7	–3.8	–6.9	–10.8	14.4
Brazil	1.51	62.9	32.8	2.5	–12.0	5.2	24.3	–15.7	–3.2
Argentina	1.48	559.2	18.5	10.2	58.8	12.8	13.9	–22.5	–13.8

South Korea	1.43	3.4	10.3	–0.1	6.4	5.3	–1.0	–7.1	14.1
United Kingdom	1.13	1.2	6.2	7.2	4.8	33.5	–0.3	–27.2	–19.0
Pakistan	0.95	59.3	9.1	6.5	13.2	54.1	8.2	–36.4	–7.7
France	0.86	43.7	11.5	–1.7	11.0	27.6	24.6	–18.9	–3.2
Laos	0.78	16.1	21.9	22.6	–0.3	7.1	12.1	–20.5	4.0
Spearman's rank correlation coefficient (comparing with previous period)		n.a.	0.851	0.938	0.963	0.965	0.972	0.981	0.956

Note: The formula of Spearman's rank correlations coefficient is as follows:

$$r_s = \frac{1-6\sum_i d_i^2}{n(n^2-1)}$$ where d is the difference between the two ranks of each destination and n is the number of observations. A r_s value of +1 means a perfect association of rank, a r_s value of 0 means no association of rank, and a r_s value of –1 means a perfect association of rank, with decreasing monotonic trend.

Source: UN Comtrade database.

Table 4.9 Parts and components imports, by key importing countries during 2002–2020

	Proportion of P&Cs imports, by destinations in 2020	*Growth (percent)*							
		2002–2005	*2006–2010*	*2011–2015*	*2016*	*2017*	*2018*	*2019*	*2020*
World	100.00	12.4	9.5	1.5	0.5	12.6	7.1	–12.7	0.2
China	33.14	27.1	15.2	10.2	1.3	14.2	14.1	–16.8	18.3
Japan	21.21	16.3	12.1	–5.5	2.6	9.4	3.9	–13.5	–9.1
United States	8.94	5.1	2.4	2.6	4.2	7.1	4.1	–5.9	9.4
Malaysia	4.44	9.0	4.5	2.3	–6.1	0.0	–3.3	–11.2	–11.2
Philippines	3.71	17.0	3.8	5.0	10.2	19.6	15.2	–8.8	3.5
Vietnam	3.47	62.8	5.1	36.3	–2.1	15.0	7.5	–15.9	–10.0
Taiwan	3.37	7.3	12.4	–1.1	–4.2	9.9	3.3	–19.2	23.1
Germany	3.18	2.6	10.0	6.5	8.6	11.2	15.1	–15.1	–21.7
South Korea	2.40	7.1	5.4	–4.1	–3.3	7.7	–2.3	–10.3	–2.2
Indonesia	2.01	31.0	12.2	8.1	9.3	–1.0	6.9	–13.2	–20.0
India	1.85	29.7	43.8	2.3	–1.6	19.9	73.6	–0.6	–7.4
Singapore	1.48	6.1	15.5	–17.6	–10.1	–4.5	14.6	–11.9	–1.1
United Kingdom	1.04	29.4	21.5	6.1	–22.2	106.8	–21.2	–23.1	–48.8
Italy	0.93	7.1	10.6	7.5	6.7	–0.3	11.6	18.8	–0.8
Mexico	0.89	19.5	34.7	17.5	8.3	13.2	17.7	–0.5	5.9
Spearman's rank correlation coefficient (comparing with the previous period)		n.a.	0.993	0.921	0.929	0.961	0.968	0.996	0.961

Note: The formula of Spearman's rank correlation coefficient applied in this table is the same as in Table 4.8
Source: UN Comtrade database.

This is consistent with observations of a significant decline in machinery and electronics exports/imports during this period (see Tables 4.2 and 4.4) as most P&Cs belong to goods falling in these categories. For exports, a sizable decline in 2018 was revealed in the US and various East and Southeast Asian countries, including Japan, China, Hong Kong, and Vietnam (Table 4.8). The share of these countries accounted for around half of all P&C exports in Thailand. In Southeast Asian countries, only Malaysia, Singapore, and Cambodia recorded an increasing trend in importing P&Cs from Thailand. As mentioned in the previous section, in response to the US–China trade war, some exports diverted to ASEAN countries, and their share in total Thai exports slightly appreciated. While P&C exports declined, it seems that exports diverting into ASEAN countries during this period were mostly dominated by finished products.

Regarding P&C imports, interestingly, China remained the key import partner of Thailand during the trade war as P&C import growth from China remained unchanged in 2017–2018 and registered at around 14 percent. Import growth from other key trading partners in Southeast Asian countries, including Indonesia and Singapore, increased. As assembly points for various electrical appliances, such as air conditioning, microwave ovens, washing machines, and vehicle parts under GVCs, the process of diverting finished products into ASEAN countries necessitated parts and components from other countries. However, the global demand slowdown driven by the trade war outweighed the propensity of the country to diversify exports, thereby causing overall P&C imports to stall somewhat during this period, particularly P&C imports from Japan, Malaysia, Vietnam, Taiwan, and South Korea (Table 4.9).

The COVID-19 pandemic caused the export situation for P&Cs to worsen in 2019. Exports of P&Cs plunged to −13.2 percent in 2019, while imports declined at the same pace to −12.7 percent. Negative growth rates were revealed in all key Thai export destinations, except the US, Mexico, and Cambodia, where the growth of P&C exports registered at 6.3, 7.7, and 0.7 percent, respectively (Table 4.8). The positive growth of P&Cs in the US market was in line with total exports, which recorded a positive value in the US market during this period. This showed that both finished, and P&C products performed well in the US market at this time. However, due to the overall decline in exports, imports of P&Cs deteriorated in all markets, particularly that of China. The decline in US imports of P&Cs tends to be smaller than observed with other countries, partly due to the growing demand for export products from Thailand. Interestingly, in 2020, although total export growth in Thailand slumped to −6 percent (Table 4.1), P&C export growth stood at 2.6 percent (Table 4.8). The US, China, Hong Kong, Vietnam, and Singapore took the lead in importing P&Cs from Thailand during this period. Not surprisingly, exports of electronics and electrical machinery, with which most P&Cs are associated, were the only category showing growth in Thailand amid the pandemic (Table 4.1). In responding to the growth in P&C exports, P&C imports also rose by 0.17 percent in 2020, from −12.7 percent in the previous year (Table 4.9). China, the US, the Philippines, and Taiwan were the key suppliers during this period.

The COVID-19 pandemic seems to have re-ignited a discussion of the risks associated with international production induced by international trade shocks. In particular, whether the pandemic would lead to lesser importance of GVCs in global trade, as well as a permanent change in how multi-national enterprises (MNEs) operate their production networks globally, have emerged as crucial issues for debate. So far, based on the information shown earlier, that is, the growth in the P&C trade and its importance in the manufacturing trade during the pandemic, it seems that GVCs are likely to continue. The Organization for Economic Co-operation and Development (OECD) (2020), using company-specific experience, also revealed that many businesses have reported disruption in their supply chains during the COVID-19 pandemic, but global production sharing has persisted. Often, when resilient supply chains are created, they are likely to be less vulnerable to external shocks, so GVCs are likely to remain as crucial components within global trade. There are also various options for firms to enhance their ability to respond to shocks quickly instead of leaving supply chains, for example, by improving supply-chain risk-management systems (through establishing control towers and real-time flows of inputs to anticipate disruption and so on), diversifying suppliers and locations of production, and taking greater control (through vertical integration with the ownership of main suppliers) (Gallagher and Worrell, 2007). The response could be different across firms, depending on various factors, such as the structure of suppliers (whether high or low concentration), geographic distance, cost-effectiveness, and efficiency.

One option, which has received much attention from academics and policy-makers in developing countries, concerns whether firms participating in GVCs could diversify their supplier base or re-shore some activities to home countries. Such moves, especially diversification, could bring new opportunities to countries which were previously less popular investment destinations or that involve trade participation. However, so far, the evidence from Thailand reveals that there is no strong indication that firms participating in GVCs have significantly altered their supply chains or means of sourcing parts and components in response to the pandemic. From detailed trade data, the export and import destinations of parts and components have slightly changed in Thailand during the COVID-19 period. The Spearman's rank correlation coefficients for key trading partners between 2019 and 2020 slightly declined in 2020, reflecting that the rank of the country's key trading partners between these two periods remained relatively unchanged (Tables 4.8 and 4.9). The slight decline of the coefficient for the export side was due to the increased importance of Vietnam, Singapore, and Taiwan within Thai P&C exports, while Malaysia, Indonesia, and the Philippines became slightly less crucial. On the import side, Singapore and the Philippines increased their rank importance, with China remaining at the first rank and gaining a higher market share as a P&C supplier for Thailand, rising from around 28 percent in 2019 to 33 percent in 2020.

Our findings are in line with other arguments, as reflected in a Standard Chartered Bank poll finding, wherein just 10 percent of firms are looking at moving their supply chains, while 6 percent are considering shortening them

(Financial Times, 2021). Similar evidence is found in the World Bank's monitoring of foreign investor sentiments since the crisis. Caroline Freund, global director of trade, investment, and competitiveness at the World Bank, said in December that the expectations of reshoring or nearshoring 'may be driven more by rhetoric than reality' (Financial Times, 2021). Kohpaiboon and Jongwanich (2021), using product-level analysis and input–output mapping of hard disk drives, air conditioners, microwave ovens, televisions, washing machines, and automotive parts to examine the impact of the COVID-19 pandemic on GVCs in Thailand and other ASEAN countries during January 2019 and October/November 2020, suggest similar findings. When the COVID-19 pandemic began in China, interruptions in the global value chains of these products occurred. The common pattern found across products is that they experience parts shortages and cease their export activities. While firms producing these products were able to source parts elsewhere, the substitution was far from ideal. Hence, in most cases, their exports dropped sharply. The greater the reliance on Chinese-made parts, the larger the impact was on export contraction. Nonetheless, the effect was short-lived, found only in January and February 2020. From January to November 2020, there was no strong evidence that MNEs altered their supply chains and sourcing of parts and components due to the pandemic. All in all, altering supply chains during the global uncertainty tended to be complicated and expensive. Therefore, so far there has been no strong evidence of changing supply chains during this period. However, our observations are based on an incomplete process. While the COVID-19 pandemic continues, along with ongoing tensions between the US and China, developments concerning GVCs should continue to be monitored to clearly reveal the impact of the pandemic on global production sharing and the behavior of (MNE) firms participating in the supply chains.

4.2 Foreign (direct) investment in Thailand

Foreign direct investment inflows have been increasingly important to the Thai economy since the 1980s. The annual average value of FDI inflows increased from \$0.98 billion and \$4.6 billion in the 1980s and the 1990s respectively to a peak of around \$16 billion in 2013. FDI inflows declined during 2014–2016 before showing an upward trend in 2017–2018. With COVID-19 hitting the Thai economy, the result was net outflows of foreign investors standing at around \$6 billion in 2020 (Figure 4.4 (a)). Net FDI inflows over gross domestic products (GDP) plummeted to −0.9 percent in 2020 from around 2.6 percent in 2018 (Figure 4.4 (b)). The stock of FDI at the end of 2020 increased to \$271.8 billion from only \$14 billion in 1991–1995. Compared to other forms of capital inflow, FDI has dominated both portfolio and other investment inflows since the 1998 Asian financial crisis (Figure 4.4 (a)). However, in 2020, due to a significant decline in FDI, other forms of investment, including loans, dominated capital inflows in Thailand.

During the period 1960–1985, when Thailand pursued trade and investment policy regimes to promote an import-substitution industrialization strategy,

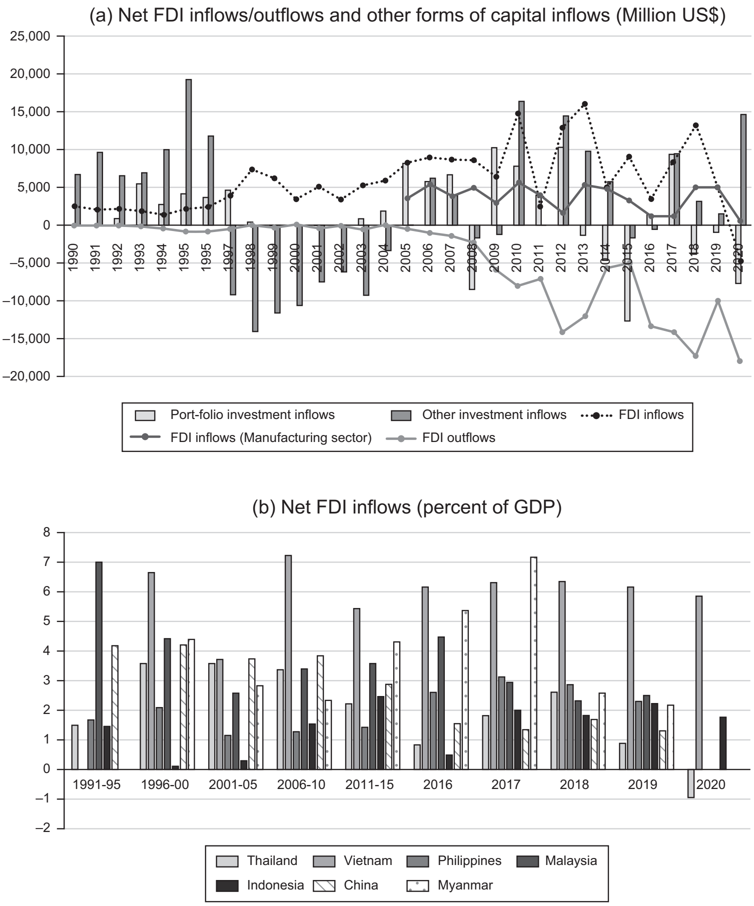

Figure 4.4 Net foreign direct investment (FDI) flows and other, 1990–2020. Source: The Bank of Thailand; International Financial Statistics, IMF, available at https://data.imf.org/?sk=7A51304B-6426-40C0-83DD-CA473CA1FD52 and World Development Indicators, available at https://worldinvestmentreport.unctad.org/annex-tables/

annual average values of FDI inflows moderately increased from $32 million in the 1960s to $207 million and $508 million in the 1970s and the first half of the 1980s, respectively (Kohpaiboon, 2006). By contrast, from 1986 onwards, when the policy regimes had changed to encompassing an export-promotion industrialization strategy, FDI inflows dramatically increased and became increasingly important to the country's capital accumulation process. The annual value of FDI inflows jumped to $1.9 billion during the period 1991–1995 (Table 4.10). The evidence showed that the amount of FDI inflows in the context of import-substitution industrialization tends to be lower than under a policy regime geared

Table 4.10 Net foreign direct investment inflows, 1991–2020, million US$

Region/economy	*FDI Inflows*									
	1991–1995	*1996–2000*	*2001–2005*	*2006–2010*	*2011–2015*	*2016*	*2017*	*2018*	*2019*	*2020*
World	228.4	798.0	712.9	1488.9	1598.4	2065.2	1647.3	1436.7	1530.2	998.9
Developed economies	148.5	599.7	459.7	893.6	854.9	1344.5	894.3	707.6	749.0	312.2
Developing economies	77.7	191.2	234.1	517.4	679.7	653.9	702.5	692.5	723.4	662.6
Africa	4.9	9.9	20.0	49.6	53.3	46.2	40.2	45.4	47.1	39.8
Asia	52.8	111.3	149.8	350.7	442.7	470.8	505.2	496.5	515.5	535.3
East Asia	30.6	75.2	91.7	169.1	248.5	270.8	271.0	266.5	242.0	291.8
China	22.8	42.7	57.2	94.7	126.6	133.7	136.3	138.3	141.2	149.3
Hong Kong, China	5.2	23.1	22.8	56.9	105.7	117.4	110.7	104.2	73.7	119.2
Korea, Republic of	1.4	6.9	9.2	9.5	9.1	12.1	17.9	12.2	9.6	9.2
Taiwan Province of China	1.2	2.4	1.9	5.2	2.0	9.7	3.4	7.1	8.2	8.8
South-East Asia	18.4	28.5	30.0	69.3	112.1	113.7	154.6	145.9	181.0	135.9
Brunei Darussalam	0.1	0.6	1.1	0.4	0.6	–0.1	0.5	0.4	0.3	0.6
Cambodia	0.1	0.2	0.2	0.9	1.9	2.5	2.8	3.2	3.7	3.6

(*Continued*)

Table 4.10 Continued

Region/economy	*FDI Inflows*									
	1991–1995	*1996–2000*	*2001–2005*	*2006–2010*	*2011–2015*	*2016*	*2017*	*2018*	*2019*	*2020*
Indonesia	2.4	0.9	1.4	8.0	19.1	3.9	20.6	20.6	23.9	18.6
Lao	0.0	0.1	0.0	0.2	0.7	0.9	1.7	1.3	0.6	1.0
Malaysia	5.1	4.8	3.0	6.5	10.9	11.3	9.4	7.6	7.8	3.5
Myanmar	0.2	0.5	0.5	1.6	1.2	3.0	4.3	3.6	2.8	1.8
Philippines	1.1	1.6	1.0	2.1	3.3	6.9	8.7	6.6	8.7	6.5
Singapore	6.5	13.3	15.8	33.6	57.9	70.2	84.7	76.0	114.2	90.6
Thailand	1.9	4.6	5.5	9.5	9.0	3.5	8.3	13.2	4.8	–5.0
Timor-Leste	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Vietnam	1.1	1.8	1.5	6.9	9.2	12.6	14.1	15.5	16.1	15.8
South Asia	1.5	4.2	10.1	39.4	41.0	54.3	51.6	52.3	59.1	71.0
India	0.8	2.9	5.8	31.2	33.4	44.5	39.9	42.2	50.6	64.1
Latin America and the Caribbean	19.7	69.8	64.0	115.3	181.2	135.9	156.3	150.1	160.5	87.6

Source: The Bank of Thailand; and World Development Indicators, available at https://worldinvestmentreport.unctad.org/annex-tables/

toward an export-promotion strategy. As mentioned in Chapter 3, along with providing BOI privileges, 'the Eastern Seaboard (ESB)' was established as a 'new economic zone' during this period. The ESB is composed of two major areas: the Map Ta Phut area, which is a heavy-chemical industrial base utilizing natural gas from the Gulf of Thailand; and the Laem Chabang area, which is an export-oriented light-industry base involved in such activities as automobiles and electronics. The infrastructure includes deep seaports, highways, and industrial estates. Such development tended to support an influx of FDI during this period.

The financial crisis in 1997 noticeably increased FDI inflows into Thailand. The value of FDI inflows increased to $5.2 billion during the period 1997–2000 (Figure 4.4 (a)). There was substantial merger and acquisition (M&A) FDI during the onset of the crisis. The annual average value of M&A FDI inflows, which were $228 million between 1990 and 1996, increased to $2.2 billion during the period 1997–2000. Net FDI inflows in terms of M&A FDI increased to 63.5 percent in 1998. This was an unusual picture in Thailand as direct investment in the nation was mostly dominated by Greenfield investment, while M&A FDI had accounted for only around 14 percent in the early 1990s. Athukorala (2003) clearly points out that the resilience of FDI inflows in the region during the Asian financial crisis was the result of three key reasons. First, the domestic production costs of foreign firms were reduced by large exchange rate depreciation. This made firms wealthier in terms of their purchasing power within a particular country, so foreign investment increased. Second, the cost of investment was able to be reduced by falling asset prices because of the contraction in domestic demand. Third, the asset-cheapening effects of the crisis and the revision of FDI laws as part of the crisis management package toward encouraging a more liberal FDI regime in crisis-affected countries, except in Malaysia, opened up new opportunities for cross-border mergers and acquisitions, the well-known 'fire-sale' phenomenon.

The dot.com bubble in 2001 resulted in a mild decline in FDI inflows into Thailand, but the level of FDI flows was higher than those during 1990–1996. FDI inflows increased significantly again in 2003–2013, except in 2009 and 2011, due to the global financial crisis and widespread flooding in Thailand. The latter had a more severe impact than the former, reflected by the plunge of net FDI inflows to $2.4 billion in 2011, having been $6.4 billion in 2009 (Figure 4.4 (a)). The reduction of FDI inflows during the global financial crisis was relatively small, compared to other forms of capital inflows. This, to a certain extent, highlights the low volatility of FDI inflows as opposed to other forms of capital flows. Note that during 2001–2013, BOI privileges changed several times and endeavored to promote more activities geared toward using advanced technology, as mentioned in Chapter 3. For example, in 2009 (announcement No. 6/2552), to encourage promoted activities developing skill, technology, and innovation, existing promoted activities entitled to an exemption of CIT were able to apply for additional rights and privileges, although the activity's revenue was not recognized. In 2009 and 2012 (announcement No. 10/2552 and Sor1/2556), investment incentives were provided to eco-car manufacturing in terms of import duty exemption on machinery, raw materials, and essential parts. Whether such privileges were able to help promote more firms' productivity and skilled upgrading remains a question and is explored in Chapters 5–7.

A sectoral breakdown of manufacturing FDI coincided with the Thai industrialization process. Manufacturing FDI inflows from 1970 to the mid-1980s were mainly involved with import-substitution industries, such as textiles, automobiles, and chemicals. A key incentive for manufacturing FDI inflows during this period was the existence of a highly protected domestic market owing to the import-substitution industrialization strategy. Manufacturing FDI inflows were typical market-seeking FDI (Akira, 1989). The highly protected domestic market encouraged MNEs to establish affiliates in host countries and produce for the local market, instead of producing in home countries and exporting to host countries.

From the mid-1980s onward, foreign firms shifted their interest from import-substitution to traditional labor-intensive manufacturing industries, such as clothing, footwear, and toys, classified under other manufacturing industries. Labor-intensive assembly activities in electrical machinery and electronic appliances, motor vehicle, and rubber and plastic products also gained momentum in attracting foreign investors. The share of computer, electrical machinery, and electronic appliances in total manufacturing FDI inflows noticeably increased and reached around 33 percent in 2005. For motor vehicle and rubber and plastic products, their FDI shares were around 31 and 11 percent during this period, respectively (Table 4.11).

The geographical distribution of FDI inflows in Thailand from the late 1980s until 2013 changed slightly. Since 1986, Japanese investors had become increasingly involved in Thailand, and their share increased to 41.1 percent between 1986 and 1990 from 19.3 percent in 1970–1985 (Kohpaiboon, 2006). Notwithstanding the greatly increased value of Japanese FDI, direct investment flows from East Asian NICs (Hong Kong, South Korea, Taiwan, and Singapore) increased even faster in the 1990s. As a result, the Japanese share declined to 19.1 percent in the 1990s. In the early 2000s, the share of Japanese organizations was higher because of a decline in investment from investors in the US and EU. The share of FDI inflows from Japan increased to 31 percent in 2006–2010 and appreciated even further after the global financial crisis to 42 percent in 2011–2013 (Table 4.12). Most FDI inflows from Japan were channeled into the manufacturing sector, particularly motor vehicles, followed by computers, electronics, electrical appliances, machinery, and rubber and plastic products. These accounted for around 70 percent of the total FDI inflows from Japan in 2005–2007. Interestingly, the share of these activities declined in 2011–2013 to around 38 percent, mainly because of the rapid growth of FDI in mining, chemicals, and chemical products and services. Particularly, in services, net FDI inflows in financial and insurance activities increased to $6,417 million in 2013, accounting for almost 50 percent of total FDI from Japan, from only around $264 million in 2005.

Between 1986 and 1995, NICs were the second-largest direct investors, accounting for 22.5 percent, increasing from 17.1 percent during the period

Table 4.11 Net foreign direct investment inflows in Thailand, by sector, 2005–2020 (million US$)

	2005	*2006–2010*	*2011–2013*	*2014–2015*	*2016*	*2017*	*2018*	*2019*	*2020*
Agriculture, forestry, and fishing	7.7	11.3	1.9	5.6	6.7	2.7	16.1	1.3	2.1
Mining and quarrying	–144.9	–57.7	13.9	337.2	–29.1	101.3	–315.0	–77.5	–527.3
Manufacturing (of)	3,561.7	4,483.5	3,592.7	3,960.0	1,155.8	1,132.5	5,063.4	4,938.8	501.4
Food products	136.6	167.7	92.7	128.8	694.7	282.5	75.9	452.3	1,334.3
Beverages	29.8	192.5	–20.8	–7.6	10.0	56.6	586.6	10.2	4.9
Paper and paper products	8.7	77.4	96.5	110.5	107.9	–393.2	54.8	109.6	31.5
Coke and refined petroleum products	–66.1	99.7	194.2	99.1	101.9	14.7	–124.4	181.8	–339.5
Chemicals and chemical products	411.8	638.6	588.1	782.0	–235.6	–171.4	668.8	630.7	83.3
Basic pharmaceutical	0.0	0.0	215.7	39.2	–46.8	–17.8	67.3	–41.0	12.3
Rubber and plastics products	389.4	371.6	504.7	543.3	288.2	89.9	–52.8	276.3	465.7
Computers, electronics, and optical products	314.1	1,240.9	462.2	734.5	–374.8	790.1	850.2	808.4	–177.4
Electrical equipment	709.0	–751.1	89.0	1,363.9	–625.5	–105.5	254.9	1,288.3	44.4
Machinery and equipment n.e.c.	147.9	499.6	487.0	394.2	465.0	52.7	363.0	259.2	–417.8
Motor vehicles, trailers, and semi-trailers	1,109.5	1,175.0	559.4	–310.2	237.4	181.1	1,006.2	507.3	–911.4
furniture	8.4	–0.1	18.0	–29.0	0.3	0.2	7.2	36.1	35.9

(*Continued*)

Table 4.11 Continued

	2005	2006–2010	2011–2013	2014–2015	2016	2017	2018	2019	2020
Services	4,578.9	4,193.4	3,398.6	4,545.8	1,438.0	6,323.7	8,421.8	64.2	–4,403.2
Electricity, gas, steam, and air conditioning supply	–77.5	–40.1	153.1	–110.7	–115.5	625.4	–71.4	–611.3	30.6
Construction	148.8	–12.9	–39.5	–109.2	–320.0	–34.5	246.8	406.9	35.4
Wholesale and retail trade	519.8	828.1	477.1	1,009.5	–1,107.6	994.3	1,722.9	–136.9	–112.0
Transportation and storage	143.3	111.7	80.6	–8.4	–134.6	–116.5	–24.1	–68.1	37.3
Accommodation and food service activities	–39.8	60.1	–43.2	94.3	629.9	–318.1	109.0	–553.6	11.0
Financial and insurance activities	3,825.5	1,990.8	1,507.4	2,382.4	1,058.2	3,374.5	4,181.9	–1,355.8	–6,337.1
Real-estate activities	58.8	1,255.8	1,263.0	1,288.0	1,427.7	1,798.5	2,256.6	2,383.1	1,931.7
Others	212.3	823.8	3,429.2	–1,897.1	914.8	725.0	0.0	–110.1	–607.1
Total	8,215.6	9,454.2	10,436.2	6,951.5	3,486.2	8,285.2	13,186.3	4,816.6	–5,034.1

Source: The Bank of Thailand.

Table 4.12 Net foreign direct investment inflows in Thailand, by sector, 2005–2020 (million US$)

	2005	*2006–2010*	*2011–2013*	*2014–2015*	*2016*	*2017*	*2018*	*2019*	*2020*
ASEAN	2,022.2	1,912.3	245.0	–253.6	2,003.4	1,814.0	1,626.6	5,242.7	2,254.1
Brunei Darussalam	4.7	–1.2	1.3	4.1	2.6	1.5	2.5	1.6	2.8
Cambodia	0.0	3.0	1.9	2.7	3.3	13.8	–3.8	11.3	22.9
Indonesia	–0.7	4.4	62.3	–87.6	23.5	22.5	–31.6	–3.4	7.8
Laos	0.1	1.2	0.4	1.5	17.0	5.1	4.7	4.0	4.7
Malaysia	99.1	256.7	328.2	–101.5	6.6	57.2	17.6	93.7	69.8
Myanmar	–0.1	4.9	5.6	2.9	1.1	–0.2	2.1	0.8	1.1
Philippines	100.6	13.0	15.6	–14.4	21.6	–13.1	–16.7	–2.5	12.7
Singapore	1,818.3	1,629.5	–172.9	–62.1	1,928.5	1,726.7	1,650.3	5,134.3	2,131.2
Vietnam	0.1	0.8	2.6	0.9	–0.8	0.6	1.5	2.9	1.2
East Asia	3,123.1	3,626.7	5,720.9	3,973.4	5,429.4	5,067.2	8,475.6	4,739.3	2,300.0
China	18.4	174.1	519.4	8.4	1,071.9	72.9	661.2	1,024.4	503.8
Hong Kong	106.7	382.0	367.7	1,000.8	1,148.4	971.1	2,190.1	606.5	415.8
Japan	2,997.6	2,940.1	4,421.2	2,718.6	2,986.8	3,131.6	5,278.5	2,386.5	1,195.2
South Korea	–34.7	135.5	314.8	195.2	27.2	168.4	225.1	429.7	–7.2
Taiwan	35.1	–5.1	97.8	50.4	195.2	723.3	120.8	292.2	192.3
EU	650.7	1,500.5	413.9	643.4	–4,378.9	710.6	1,606.6	–4,065.9	–9,583.2
EU (excluding United Kingdom)	220.3	1,112.5	287.3	589.0	–4,201.0	457.4	1,468.7	–4,183.8	13.1
Middle East	5.2	38.5	25.8	37.6	–10.7	57.8	52.3	21.3	9.2
Australia	52.1	28.0	208.9	370.7	42.1	80.7	49.0	121.6	60.9
New Zealand	0.5	4.3	5.8	3.0	1.6	2.6	6.5	3.9	9.6
United States	812.8	370.9	1,655.7	1,553.1	438.6	–120.5	810.5	190.6	–112.7
Total	8,215.6	9,454.2	10,436.2	6,951.5	3,486.2	8,285.2	13,186.3	4,816.6	–5,034.1

Source: The Bank of Thailand.

1970–1985. Among the NICs, Hong Kong is the most important, accounting for 11.4 percent of FDI inflows during the period 1970–2000. However, since the 2000s, NICs have become less important as direct investors in Thailand as the share of inward FDI from these countries reduced to only around 5 percent. In addition to the fact that momentum has reverted to Japan as a major investor, FDI inflows from China increased noticeably during this period. In 2011–2013, net FDI inflow from China was $519 million, accounting for 5 percent of total FDI, increasing from $174 million in 2006–2010, accounting only for 1.8 percent (Table 4.12). Four sectors were attractive to Chinese investors during this period: electrical equipment, computers, chemicals, and chemical products. Note that FDI inflows from both Hong Kong and Singapore were still mostly concentrated in financial and insurance activities, while FDI from Korea and Taiwan mostly went to the computers and electronics sectors.

US and EU investors, especially Germany, the United Kingdom, and the Netherlands, were also important in contributing to FDI inflow in Thailand. Although FDI inflows from the US were interrupted in 2007 due to their financial crisis, the share of the US in Thailand's total FDI increased from 4 percent in 2006–2010 to 16 percent in 2011–2013 (Table 4.12). Although the US's share went up, FDI inflows from the US declined in almost all sectors, especially for financial and chemicals and chemical products. It seems that in the manufacturing sector, basic pharmaceutical products, coke, and refined products, as well as motor vehicles, continued to be important. The increase of FDI in motor vehicles was due to the fact that both Ford and GM, US carmakers, used Thailand as a regional hub for the Southeast Asian region. This also induced inflows from US automotive suppliers to Thailand. FDI inflows from the EU increased noticeably in some manufacturing sectors, especially computers, electronics, and motor vehicles, while FDI inflows into financial and insurance activities, together with the wholesale and retail trade, declined enormously.

Among ASEAN countries, Singapore is the largest foreign direct investor (Table 4.12), and most FDI went to three key activities: financial and insurance, the wholesale and retail trade, computers and electronics, and electrical equipment. However, the global crisis in 2008 resulted in a decline in FDI from Singapore, especially in the former two service sectors. Malaysia is the second runner up, which had a share of FDI inflows at around 3 percent of total inward FDI in Thailand during 2005–2013. Financial and insurance activities became a more important sector in attracting FDI from Malaysia, while computers, electronics, and electrical equipment became a less important sector. For Indonesia, the share of net FDI inflows was less than 1 percent. Four activities – the wholesale and retail trade, including the repair of motor vehicles; motor vehicles; chemical and chemical products; and rubber and rubber products – attracted more FDI from Indonesia.

FDI dropped dramatically during 2014–2016, after there was a military coup, led by Gen. Prayut Chan-O-Cha, against the government of Yingluck Shinawatra in May 2014. Then in August 2014, an unelected military-dominated national legislature appointed him as prime minister.[6] Total FDI plunged from around

$16 billion in 2013 to $3.5 billion in 2016, while net FDI inflows in the manufacturing sector declined from $5.6 billion to around $1.2 billion during the same period (Figure 4.4.(a) and Table 4.11). In some manufacturing and service sectors, net outflows of FDI were evident, including chemicals and chemical products, basic pharmaceutical products, computers, electronics, and electrical equipment, electricity, gas, and the wholesale and retail trade. The EU, Japan, and the US were the countries that showed a noticeable drop in FDI inflows. Particularly, in the case of the EU, led by the Netherlands and France, net FDI outflows were evident (Table 4.12). In fact, the BOI announced a new 5-year strategy plan (2013–2017) with new classified privileges to promote investment in Thailand in 2013, especially activities potentially enhancing the country's competitiveness and promoting sustainable development, such as renewable energy and environment-related industries (see Chapter 3). The plunge in FDI after net FDI inflows reached a peak in 2013 probably reflected the fact that the prevailing business environment, especially in terms of political uncertainty, matters in determining foreign investment in the country.

In 2017, a major change took place in the wake of an amendment included in the BOI investment promotion plan (2015–2021) as described in Chapter 3. Generally, the main purpose of the amendment was to promote activities enhancing national competitiveness through research and development (R&D) and innovation activities. Ten newly targeted industries were selected to hopefully serve as novel and more sustainable growth engines, along with the establishment of the Eastern Economic Corridor (EEC). Net FDI inflows increased in 2017–2018 to $8 billion and $13 billion, respectively. However, in 2017, it seemed that most FDI inflows went to the service sector, especially financial and insurance activities (Table 4.11). Net FDI in the manufacturing sector in 2017 remained relatively at the same level as in 2016 at around $1.1 billion. In 2018, FDI inflows increased in both the manufacturing and service sectors. In the manufacturing sector, net FDI inflows increased to $5.1 billion, while in services, net inflows increased to $8.4 billion from around $6.3 billion in 2017. Chemicals and chemical products, computer electronics, electrical and machinery equipment, auto vehicles, and beverages represented the manufacturing activities receiving heightened attention from foreign investors. The ongoing trade war between the US and China probably helped stimulate foreign investors to relocate their activities to Thailand. China, the US, Japan, and the EU (led by the Netherlands and Denmark) took a lead in investing in Thailand during this period.[7] Compared to other Southeast Asian countries, it seems that only Thailand and Vietnam showed an increase in net capital inflows in this year (Table 4.12).

As mentioned in Chapter 3, the Thai government announced additional privileges in 2019, offering an additional 50 percent corporate income tax reduction for another 5 years for those firms with a real investment of at least 1 billion Baht ($32.61 million) that apply for the incentive by 2021. Other Southeast Asian countries competed to draw windfalls from the US–China trade tension. For example, Malaysia offered tax breaks as well as financial subsidies under a batch of incentives worth around 1 billion ringgit ($240 billion) annually over

5 years. In Indonesia, deregulation measures, including corporate tax exemption, were offered.[8] Interestingly, in 2019, only Thailand among Southeast Asian countries encountered a significant drop in net FDI inflows. The net FDI inflows in Thailand plummeted from $13.2 billion in 2018 to $4.8 billion in 2019, while in other Southeast Asian countries like Indonesia, Malaysia, the Philippines, Vietnam, and Singapore, FDI inflows increased in the range of 4–50 percent during 2018–2019 (Table 4.10). COVID-19 probably disrupted FDI inflows, but it seems that only Thailand combated a reversal of foreign capital flows, as in 2020 only Thailand showed net outflows of capital of $5 billion. For other countries, capital inflows were evident, though they entered at a slower pace; for example, in Vietnam, net FDI inflows slightly declined from $16.1 billion in 2019 to $15.8 billion in 2020, in Indonesia they dropped from $23.9 billion to $18.6 billion during the same period, and in Malaysia they declined from $7.8 billion to $3.5 billion. In some countries, including China and India, net capital inflows soared amid the pandemic. This, to a certain extent, casts doubt on the effectiveness of new investment incentives in attracting foreign investors into Thailand.

Note that the manufacturing sectors where FDI dropped noticeably during this period in Thailand were machinery and equipment, computers, and motor vehicles (Table 4.11). Food products, rubber and plastic, and furniture represented promising sectors during the pandemic as their net FDI inflows showed an increasing trend. In the food sector, key investors were Singapore, the Netherlands, and Japan, while for rubber and plastic products, various countries increased their investment in response to the pandemic, including Indonesia, Malaysia, the Philippines, Singapore, Germany, the Netherlands, China, Japan, and Switzerland.[9]

Information from BOI investment promotion certificates also leads to concerns over the effectiveness of BOI privileges and the establishment of EEC in attracting foreign investment and moving the country toward Industry 4.0. Figure 4.5 clearly shows that the number of projects which received BOI investment promotion certificates stayed stable after introducing the new promotion strategy in 2017, while investment value significantly declined, especially in 2019–2020, compared to that in 2017–2018. Figure 4.6, which compares BOI investment promotion certificates by area, shows that the number of projects receiving BOI investment promotion certificates in the three eastern provinces (Chonburi, Rayong, and Chachoengsao under the EEC) was relatively stable during 2017–2020, while investment value slightly increased in 2018, but noticeably declined in 2019 and 2020. The decline in investment value in 2020 would be partly due to the COVID-19 pandemic. When compared to other areas, it seems that the establishment of the EEC has tended to create a greater concentration of investment in the three provinces as the investment value in other areas declined noticeably. This leads to concerns about industrial decentralization, which is a crucial element in ensuring the sustained development of the country is moving toward Industry 4.0.

Another point based on registered capital is that a noticeable decline in investment value in other areas tended to originate from domestic investors, instead

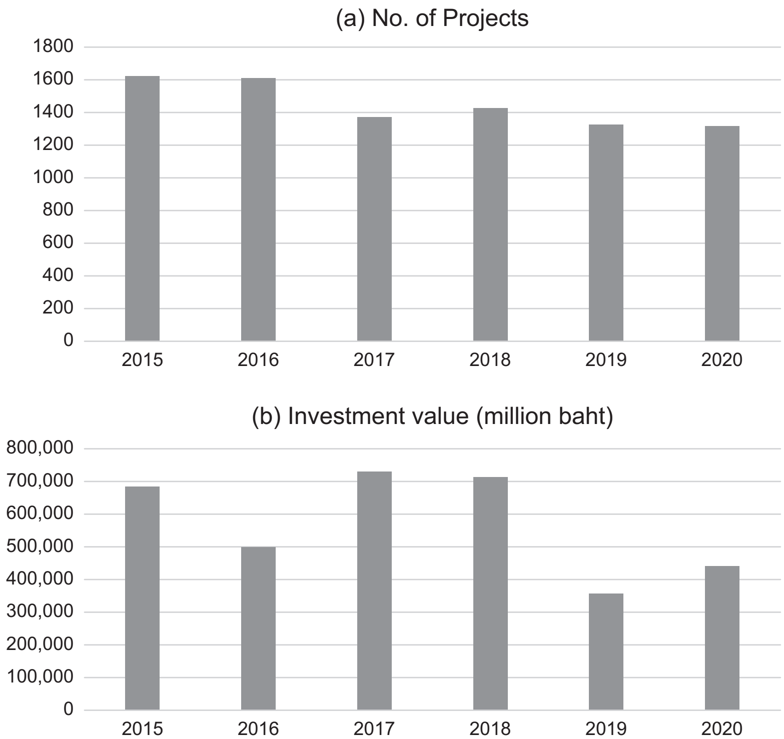

Figure 4.5 Received BOI investment promotion certificates in Thailand, 2015–2020.
Source: Board of Investment, Thailand

of foreign. For foreign investors, registered capital had shown an increasing trend since 2018, and in 2020 the value of registered capital was even higher than that in 2017. Other areas where foreign investors brought in the capital included Prachinburi, Pathum Thani, Samut Prakan, Samut Sakhon, and Nakhon Ratchasima, where the production bases for various products in Thailand, particularly electronics, electrical appliances, automotive parts, and food, are located. Investments in these areas tend to receive less BOI privileges than those in the EEC under the new investment promotion scheme, as mentioned earlier. Thus, it reflects the fact that foreign investors consider factors other than BOI privileges when bringing in foreign capital into the country. In addition, Figure 4.7 shows that among the ten targeted industries, investment tended to be concentrated in only three – namely new-generation automotive, aviation and logistics and biofuels and biochemicals – in 2018–2019. This also raised concerns as to whether the ten targeted industries selected by the government would be able to effectively serve as new and more sustainable growth engines for Thailand. Particularly, the

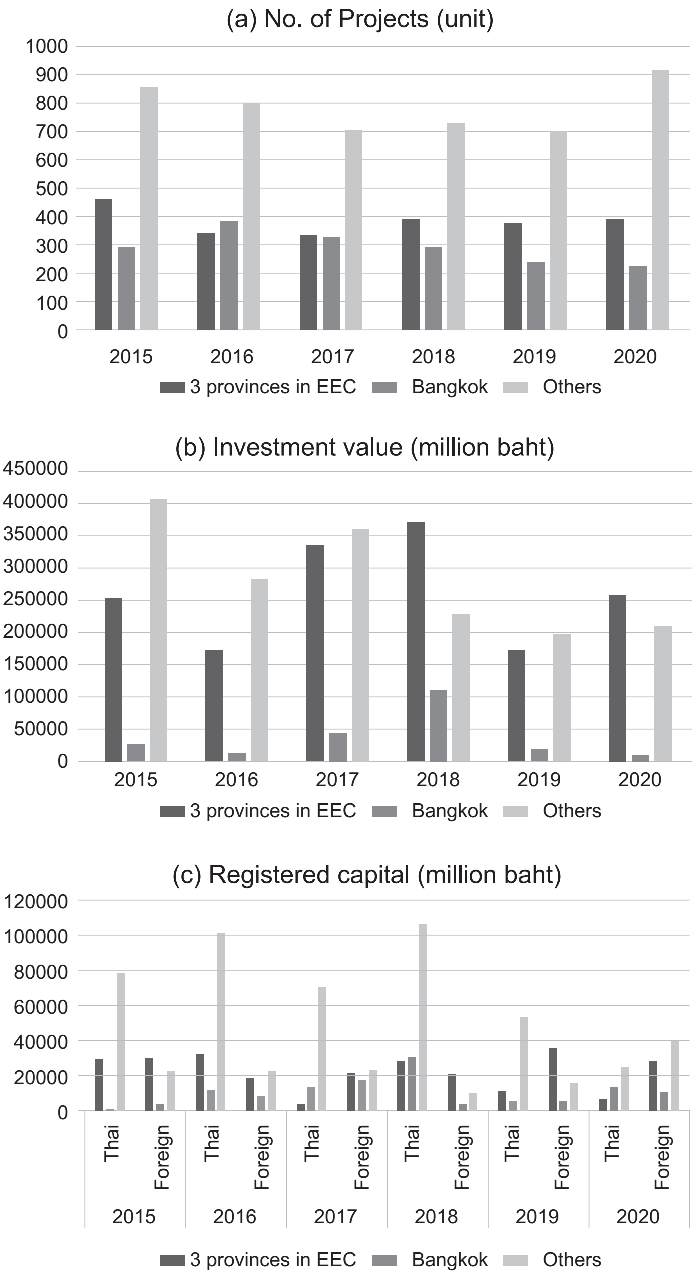

Figure 4.6 Received BOI investment promotion certificates in Thailand, by area, 2015–2020. Source: Board of Investment, Thailand

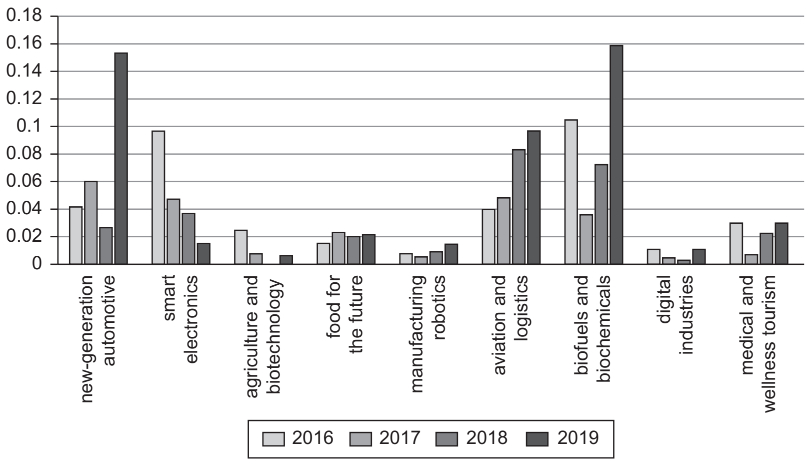

Figure 4.7 Share of investment value in ten targeted industries, 2016–2019. Source: Board of Investment, Thailand

value added of these ten targeted industries accounts only for 57 percent of total value added in the country, while the small- and medium-size enterprises (SMEs) covered in these industries comprise only around 23 percent of total SMEs.

It is noteworthy that doubts about using investment incentives *per se* in attracting foreign direct investment are consistent with various empirical studies suggesting that the investment climate is much more crucial than investment incentives in influencing investors' decisions (Dollar et al., 2004; and Brooks et al., 2004; and Brooks and Hill, 2004). Investment incentives matter only when the (host) countries create a conducive investment climate that allows foreign investors to make profits from foreign investment. Brooks et al. (2004) argue that investment incentives potentially create distortions, a lack of transparency, and bias against small and medium enterprises. In addition, the incentives offered by a country could be counterbalanced by similar moves by other competing countries. Jongwanich (2017), examining the determinants of FDI inflows in emerging Asian economies, including Thailand, with an emphasis on the implications of existing international production networks, argues that strengthening supply-side capacity and improving services links and efficient market accessibility conditions should be established as policy priorities in promoting inward FDI in the region. To strengthen services links, a policy leading toward a reduction in trade costs is crucial. This policy includes customs reform and the improvement of infrastructure and logistical services, as well as increased legal certainty and strengthened governance in enforcing contracts to protect intellectual property rights. Improvements in the availability of world-class operators and technical and managerial skills are also crucial in strengthening the production network. It is noteworthy that with the harmonization of commitments under the WTO and several regional agreements, some empirical studies, such as Taylor (2000) and Easson (2001), support the increased importance of investment incentives on international direct investment.

4.3 Conclusions

This chapter examines trends and patterns regarding trade, including the parts and components trade under global value chains (GVCs), and foreign direct investment in Thailand. Whether the introduction of new investment promotion privileges and the establishment of Eastern Economic Corridors (EEC) could attract more foreign investors is also explored. Regarding trade patterns, labor-intensive manufacturing products, such as clothing, footwear, leather, and electronic products, have dominated the exports of Thailand since the late 1980s, when there was a clear shift in emphasis from import-substituting activities to an export-promotion strategy. The degree of openness, measured by total trade of goods (and services) over GDP, rose noticeably from the late 1980s until the 1997 Asian economic crisis. During the 1997 crisis, the dramatic currency depreciation helped catalyze exports, though some manufacturing exporters were constrained by the credit crunch in the financial sector.

After the Asian financial crisis, Thailand experienced a slight growth slowdown between 2000 and 2005. However, exports performed relatively well, and the degree of trade openness continued to rise during this period. After 2008, however, export performance, especially that of goods, became relatively poorer due to both internal and external factors interplaying. The share of exports of goods over GDP declined, but thanks to the exports of services, especially the tourism sector, total exports over GDP remained relatively stable. Weak domestic demand, especially investment, caused a noticeable stall in the import of goods, thereby significantly lowering the degree of trade openness in Thailand since 2011. Export destinations changed considerably after the recent global financial crisis in 2008. ASEAN and China have become more crucial export destinations for Thailand.

Export growth improved in 2017, owing to an expansion in foreign investment, which was probably influenced by the Thailand 4.0 policy announcements. However, the external environment, in particular the US–China trade war and COVID-19, caused a significant decline in exports in 2018–2020. The US–China trade war created both positive and negative consequences for the Thai economy, but the latter tended to dominate the former. Windfalls from the US–China trade war, especially in terms of possible trade diversion and investment relocation, were limited in Thailand compared to other Southeast Asian countries. The limited windfalls in Thailand may reflect some fundamental problem in the country, especially the relatively low investment over the preceding period and the unattractiveness of new BOI incentives for existing firms, particularly those located outside the EEC.

The parts and components (P&C) share in the total manufacturing trade in Thailand has been substantial, though a noticeable decline in electronic and electrical appliance prices recently reduced their proportion within the manufacturing trade. The US–China trade war and COVID-19 have disrupted the parts and components trade in Thailand. However, so far, their importance in the manufacturing trade during the pandemic has tended to illustrate the continuity of global supply chains in the country. In addition, so far sources of P&C suppliers in the key manufacturing products have not yet significantly altered in response to the virus crisis.

In terms of foreign investment, coinciding with the Thai industrialization process, FDI inflows dramatically increased and became increasingly important to the country's capital accumulation process from the late 1980s. The financial crisis in 1997 even increased FDI inflows into Thailand due to the 'fire-sale' phenomenon. The dot.com bubble in 2001 caused a (mild) decline in FDI inflows into Thailand, but the level of the flows was still higher than those during 1990–1996. FDI inflows expanded significantly again in 2003–2013, except in 2009 and 2011, due to the global financial crisis and the flooding disaster in Thailand. Chinese and ASEAN investors gained importance in Thailand after the 2008 global financial crisis, along with major investors like Japan, the US, and the EU.

However, despite the BOI announcing their new 5-year strategy plan (2013–2017) with new classified privileges intended to promote investment in Thailand in 2013, FDI dropped dramatically during 2014–2016, after a military coup took place in May 2014. In 2017, a major change was announced in the wake of an amendment included in the BOI investment promotion plan (2015–2021), along with the establishment of the Eastern Economic Corridor (EEC). Net FDI inflows increased in 2017–2018, with predominance in the service sector, especially financial and insurance activities. The trade war between the US and China is likely to have stimulated foreign investors to relocate their investment into Thailand, but its impact tended to be negligible. The COVID-19 pandemic, which started in early 2019, had a further unfavorable impact on Thailand, and FDI inflows were interrupted. In 2020, it seems that only Thailand was faced with a reversal of foreign capital flows, while other neighboring countries encountered only a deceleration in foreign investment. Information from BOI investment promotion certificates also revealed concerns over the effectiveness of BOI privileges in attracting foreign investment and moving the country toward Industry 4.0.

Notes

1 Note that export growth slumped to –14.3 percent in 2009, before rebounding to 26.8 percent, partly due to a low export base in the previous year.
2 Interestingly, although the share of private consumption over GDP declined during this period, household debt soared noticeably from 60 percent of GDP to 78 percent in 2017 and 90 percent in 2020. A significant increase in household debt raises concerns over rebalancing the economy toward more domestic demand driven growth to avoid excessive reliance on the external sector, especially the tourism sector, after COVID-19.
3 In this study, intensive and extensive margins are measured by (1) counting measures, using the Theil's entropy index and decomposing it into within- and

between-group components to represent *intensive* and *extensive* margins (Cadot et al., 2011); (2) dividing exports into traditional and new products and looking at the importance of each product relative to corresponding world exports. The second is applied as the implications of margins arising from low- and high-value products could not be accurately captured in the first measurement. It is likely that the number of export lines defined as extensive margins are far lower than those defined as intensive margins, but such extensive margins may be significant economically. Note that we can define extensive margins in terms of world market share since, as mentioned in Cadot et al. (2011), opening new export lines in developing countries tends to entail copying products from developed countries, not genuine innovation. Klinger and Lederman (2006) called an increase in export lines such as this 'inside-the-frontier innovation'. To determine new export products, we use the definition of Klinger and Lederman (2006), who defined 'discoveries' by comparing exports between two periods using a 3-year average as a benchmark. In other words, 'discoveries' occur when products are not exported in the previous period, e.g., 2002–2004, but are exported in the latter period, i.e., 2005–2007. We also use another definition outlined by Cadot et al. (2011), who define 'discoveries' as export lines that were inactive for the previous 2 years but become active and remain active for the subsequent 2 years.

4 Note that for electronics/electrical appliances in Singapore, export growth slightly declined in 2018, i.e., a one percentage point dropped from 12 percent in 2017.

5 Note that Indonesia has remained a small player in regional production networks. P&C imports slightly increased from 24 percent in 2002–2005 to 26 percent in 2017–2018. The P&C export share to total manufacturing exports was lower, ranging between 14 percent and 18 percent during the period with a declining trend. Infrastructure development, as well as an unfavorable business environment, in particular labor market rigidities hinder restructuring operations to be in line with global changes in the semiconductor industry (Thee and Pangestu, 1998; Manning and Purnagunawan, 2011).

6 Note that Gen Prayut Chan-O-Cha was re-elected as prime minister of Thailand following the disputed 2019 Thai general election.

7 Examples of companies which were reallocated to Thailand are Midea Group (Chinese electric appliance manufacturer); Shandong Yinbao Tyre Group, Shanghai Huayi, Shanghai Huayi (tiremaker from China); Prinx Chengshan (Hong Kong tiremaker) and Harley Davidson (motorcycles from the US).

8 See Nikkei Asia, November 19, 2019 https://asia.nikkei.com/Economy/Southeast-Asian-nations-compete-to-redraw-supply-chain-map.

9 See detail data from the Bank of Thailand website, Table EC_XT_081, as following link: https://www.bot.or.th/English/Statistics/EconomicAndFinancial/Pages/StatFinancialAccount.aspx. Note that a rise of net FDI inflows from Cambodia in 2020 were mainly in the service sector, i.e., in the real-estate and wholesale and retail trade activities. Another remark concerns the increasing importance of outward FDI from Thailand. Outward FDI flows increased noticeably from 2003 onward. They increased from $0.6 billion in 2002 to about $18 billion in 2020, with an interruption in 2014–2015 where the net outflows declined to around $5 billion from $12 billion in 2013 (Figure 4.4(a)). The amount of FDI outflows continued and surpassed inward FDI flows by 2011 so that from 2011, Thailand experienced a deficit in its FDI account, i.e., net outflows of direct investment, with only exception in 2013 where inward FDI soared noticeably. It is important to note that the analysis of FDI must be undertaken separately between inward and outward FDI as they involve different players, i.e., foreign investors engage with the former flows, while the latter is connected with Thai investors and actual economic consequences.

5 MNEs, exporting, and R&D activities in Thailand

Research and Development (R&D) has been widely recognized as a key factor in generating industrial development and promoting sustainable economic growth. Governments in most developing Asian countries, including Thailand, began to place policy emphasis on R&D activities in order to upgrade the level of technological capabilities in their manufacturing sectors, especially since the competitiveness which emerged from low labor costs has eroded over the past decade. In fact, there are two broad ways that technological upgrading has been able to take place, namely technology transmission and technology generation. The former refers to a situation where a firm imports technology from abroad, while the latter refers to developing new technology locally through R&D investment. The host-country government generally attaches greater attention to technology generation over technology transmission, in the hope that the former will help lay the foundation of national scientific and technology activity in the country.

In relation to R&D activity, recent interest has been paid to the role of government support, including terms of trade and investment aspects, in promoting R&D activity in the host country (Brown et al., 2017; Szczygielski et al., 2017). In terms of investment, the firm-specific advantages of multinational enterprises (MNEs), which arise in the form of knowledge-based assets, managerial know-how, the quality of the workforce, marketing, and branding, are expected to generate/promote R&D activity in the host countries. Therefore, there has been strong competition among developing countries to attract R&D-intensive foreign direct investment (FDI) both through investment promotion campaigns and by offering generous R&D-related tax concessions and high-quality infrastructure at subsidized prices (Athukorala and Kohpaiboon, 2010). With respect to trade, recent literature points to links from exporting to innovation and productivity (Damijan et al., 2010; Cassiman et al., 2010; Becker and Egger, 2013).

However, the relationship between MNEs and R&D activity is not straightforward. Some studies (e.g., Daft et al., 1987) argue that the involvement of MNEs may not necessarily generate R&D activity in the host country. Instead of decentralizing R&D activity, they may restrict R&D activity to their headquarters and only export R&D outcomes to their affiliates, mainly to ensure cost efficiency and firm-specific advantages. Some studies (e.g., Lall, 1979) believe that the R&D activities established by MNEs are likely to take place in a sequential

DOI: 10.4324/9781003144076-5

manner, i.e., the subsidiary begins to set up some types of R&D activity only when they gain more experience in the host country. Belderbos (2003), Frost and Zhou (2005), and Ferraris et al. (2017) argue that MNEs are likely to establish R&D subsidiaries. Thus, they are able to create new technologies and exploit firm-specific resources, thereby sustaining their global competitive advantage.

In terms of exports, some empirical studies (e.g., Hirsch and Bijaoui, 1985; Wakelin, 1998; Aw, Roberts and Xu, 2011) were unable to uncover a positive relationship between exporting and R&D activity. Some studies (e.g., Vernon, 1979; Salomon and Shaver, 2005; Cassiman et al., 2010) found that exporting helped only certain types of R&D activity; for example, exporting did not help firms to learn a considerable amount about improving production technologies, but it did allow them to learn more about product development. By contrast, Damijan et al. (2010) using Slovenian firm-level data, showed that exporting promotes the process innovation of medium and large firms, but it does not affect product innovation. Van Beveren and Vandenbussche (2010) and Becker and Egger (2013) found that exports led to innovation, but mostly in the form of product innovation, instead of the process.

Therefore, the relationship between MNEs, exporting, and R&D activity has not yet been fully clarified. Identifying the nature of such a relationship is not without challenges, given the fact that the heterogeneity of firms and country characteristics, as well as types of R&D activities, all influence the linkages involved. However, attempting to address these challenges is important to gain a better understanding of the role of MNEs and exporting in affecting R&D activities. This will help governments design more effective measures in promoting firms' technology upgrading within a country. Thus, this chapter aims to examine the relationship between MNEs, exporting, and R&D activities by using plant-level data from Thai manufacturing as a case study.

The research outlined in this chapter is distinct from other empirical studies in this area in three ways. Firstly, R&D activity in this study is disaggregated into three categories –R&D leading to improved production technology, R&D leading to product development, and R&D leading to process innovation – while most previous empirical studies use total R&D without delineation to examine R&D determinants. As mentioned earlier, MNE involvement and exporting could possibly have a different impact on different R&D activities. Thus, the disaggregation of R&D activity potentially helps us to clearly examine the role of MNEs and exporting in generating R&D investment. Second, this study examines both a firm's decision to invest in three types of R&D and their R&D intensity. Examining both aspects assists us to clearly understand the role of MNEs and exporting activity in influencing these three types of R&D. The selection model and instrument variables are applied here to guard against the possible selection bias in R&D intensity and endogeneity problems, respectively. Finally, this study examines not only the direct effect of MNEs on R&D activity in Thailand, but also their indirect effect, referred to here as R&D spillovers. It is possible that MNEs may import technology from their headquarters, instead of decentralizing

R&D activity to the host country. However, the entering of MNEs may help stimulate indigenous firms to set up more R&D activities (R&D spillovers) by reinforcing imitation and/or demonstration effects, as well as by increasing competition in the domestic market (Blomström and Kokko, 1998; Kokko et al., 2001; Kohpaiboon, 2006; Jongwanich and Kohpaiboon, 2008). Thus, it is plausible to examine both the direct and indirect effects of MNEs on R&D activity.

5.1 MNEs, exports, and R&D activities: The literature

Research and Development (R&D) has been widely recognized as an important factor contributing to innovation, industrial development, and sustainable economic growth. R&D leading to *process* innovation leads to more efficient production and management and helps firms to cut costs and lower prices. R&D leading to *product* innovation, through either improved production technology or product development, is able to increase the quality and variety of goods that potentially open up opportunities for firms to attain higher profits through larger quantities and/or price changes. Both innovations are able to eventually lead to productivity improvements, industrial development, and long-term economic growth.

In contributing to R&D activity, multinational enterprises (MNEs) have a potential role to play in establishing such activities in the host country. This is because multinational firms have firm-specific advantages, which take place in the form of knowledge-based assets, including proprietary information assets relating to product or process technology, managerial know-how, the quality of the workforce, marketing, and branding. However, it is not always the case that multinational firms will establish R&D activities in an investment-receiving country (Lall, 1979; Daft et al., 1987). In fact, the R&D activity of MNEs could potentially take place either at a company's headquarters or be decentralized to the host country, or both.

There are three key reasons why MNEs keep R&D activity as a headquarter function (Daft et al., 1987; Athokorala and Kohpaiboon, 2010). First, the establishment of R&D activity involves high (fixed) costs and uncertainties. Given the fact that transportation costs have noticeably declined over time, MNE affiliates can easily import technology (the so-called 'technology transmission'), which is developed and produced from their headquarters, instead of establishing R&D activity in the host country. Second, the innovatory process essentially involves complex communication and cooperation within a firm, from product design and production team cooperation to marketing and other related key functions. Face-to-face communication, inter-departmental relationships, and highly networked teams in transmitting highly equivocal and fluctuating information are essential for the development of innovation. Thus, the decentralization of R&D activity may be wasteful and reduce the ultimate productivity of R&D initiatives. Third, the decentralization of R&D also includes the risk of the leakage of proprietary technology, which involves the assets created by the R&D process and determines the ownership advantage in international operations, to foreign competitors. Such leakages could occur through either the defection of R&D personnel to competitors or simply through the demonstration effect. Thus, to maintain strategic knowledge within the firm, a MNE can decide to keep R&D activity as a headquarter function.

Nevertheless, MNEs may need to adapt the products' design, characteristics, and production processes to correspond with conditions and regulations in the host country. Thus, multinational firms may decide to establish R&D activity in the host country ('technology generation') to reduce the time lag in adjusting production techniques or product characteristics to host country conditions. Improvements in communication technology help to reduce the difficulties created by distance, although still not achieving the perfect substitutability for physical proximity needed for effective communication within the innovation process (Athokorala and Kohpaiboon, 2010). In addition, MNEs may undertake R&D activities overseas or decentralize such activities to other countries in order to access local technology, scientists, and technicians and benefit from localized technology spillovers in that location (Serapio and Dalton, 1999; Belderbos, 2003; Frost and Zhou, 2005; and Ferraris et al., 2017). In contrast to a conventional R&D department established outside company headquarters and primarily engaged in adapting products for the local market, modern R&D activity in developing countries could be engaged in the original product and process development to support the evolution of the core technology of MNEs.

Some previous empirical studies (including Lall, 1979; Athokorala and Kohpaiboon, 2010) argue that the establishment of R&D research support by MNE affiliates in host countries is likely to take place in a sequential manner. The process begins with the establishment of production activity entirely based on the technology provided by the parent company. When the subsidiary gains experience in a particular location and sales prospects are promising, the subsidiary begins to set up local R&D research support activities. In addition, investment promotion campaigns, such as generous R&D-related tax concessions and high-quality infrastructure development at subsidized prices, may help to encourage the subsidiary to establish R&D activity in the host country.

In addition to the direct potential of MNE affiliates in establishing R&D activity in the host country, the indirect effect, in which the entering of MNE affiliates stimulates domestically owned firms to set up their own R&D activities, could occur (Blomström and Kokko, 1998; Sjöholm, 1999; Kokko et al., 2001; Kohpaiboon, 2006, Jongwanich and Kohpaiboon, 2008; Thuyen; Jongawanich and E. Ramstetter, 2015). The indirect effects of multinational firms on indigenous companies are referred to here as "R&D spillovers". There are two key channels through which R&D spillovers could take place. First, MNEs can be a source of information, including technologies and management techniques, from which domestically owned firms benefit through the processes of demonstration and imitation. Subsidiaries tend to have more advanced production technology than local firms. While such technology associated with foreign firms possesses certain public-good qualities, the localization of the foreign firm potentially generates a positive externality in terms of the technological benefits afforded to the local firm. Since the market success of each firm depends on the level of technology it employs, this encourages the local firm to incorporate the associated superior technology and set up R&D activities.[1]

Second, affiliates of foreign firms could affect the decision of domestic firms in setting up R&D activity by increasing the level of competition. Such a higher level of competition forces domestic firms to become more productive and competitive. This process may also help to reinforce the imitation (or demonstration) effect of domestically owned firms, as it constitutes an incentive to engage in more efficient and leaner production techniques. This helps to stimulate domestically owned firms to set up and invest in R&D activities. Levin et al. (1987) point out that setting up independent R&D near the source of spillovers is the most effective way to learn about other firms' products and processes, when compared with licensing or the hiring of a competitors' R&D-related employees.

Exports and R&D activity

In addition to the potential role of MNEs in supporting R&D activity in the host country, previous studies point to the part played by exporting in stimulating innovation, including R&D activity (such as Grossman and Helpman, 1991; Damijan et al., 2010; Cassiman et al., 2010; Aw et al., 2011; Becker and Egger, 2013). 'Learning by exporting', which refers to engaging in exporting that allows a firm to enhance its productivity and overall competitive position, represents a key link between exporting and innovation. Those exporting firms exposed to the knowledge inputs not available to firms whose operations are confined to the domestic market are likely to be able to amass market and technological information (Salomon and Shaver, 2005). Specifically, exporters potentially benefit from the technological expertise of their buyers or receive valuable information about consumer preferences and competing products (Baldwin and Gu, 2004; Eckel and Neary, 2010). Iacovone and Javorcik (2012) and Manova and Zhang (2012) provide evidence that firms in developing countries need to upgrade their products to sell in export markets. Improving productivity could help a firm to involve more R&D activities.

International competition could be another channel that links exports and innovation activity. As pointed out by Aw et al. (2011), Clerides et al. (1998), and Greenaway et al. (2004), entering an export market incurs sunk costs so that a firm must reach a certain level of productivity to cover such expenses. However, to maintain or expand its market position under intense global competition, the firm must keep improving products and/or instigate process innovation, stimulating the firm to set up more R&D activities. Note that there is no clear evidence which types of innovation are promoted by exporting. On the one hand, Vernon (1979) and Salomon and Shaver (2005) found that exporting helps firms to learn more about product development, but less about improving production technologies. By contrast, Damijan et al. (2010), using Slovenian firm-level data, show that exporting promotes the process innovation of medium and large firms, but it does not affect product innovation. Van Beveren and Vandenbussche (2010) and Becker and Egger (2013) found that exports lead to innovation, but mostly in the form of product innovation, not process.

In fact, the recent theoretical literature suggests a bi-directional relationship between innovation and exports. Aw et al. (2008), for example, developed a theoretical model, which can be viewed as representing dynamic innovation-based endogenous growth theories. Specifically, the model is a dynamic structural model of a producer's decision to invest in R&D and participate in export markets. The investment decisions underlying investing in R&D and participating in export markets depend on expected future profitability and the fixed and sunk costs[2] incurred with each activity. The model has linked the innovation–export nexus with the role of firm-level productivity. While involvement in R&D and export activities requires entry costs, this generates the feature of productivity-based self-selection into both activities. Meanwhile, the model suggests that a firm that pursues R&D and/or exporting will be able to improve its productivity. Subsequently, this process helps to reinforce a firms' deeper involvement in innovation and/or export activities. All in all, the model points out that the bi-directional relationship between innovation and export could occur through changes in a firm's productivity following the two-step mechanism. Exporting improves firm productivity, which subsequently makes that firm more likely to self-select into seeking and adopting innovation. Or this can be the other way round, whereby a firm being involved in innovation activity results in productivity improvement and, subsequently, makes the firm more likely to self-select into export markets.

However, the bi-directional relationship between innovation and exports is not always supported by empirical studies. Most of the studies find only the impact of a firm's productivity on exports, but not the other way round (e.g., Hirsch and Bijaoui, 1985; Wakelin, 1998). Vernon (1979) and Salomon and Shaver (2005) point out that in export markets, exporters learn more about competing products and customer preferences from export intermediaries, customer feedback, and other foreign agents than they learn about process technologies. Thus, information derived from foreign customers might help firms tailor their products to meet the specific needs of such customers but have only a negligible impact on improving productivity. Meanwhile, Salomon and Shaver (2005) suggest that the lack of empirical support for learning by exporting could be because of the act of using productivity as a measure of learning. Since gains from incorporating technological information in a firm's production operations take time to result in productivity gains, it is difficult to find a statistical relationship between exports and productivity. Salomon and Shaver (2005), who proxy learning by patent application (instead of productivity) and use a number of new products launched to proxy product innovation, revealed a positive relationship between the two variables. They conclude that exporting is associated with innovation. Aw et al. (2011) conducted their research in the context of the Taiwanese electronics industry and showed that the self-selection of high productivity plants (investing in R&D) is the dominant channel driving participation in the export market, while exporting does not raise the probability of conducting R&D. Damijan, Kostevc, and Polanec (2010), on the other hand, using information from Slovenian firms during 1996–2002, showed that exporting leads to productivity improvements, especially concerning process innovation, while there was no evidence that either product or process innovation increased the probability of becoming an exporter.

5.2 Empirical model

To examine the impact of globalization, particularly the role of MNEs and exporting, on R&D investment in the Thai manufacturing sector, an empirical model is developed. The empirical model is developed based on available information about R&Ds and firm-specific information from the Industrial Census in Thailand, conducted by the National Statistics Office (NSO). From the census, there are three alternatives concerning R&D investment, comprising of the dependent variable in this study, namely R&D leading to improved production technology (*RDTech*); R&D leading to product development (product innovation) (*RDProduct*); and R&D leading to improved waste management systems (process innovation) (*RDProcess*). As argued in the previous section, MNEs and exporting tend to have different impacts on different types of R&D, so that separating R&D investment into these three alternatives allows us to clearly examine the possibly different impacts of MNEs and exporting on R&D investment.

The impacts of MNEs and exporting on each type of R&D are examined in three stages. The first stage examines the impact of MNE involvement and exporting on a firm's decision to participate in R&D investment. In this stage, R&D activity is measured in terms of a binary dummy variable, where '0' refers to a firm that is not involved in R&D activity and '1' refers to a firm that has participated in R&D activity (*RDTech*, *RDProduct*, *RDProcess*).[3]

The second stage involves examining the impact of MNEs and exporting on each category of R&D expenditure (i.e., R&D intensity) (*RDTechEx*; *RDProductEx*; *RDProcessEx*). R&D investment is measured here in terms of the percentage of sales. In this stage, sample-selection bias, which refers to problems where the dependent variable is observed only within a restricted, non-random sample – that is, we can observe R&D expenditure only if the firm decides to invest in R&D – could occur. Thus, a sample-selection model is applied to redress the possible bias that potentially arises from a restricted and non-random sample of the dependent variables (see Section 5.3).

In the first two stages, the MNE variable (*MNE*) is measured by the proportion of foreign shares held in a firm, while exporting (*EX*) is measured by export propensity, that is, the share of exports in total sales.[4] Alternatively, the binary dummy variables for MNEs, which takes the value of '1' for firms that are involved with MNEs and '0' otherwise, and for exports, '1' for firms involved in the export market and '0' otherwise, are also used as a robustness check.

The third stage involves investigating whether MNEs generate R&D spillover to domestically owned firms. As mentioned in the previous section, MNE affiliates can stimulate indigenous firms to invest in R&D activity through the processes of both demonstration and imitation, as well as through more intense competition. To examine such impacts, the data used for R&D investment and MNEs in the first and second stages are modified. In the first and second stages, the dependent variable (all three types of R&D investment) includes both multinational and domestically owned firms, but in the third stage (examining spillovers), only the R&D activities of domestically owned firms are included as the dependent variable in the model. In addition, instead of using the firm-level information of MNEs, the variable is replaced by the share held by foreign firms in the total capital stock at the industry level (*FOR*). If the coefficient associated with *FOR* is positive, it shows that MNEs could positively influence indigenous firms to invest in R&D initiatives.

In addition to MNEs and exporting, firm- and industry-specific variables are included in these three stages to reduce the possible estimation bias that could arise from correlations between an error term and independent variables. The firm- and industry-specific variables are based on studies in the previous literature on R&D determinants as follows. The first firm-specific variable is the firm size (*Size*). Schumpeter (1942) points out that firm size matters in terms of innovation activity by showing the qualitative differences between the nature of innovation activity undertaken by small firms which have no formal R&D unit, and large firms which have formal R&D laboratories. Many scholars (including Pavitt, 1987; Vaona and Pianta, 2008) tested Schumpeter's hypothesis and uncovered a positive relationship between firm size and innovation. Such a positive relationship could arise for two key reasons. First, due to imperfections in the capital market, large firms, which are relatively stable and can access internally generated funds, can afford to invest in (risky) R&D. Second, under the influence of large sales, the returns on R&D are higher; that is, the fixed costs arising from investing in R&D can be recovered faster as a result of the impact of large sales volumes. However, there are some studies (such as Aces and Audretsch, 1987 and Dorfman, 1987) which argue that the efficiency of R&D could be undermined by the loss of managerial control when a firm grows to become so large that the incentives of scientists and engineers become attenuated. They argue that industry condition and market structure seem to be more crucial than firm size, while a non-linear relationship between firm size and R&D investment is possible.[5]

In this study, firm size (*Size*) is measured by a firm's total sales. To capture the possible non-linear relationship between firm size and R&D investment, we include the squared term of size ($Size^2$) in the model. In view of the fact that exporters and MNE affiliates tend to be larger firms than non-exporters and non-MNE operations, by omitting this variable (size), exporting and MNEs might capture a spurious effect based on firm size.

In addition to firm size, the model includes firm age (*Age*) as another firm-specific factor. The sign of firm age is inconclusive, since older firms, on the one hand, may be more traditional than younger firms and therefore less inclined to change their operating processes to adopt new technologies. On the other hand, older firms may have more experience in changing production processes and adopting new technologies. The need to adopt new technology may be greater than the case with younger firms since their technologies are outdated. Thus, the likelihood that they will have to become involved in R&D investment is higher. In addition, firms accumulate knowledge through experience (the learning-by-doing argument, Barrios et al., 2003) so that older firms tend to be more efficient and perform better in terms of export activity than younger. Meyer (2009) found that firm age has a positive effect in determining technology adoption among German firms. To capture this effect, this study proxies *Age* by the periods a firm has operated in an industry. The squared term of *Age* is also included to capture the possible non-linear relationship between age and R&D investment.

A firm's productivity (*PROD*) is also included in the model. As argued by Aw et al. (2008, 2011), changes in a firm's productivity could influence its decision to invest in R&D in two ways. They could directly affect the prospects of the firm's future profitability, thereby encouraging it to invest more in R&D, and indirectly through the export channel as mentioned earlier. Thus, it is relevant to include a firm's productivity as another control variable. We use value added per worker as a proxy of this variable.

Governmental policy to promote R&D investment is also included in the empirical model. The sign of government policy is ambiguous. Some studies report a positive relationship between government policy and R&D investment. Yoon, Kwon, and Sim (2000) found the government subsidy program in Korea helped stimulate R&D activity in the IT industry; Lee and Hwang (2003) showed that government subsidy helped promote R&D activity only for the IT industry, not for non-IT industries. The negative impact of government policy, especially subsidies, and R&D may result from the moral hazard and burden potentially arising from the result-sharing agreements involved in subsidies. This could disincentivize a company from conducting R&D. To capture government policy, we include the binary dummy variable, which takes the value of '1' for a plant that receives investment (R&D) promotion from the Board of Investment (BOI) and '0' otherwise.

To capture the possible effect of both regional-specific factors and infrastructure, the model includes the location of a plant (*region*) as another explanatory variable. Infrastructure could influence a firm's R&D decision making and facilitate R&D intensity. Since infrastructure tends to be well developed in the central part of a country, including Bangkok in the Thai context, we include a binary dummy variable, which takes the value of '1' for a plant that is established in Bangkok, its vicinity, and the central region; and '0' otherwise.

The model also controls for the capital–labor ratio (*KL*). Newark (1983) points out that the capital intensity of firms/industries could influence their R&D activity. More specifically, firms in capital-intensive industries, such as telecommunications, generally require a greater budget to implement R&D activity than those in labor-intensive industries. Thus, a positive relationship between capital–labor ratios and R&D activity is expected.

Finally, the model also includes a proxy of the 'international production network' (*Network*) in the model. Rapid advances in production technology and technological innovations in transportation and communications have allowed companies to 'unbundle' the stages of production so that different tasks can be performed in different places. These dynamics have resulted in the increasing importance of international product fragmentation – the cross-border dispersion of component production/assembly within vertically integrated production processes – and a shift in the composition of exports toward intermediate goods (parts and components). Industries that are more involved in production networks tend to be more dynamic, such as the electronics and electrical appliance industry. Thus, the need to invest in R&D activity is expected to be higher than in other industries.

We use trade data to capture the aspect of the international production network (*Network*). It is measured by the ratio of the parts and components (P&C) trade (the sum of imports and exports) to total goods trade. The list of P&Cs is derived from a careful disaggregation of trade data based on Revision 3 of the Standard International Trade Classification (SITC, Rev 3) extracted from the United Nations trade data reporting system (UN Comtrade database) (Kohpaiboon, 2010; Jongwanich, 2011 and 2017). Trade data compiled from UN Comtrade is matched with the International Standard of Industrial Classification (ISIC, Rev 3).

It is noteworthy that industry dummy variables are included in the model to control for the different characteristics of each industry. In addition, while MNEs play a key role in certain industries in Thailand, including the automotive and hard disk drive industries, and products from these industries have been considerably successful in the global economy, it could be possible that the role of MNEs in the R&D activities of these industries differs from that of other industries. The interaction terms between MNEs and industry dummy variables are tested in the model, e.g., *MNE* × *automotive industry dummy*; *MNE* × *hard disk drive industry dummy*.

All in all, the empirical model to determine a firm's decision to invest in R&D activity and a firm's R&D expenditure can be summarized as follows.[6]

$$RD_{ij} = f\begin{pmatrix} MNE_{ij}, Ex_{ij}, Size_{ij}, Size_{ij}^2, Age_{ij}, Age_{ij}^2, PROD_{ij}, \\ KL_{ij}, BOI_{ij}, region_{ij}, Network_j, D_j, MNE \times D_j \end{pmatrix} \tag{5.1}$$

$$RD\_Ex_{ij} = f\begin{pmatrix} MNE_{ij}, Ex_{ij}, Size_{ij}, Size_{ij}^2, Age_{ij}, Age_{ij}^2, PROD_{ij}, \\ KL_{ij}, region_{ij}, Network_j, D_j, MNE \times D_j \end{pmatrix} \tag{5.2}$$

where:

RD_{ij} = Decision of firm *i* in industry *j* to invest in R&D. There are three types of R&D:

$RDTech_{ij}$ = Decision of firm *i* in industry *j* to invest in R&D improved technology

$RDproduct_{ij}$ = Decision of firm *i* in industry *j* to invest in R&D product development

$RDprocess_{ij}$ = Decision of firm *i* in industry *j* to invest in R&D process innovation

RD_EX_{ij} = R&D expenditure of firm *i* in industry *j* (% of total sales).
$RDTechEx_{ij}$ = R&D expenditure of firm *i* in industry *j* in improving production technology
$RDproductEx_{ij}$ = R&D expenditure of firm *i* in industry *j* in product development
$RDprocessEx_{ij}$ = R&D expenditure of firm *i* in industry *j* in process innovation
MNE_{ij} = Proportion of foreign shareholding of film *i* in industry *j*
Ex_{ij} = Propensity to exports of firm *i* in industry *j*
$Size_{ij}$ = Size of firm *i* in industry *j*
Age_{ij} = years of operation of firm *i* in industry *j*
$PROD_{ij}$ = Productivity of firm *i* in industry *j*
KL_{ij} = Capital–labor ratio of firm *i* in industry *j*
BOI_{ij} = Investment (R&D) promotion from Board of Investment (BOI) of firm *i* in industry *j*
$region_{ij}$ = Location of plant of firm *i* in industry *j*
$Network_j$ = Proportion of parts and components exports in industry *j*
D_j = Dummy variable for industry *j*
$MNE_{ij} \times D_j$ = Interaction term between MNE and industry dummy variable

In terms of R&D spillovers, R&D and foreign ownership variables in Equation (5.1) are modified as follows:

$$RD_{ij,d} = f\begin{pmatrix} FOR_j, Ex_{ij}, Size_{ij}, Size_{ij}^2, Age_{ij}, Age_{ij}^2, PROD_{ij}, \\ KL_{ij}, BOI_{ij}, region_{ij}, Network_j, D_j, FOR_j \times D_j \end{pmatrix} \tag{5.3}$$

where:

$RD_{ij,d}$ = Decision of firm *i* (only indigenous firms) in industry *j* to invest in R&D, composing of $RDTech_{ij,d}$; $RDProduct_{ij,d}$; $RDProcess_{ij,d}$
FOR_j = the presence of multinational firms in industry *j*

5.3 Data and econometric procedure

Data for the study is compiled from unpublished returns to the Industrial Census in Thailand, conducted by the National Statistics Office (NSO). To date, four censuses have been conducted in Thailand, in 1996, 2006, 2011, and 2016. Interestingly, only the industrial census in 2006 provided detailed information concerning R&D activities at the firm level in Thailand. In that census, R&D activities were divided into three types: R&D leading to improved production technology, R&D concerning product development, and R&D involving process innovation. Thus, this study uses information from the industrial census of 2006 to reveal the possible role of MNEs and exporting on R&D activities in Thailand. Employing the industrial census of 2006 *per se* to determine the impact of globalization, especially regarding the role of MNEs and exporting, on R&D activities has shortcomings. A well-known limitation of cross-sectional data sets with each industry representing a single data point is that they make it difficult to control for unobserved industry-specific differences. Long-term averages tend to ignore changes that may have occurred over time in the same country. These limitations can be avoided by using a panel data set compiled by pooling cross-industry and time-series data. Unfortunately, given the nature of data availability in Thailand, such a detailed analysis of R&D activities is impossible. However, we conduct panel data analysis using the aggregate information of R&D available from the three industrial censuses for the sake of a robustness check (see Appendix 5.4 for the results). The results when the three censuses are applied resemble, to a certain extent, what we observed when only the industrial census of 2006 was employed. Table 5.1 shows that R&D in Thailand, as a percentage of GDP, gradually increased during 2006–2017, while previous chapters show that MNEs involvements, especially through the FDI channel, and exports have started to play a vital role in the Thai economy since the late 1980s. Thus, the results revealed in employing the detailed information of 2006 would to some certain extent provide insightful information regarding the role of globalization within R&D activities.

The census of the year 2006 covers 73,931 plants, classified according to four-digit industry specifications of the International Standard of Industrial

Table 5.1 R&D expenditure (percent of GDP), 1996–2018

	1996–2000	*2001–2005*	*2006–2010*	*2011–2015*	*2016–2018**
World	2.01	2.02	1.99	2.04	2.18
United States	2.52	2.56	2.70	2.72	2.81
Euro area	1.75	1.80	1.89	2.10	2.18
Upper middle income	0.66	0.80	1.02	1.34	1.59
Middle income	0.65	0.77	0.97	1.24	1.45
Lower middle income	n.a.	0.60	0.60	0.58	0.58
Latin America & Caribbean	0.57	0.56	0.67	0.72	0.72
Middle East & North Africa	n.a.	n.a.	0.92	0.93	n.a.
East Asia & Pacific	2.27	2.34	2.37	2.40	2.42
Thailand	0.18	0.24	0.22	0.47	0.89
Singapore	1.62	2.05	2.22	2.04	2.01
Philippines	n.a.	0.13	0.11	0.14	n.a.
Malaysia	0.36	0.63	0.86	1.17	1.44
Indonesia	0.07	0.05	0.08	0.08	0.24
Korea, Rep.	2.19	2.43	3.14	4.08	4.53
China	0.70	1.13	1.51	1.96	2.15
India	0.70	0.75	0.82	0.72	0.66

Note: *For lower middle income, Latin America and the Caribbean, the Middle East and North Africa, Thailand, Singapore, the Philippines, and Malaysia, the data was until 2017
Source: World Development Indicator (WDI), available at http://data.worldbank.org/data-catalog

Classification (ISIC). The census was cleaned by checking duplicated samples; deleting establishments which had not responded to one or more of the key questions, such as those concerning sales values and output, and which had provided seemingly unrealistic information, such as negative output values or initial capital stock of less than 5,000 Baht ($200),[7] deleting micro enterprises which do not hire paid workers (zero paid workers), and focusing on samples with more than ten workers to avoid problems related to self-employed samples. Seven industries that function either to serve niches in the domestic market (such as the processing of nuclear fuel and manufacture of weapons and ammunition) are in the service sector (for example, building and repairing of ships, manufacture of aircraft and spacecraft, and recycling), or are explicitly preserved for local enterprises (including the manufacture of ovens, furnaces, and furnace burners and the manufacture of coke oven products) are excluded. All in all, the remaining plants accounted for 75 percent of Thai manufacturing gross output and 62 percent of manufacturing value added in 2006 (see the data employed in our empirical analysis and their correlations in Appendixes 5.1 and 5.2, respectively).

Table Appendix 5.3 presents the disaggregated R&D investment in Thailand from the industrial census 2006, conducted by the National Statistics Office (NSO). For R&D leading to improved production technology, firms in four industry areas, namely beverages, petroleum and chemical products, textiles, and electronics, dominate R&D activity. For example, in the manufacture of malt liquor and malt, more than 70% of total firms invested in R&D leading to improved production technology. This was followed by the manufacture of refined petroleum products (41 percent) and the manufacture of bearings, gears, and driving elements (35.5 percent). The percentage of firm participation in R&D leading to product development and process innovation tends to be less than that of R&D leading to improved production technology (Table Appendix 5.3: B and C). The highest percentage of firm participation in both product development and process innovation is around 43 percent for the manufacture of malt liquors, while their production technology rate is 71 percent. However, the R&D intensity in product development (on average around 5 percent of total sales) tends to be higher than that in improved production technology (3.5 percent of total sales). Meanwhile, industries covered in product development are more diversified than the other two types of R&D. Electrical equipment and appliances, watches and clocks, rubber tires and tubes, and paints and printing inks are industries that have a high percentage of firm participation.

Econometric procedure

To examine a firm's R&D decisions and R&D spillovers, a probit model is applied. There are two key problems related to OLS estimation under binary dependent variables, i.e., 1 for firms that export and 0 otherwise. Firstly, the predicted value of dependent variables under OLS could be higher than 1 or be negative. Secondly, the linear relationship between the dependent and independent variables is generally assumed. However, the relationship between the probability of investing in R&D and the explanatory variables could be non-linear. To limit the predicted value of dependent variables to lie between 0 and 1, the probit model is applied.

To deal with the endogeneity issue, especially for exports, the instrumental variable method is applied with the probit model (IV probit). The term *instrument variables* refers to variables which statistically affect/determine exports but are not statistically significant in determining R&D. Effective rate of protection (ERP) and concentration ratio (CR4) are used as instrumental variables. For both, based on diagnostic tests, we found that the concentration ratio performs better as an instrument variable than the effective rate of protection. Thus, we use concentration as a key instrument variable in this study. Concentration ratio (*CR4*), which is used as an instrument variable for exports, is measured at the more aggregate level (the 3-digit ISIC classification) to guard against possible problems arising from the fact that two reasonably substitutable goods are treated as two different industries according to the conventional industrial classification at a high level of disaggregation.

To estimate a firm's R&D expenditure (Equation 5.2), a sample-selection model is applied since the dependent variable (i.e., R&D expenditure) is observed only with firms deciding to invest in R&D (that is, R&D expenditure could be observed only in a restricted, non-random sample). There are two key equations in the model. The first equation (5.4) explains whether an observation is in the sample or not, while the second equation (5.5) determines the value of Y. Note that Y is the outcome variable, which is only observed when a variable Z is positive.

$$Z_i^* = w_i^* \alpha + e_i$$

$$\left.\begin{aligned} Z_i &= 0 \;\; if \;\; Z_i^* \le 0 \\ Z_i &= 1 \;\; if \;\; Z_i^* > 0 \end{aligned}\right\} \tag{5.4}$$

$$\Upsilon_i^* = x_i'\beta + \mu_i$$

$$\left.\begin{aligned} &\Upsilon_i = \Upsilon_i^* \;\; if \;\; \mathrm{Z}_i = 1 \\ &\Upsilon_i \text{ not observed } if \;\; \mathrm{Z}_i = 0 \end{aligned}\right\} \tag{5.5}$$

When Equations (5.4) and (5.5) are solved together, the expected value of the variable Y is the conditional expectation of Υ_i^* conditioned on it being observed ($Z_i = 1$).

$$\begin{aligned} E\left(\Upsilon_i / x_i, w_i\right) = E\left(\Upsilon_i^* / d_i = 1, x_i, w_i\right) &= x_i'\beta + \rho\sigma_\varepsilon \frac{\phi\left(w_i'\alpha\right)}{\Phi\left(w_i'\alpha\right)} \\ &= x_i'\beta + \rho\sigma_\varepsilon \lambda\left(w_i'\alpha\right) \end{aligned} \tag{5.6}$$

where $\lambda\left(w_i'\alpha\right)=\phi\left(w_i'\alpha\right)/\Phi\left(w_i'\alpha\right)$ is the inverse Mills' ratio. It is important to note that $E\left(Y_i / x_i, w_i\right) = x_i'\beta$ if the two error terms are uncorrelated, i.e., $\rho = 0$. In other words, if two error terms are uncorrelated, the simple OLS approach is efficient and unbiased in explaining Y, and we can apply either Maximum Likelihood simultaneously estimating Equations (5.4) and (5.5) or employ the Heckman two-step estimation.

In this study, we apply the two-step estimation since the model needs to take into account the possible endogeneity problem that could arise, especially for the export variable. The estimation procedure is as follows. First, we construct the inverse Mills' ratio from the probit model (IVprobit model) in each type of R&D and then estimate Equation (5.2) using cross-sectional models and include the inverse Mills' ratio as an additional regressor. Note that the instrumental variable method is also applied at this stage.

5.4 MNEs, exporting and R&D activities: Empirical results

Tables 5.2, 5.3, and 5.4 illustrate the results of a firm's R&D investment in terms of improved production technology, product development, and process innovation, respectively. In each table, there are two columns. Column A presents the determinants of a firm's R&D decision, which take a value of '1' for a firm involved with R&D activity and '0' otherwise, while column B shows the determinants of a firm's R&D intensity. Table 5.5 presents the determinants of R&D spillover for improved production technology (column A), product development (column B), and process innovation (column C).

The model reveals a negative and statistically significant relationship between multinational firms (MNE) and a firm's decision to invest in R&D leading to both improved production technology and product development, but statistical insignificance in R&D leading to process innovation (Column A of Tables 5.2–5.4). This implies that most MNE affiliates are unlikely to invest in R&D in the host country (Thailand), but instead they are likely to import technology (technology transmission) from their parent company. In terms of improved production technology, this is plausible since R&D investment in such activity involves high fixed costs, while transportation costs have become cheaper; hence, it tends to be more efficient to invest in R&D activity at their headquarters and import technology to the host country. In addition, the decentralization of R&D activity related to production technology involves a high risk of the leakage of propriety assets, which are important in order to maintain the firm's ownership advantage in international operations.

In terms of product development, the innovation process involves complex communication and cooperation within a firm, encompassing product design, the efforts of a production team, and marketing among other stakeholders. In addition, face-to-face communication, inter-departmental relationships, and teamwork are required for the development of innovation to prosper. Thus, it would be more efficient for MNEs to develop/innovate new and core products

Table 5.2 Estimation results of R&D improved production technology (both domestic and foreign firms)

	Column A *A firm's decision to invest in R&D*		*Column B* *R&D intensity (% of sales)*	
	Coefficient	*Z-statistics*	*Coefficient*	*Z-statistics*
Intercept	–12.37	–9.80***	–3.16	–1.32
MNE_{ij}	–11.13	–1.60**	–4.15	–0.24
Ex_{ij}	0.9	1.36	0.08	0.1
Age_{ij}	0.07	2.72***	0.07	1.14
Age_{ij}^2	–	–	–	–
$PROD_{ij}$	–0.08	–3.53***	0.003	0.07
$Size_{ij}$	0.99	7.51***	0.43	1.79**
$Size_{ij}$^2	–0.02	–5.90***	–0.01	–1.99***
KL_{ij}	0.07	4.67***	–0.006	–0.12
BOI_{ij}	–0.09	–0.31	–	–
$region_{ij}$	0.02	0.41	0.14	1.62**
$Network_j$	0.43	2.30***	1.14	2.78***
MNE_{ij}×*Auto dummy*	12.76	0.8	31.09	1.60**
MNE_{ij}×*Hard disk dummy*	1.96	0.09	92.38	2.63***
Inversed mill ratio	–	–	–0.4	–0.3
D_j	Included		Included	
No. of obs	17,427		1018	
Log likelihood	5316.07		Root MSE = 0.89	
Wald chi²	1254.87 (Prob>chi² = 0.00)			
Wald-test for exogeneity	1.32 (Prob>chi² = 0.25)			

Note: (1) Column A is estimated by IVProbit model using concentration ratio as the instrument for exports, and Column B is estimated by 2SLS and a sample-selection model. Logarithm is used for Age, Size, and KL while the ratio is applied for MNE (the share of foreign firms), EX (the share of exports to total sales), and Network (the share of trade in parts and components to total trade).
(2) *, **, and *** indicate the significant level at 10, 5, and 1 percent, respectively.
(3) Industrial dummy variables are included (according to ISIC) in the estimation.
Source: Author's estimations.

in their headquarters, instead of decentralizing such activity to their MNE affiliates. However, MNEs still listen and gather information from their affiliates to ensure that the innovated products match efficiently with consumer preference in different locations. The statistical insignificance found in R&D leading to process innovation implies that some MNEs began to invest in such R&D in the host country, including introducing 'lean processing' operations, but the proportion of firms who invest in such activities is still low.

Interestingly, when R&D intensity is considered (Column B of Tables 5.2–5.4), a positive relationship is found for the interaction term between MNEs

Table 5.3 Estimation results of R&D product development (both domestic and foreign firms)

	Column A *A firm's decision to invest in R&D*		*Column B* *R&D intensity (% of sales)*	
	Coefficient	*Z-statistics*	*Coefficient*	*Z-statistics*
Intercept	–11.53	–9.34***	–2.43	–1.12
MNE_{ij}	–16.44	–2.57***	7.44	0.52
Ex_{ij}	1.9	3.35***	–0.55	–0.79
Age_{ij}	0.12	4.87***	–0.02	–0.33
Age_{ij}^2	–	–	–	–
$PROD_{ij}$	–0.09	–4.10***	0.08	2.11***
$Size_{ij}$	0.99	7.89***	0.39	1.64**
$Size_{ij}$^2	–0.02	–6.37	–0.01	–1.88**
KL_{ij}	0.04	3.21***	0.05	2.01***
BOI_{ij}	–0.6	–2.29***	–	–
$region_{ij}$	0.26	5.22	0.41	3.50***
$Network_{j}$	0.52	2.92***	0.52	1.54*
MNE_{ij}×*Auto dummy*	–8.84	–0.53	53.59	2.12***
MNE_{ij}×*Hard disk dummy*	9.96	0.49	94.67	2.40***
Inversed mill ratio	–	–	0.14	0.52
D_{j}	Included		Included	
No. of obs	17,427		1191	
Log likelihood	5058.57		Root MSE = 0.98	
Wald chi^2	1643.85 (Prob>chi^2 = 0.00)			
Wald-test for exogeneity	0.33 (Prob>chi^2 = 0.56)			

Note: (1) Column A is estimated by IVProbit model using concentration ratio as the instrument for exports, and Column B is estimated by 2SLS and a sample-selection model. Logarithm is used for Age, Size, and KL while the ratio is applied for MNE (the share of foreign firms), EX (the share of exports to total sales), and Network (the share of trade in parts and components to total trade).
(2) *, **, and *** indicate the significant level at 10, 5, and 1 percent, respectively.
(3) Industrial dummy variables are included (according to ISIC) in the estimation.
Source: Author's estimations.

and the automotive industry dummy variable for all three types of R&D activity. In terms of the hard disk drive industry, such a positive relationship is found for R&D improved production technology and R&D product development. This result shows that MNE affiliates in both industries set up R&D activities in Thailand, confirming the world-class production bases of the country in these two industries. Meanwhile, the expenditure of R&D activities in these two industries tends to be far higher than in others, resulting in a significant coefficient corresponding to such interaction terms.

Table 5.4 Estimation results of R&D process innovation (both domestic and foreign firms)

	Column A *A firm's decision to invest in R&D*		*Column B* *R&D intensity (% of sales)*	
	Coefficient	*Z-statistics*	*Coefficient*	*Z-statistics*
Intercept	–11.54	–8.35***	–0.3	–0.11
MNE_{ij}	–9.69	–1.25	11.89	0.83
Ex_{ij}	0.34	0.47	–0.56	–1
Age_{ij}	0.35	2.47***	0.1	0.37
Age_{ij}^2	–0.04	–1.52*	–0.03	–0.52
$PROD_{ij}$	–0.12	–4.40***	0.07	1.46*
$Size_{ij}$	0.88	6.03***	0.12	0.43
$Size_{ij}$^2	–0.02	–4.38***	–0.008	–1.01
KL_{ij}	0.05	3.04***	–0.04	–1.14
BOI_{ij}	–0.009	–0.03	–	–
$region_{ij}$	0.13	2.25***	0.26	2.05***
$Network_{j}$	0.04	0.17	0.63	1.77**
MNE_{ij}×*Auto dummy*	16.65	0.96	57.39	2.52***
MNE_{ij}×*Hard disk dummy*	–36.99	–1.29	–1	–0.02
Inversed mill ratio	–	–	1.82	2.20***
D_{j}	Included		Included	
No. of obs	17,473		748	
Log likelihood	5893.83		Root MSE = 0.88	
Wald chi²	917.03 (Prob>chi² = 0.00)			
Wald-test for exogeneity	0.36 (Prob>chi² = 0.55)			

Note: (1) Column A is estimated by IVProbit model using concentration ratio as the instrument for exports and Column B is estimated by 2SLS and a sample-selection model. Logarithm is used for Age, Size, and KL while the ratio is applied for MNE (the share of foreign firms), EX (the share of exports to total sales), and Network (the share of trade in parts and components to total trade).
(2) *, **, and *** indicate the significant level at 10, 5, and 1 percent, respectively.
(3) Industrial dummy variables are included (according to ISIC) in the estimation.
Source: Author's estimations.

In contrast to MNEs, a positive sign is found for the exporting variable. However, the model shows a positive, but statistically insignificant, relationship between exporting and a firm's decision to invest in R&D leading to both improved production technology and process innovation (Tables 5.2 and 5.4). The statistical insignificance implies that the probability of firms investing in R&D for improving production technology and process innovation is not significantly affected by market destination, neither domestic nor export markets.

This study finds a positive and statistically significant relationship between exports and a firm's decision to invest in R&D product development (Table 5.3).

Table 5.5 Estimation results of R&D spillovers (domestically owned firms' decision to invest in R&D)

	Column A *R&D improved technology*		*Column B* *R&D product development*		*Column C* *R&D process innovation*	
	Coefficient	*Z-statistics*	*Coefficient*	*Z-statistics*	*Coefficient*	*Z-statistics*
Intercept	–14.06	–10.91***	–12.23	–8.90***	–12.78	–11.03***
FOR_j	0.004	1.50*	0.004	1.70**	0.003	1.76**
Ex_{ij}	–1.3	–1.27	1.34	1.45*	–2.02	–1.2
Age_{ij}	0.05	1.62**	0.1	3.64***	0.17	1.56**
Age_{ij}^2	–	–	–	–	–0.02	–0.81
$PROD_{ij}$	–0.14	–5.67***	–0.14	–5.48***	–0.14	–6.59***
$Size_{ij}$	1.06	7.21***	1.02	7.29***	0.92	6.51***
$Size_{ij}$^2	–0.02	–5.40***	–0.02	–5.64***	–0.02	–4.60***
KL_{ij}	0.1	5.88***	0.06	4.24***	0.07	4.71***
BOI_{ij}	0.92	2.08***	–0.29	–0.7	1.08	1.49*
$region_{ij}$	–0.02	–0.43	0.22	4.24***	0.06	1.19
$Network_j$	0.45	1.84**	0.64	2.92***	–	–
D_j	Included		Included		Included	
No. of obs	16,221		16,245		16,289	
Log likelihood	7347.51		7095.7		10290.9	
Wald chi^2	1167.4 (prob>chi^2 = 0.00)		1370.4 (prob>chi^2 = 0.00)		1 (prob>chi^2 = 0.00)	
Wald-test for exogeneity	1.88 (prob>chi^2 = 0.17)		1.77 (prob>chi^2 = 0.18)		1.04 (prob>chi^2 = 0.31)	

Note: (1) Column A is estimated by IVProbit model using concentration ratio as the instrument for exports and Column B is estimated by 2SLS and a sample-selection model. Logarithm is used for Age, Size, and KL while the ratio is applied for EX (the share of exports to total sales) and Network (the share of trade in parts and components to total trade).
(2) *, **, and *** indicate the significant level at 5, 10, and 15 percent, respectively.
(3) Interaction terms between FOR and industry dummy variables are all insignificant.
(4) Industrial dummy variables are included (according to ISIC) in the estimation.

The statistical significance for R&D product development, but not for production technology and process innovation, could reflect the fact that while exporters tend to learn more about competing products and customer preferences in international markets, the ability to access information related to improving production technology and process innovation is still limited. The information on competing products and customer preferences could come from customer feedback, export intermediaries, and other foreign agents. Thus, information passed on from foreign customers helps firms innovate/tailor their products to meet the specific needs of international markets. It is noteworthy that although the relationship of exports and the other two R&D activities is statistically insignificant, the positive sign of these variables could, to some extent, reflect the intense global competition that would begin to stimulate firms to invest in R&D, leading to improved production technology and process innovation.

The model also shows that firm age and firm size have a positive and significant impact in determining a company's decision to invest in R&D for improved production technology and product development. The positive sign of firm age in these two R&D equations supports the argument that older firms tend to have more experience in changing production processes and adopting new technology than younger firms. Interestingly, with R&D process innovation, we find that ($Age^{\wedge 2}$) is negative and statistically significant along with a significantly positive sign of *Age*. This implies that the incentive of firms to invest in process innovation would become negative when the firms are getting too old. In this study, we find that when a firm is over 70 years old, the probability of it investing in R&D process innovation becomes negative. Note that the negative sign of $Age^{\wedge 2}$ is also found in R&D improved production technology and R&D product development, but at a level that is statistically insignificant.

The non-linear relationship between firm size ($Size_{ij}$) and the decision of a firm to invest in R&D activity is also revealed in this study. The positive sign of firm size reflects the fact that R&D activity involves high fixed costs. Meanwhile, the capital market is imperfect, so larger firms, which are likely to have the stability of funding, can afford to invest more in R&D than smaller ones. However, the negative sign of $Size^{\wedge 2}$ shows that this factor becomes less important in affecting a firm's decision to invest in all three types of R&D when it reaches a certain level. In other words, after the firm reaches the break-even point, other factors become more important within their decision making. In this study, such a level of firm size, measured by sales, would be around 126 billion Baht. Firm size is also statistically significant in R&D intensity for both improved production technology and product development.

In addition to firm age and firm size, our study finds a negative and statistically significant relationship between a firm's productivity ($PROD_{ij}$) and their decision to invest in all three types of R&D. This result stands in contrast to the expected positive sign. The negative relationship shown in this study implies that the probability of a firm with lower productivity to invest in R&D is higher than that with higher productivity. This tends to reflect a possible catching-up behavior at the firm level, not only to improve its own productivity but also to survive in an intensely competitive environment. The coefficient corresponding to this variable is highest for R&D process innovation, followed by R&D product development and improved production technology. This may reflect the fact that to improve their productivity, (smaller) firms tend to use process innovation before improving production technology, which involves relatively higher fixed costs. Interestingly, once firms have already made a decision to invest in R&D, a firm that has higher productivity tends to invest more in R&D, especially in product development. This is shown by the positive sign of a firm's productivity ($PROD_{ij}$) in determining R&D intensity. As productivity could affect the prospects of the firm's future profitability, those with higher productivity are likely to spend more on R&D investment (Lazonick, 2006).

The model also shows that firms producing more capital-intensive goods have a higher probability of being involved in all three types of R&D activity, confirming that the nature of an industry could influence a firm's decision to invest in R&D. This study also finds that infrastructure tends to be a crucial factor positively influencing a firm's decision to invest in all three types of R&D. This is reflected by the positive coefficient corresponding to '*region*' in both a firm's decision to invest in R&D and R&D intensity (Columns A and B of Table 5.2–5.4).

The statistically insignificant relationship between government policy (BOI) and a firm's R&D decision is found in R&D leading not only to improved production technology, but also process innovation.[8] This result could, to some degree, reflect the case that government policy alone is not effective enough to influence a firm's decision to set up R&D activity. By contrast, other fundamental variables, such as firm age, size, productivity, and other industrial characteristics, play a more crucial role in influencing the decision making of firms. However, when we consider only domestically owned operations in R&D spillover (Table 5.5), government policy (BOI) positively increases the probability of a firm investing in R&D, especially in terms of improved production technology. Thus, the insignificant effect of BOI found here tends to be dominated by foreign firms, for which most of their decisions are influenced by their parent company (firm-specific factors), while government policy is less relevant. Government policy, by contrast, tends to be more important in the decision making of domestically owned firms in setting up R&D since most of them are at a disadvantage in terms of proprietary assets and need additional support from the government.

Meanwhile, the positive relationship of '*Network*' and a firm's decision to invest in R&D supports the role of international production networks in promoting a firm's R&D decision making. The dynamism of industries involved in a production network is likely to require more R&D investment to keep the industry upbeat and competitive in international markets. In addition to a firm's decision making, '*Network*' is also statistically significant and positive in terms of the R&D intensity for all three types. This implies that the higher the degree of involvement in international production networks, the greater the amount of R&D expenditure is to be expected.

It is noteworthy that some fundamental variables, such as firm age, are statistically insignificant in R&D intensity equations (Equation 5.2). The inability to effectively capture their relationships could result from the smaller sample size of firms who are involved in R&D activity. In addition, the variation of R&D expenditure is limited among these firms. For example, in R&D improved production technology, there are only 1,018 firms who decided to set up R&D activity, and the R&D expenditure is mostly set at less than (or equal to) 10 percent. The low variation of R&D expenditure may make it rather difficult to reveal the relationship, statistically.

R&D spillovers

Interestingly, although there is evidence that most multinational firms tend to import technology, instead of establishing R&D activity in the host country (except some industries such as the automotive and hard disk drive industries), multinational firms tend to stimulate indigenous firms to invest more in R&D activity (spillovers). Such evidence is supported by the positive and statistical significance of the share of foreign ownership at the industry level (FOR_j) and a domestically owned firm's R&D decision making (Table 5.5). Among the three types of R&D activity, the spillover tends to be strong with product development, followed by process innovation. The strong spillovers in product development and process innovation support the important processes of demonstration and imitation in generating R&D spillovers. The intense competition generated from MNEs entering markets might play some role in generating spillovers and encouraging domestic firms to invest in R&D and reduce costs. However, the relatively weak significance of *FOR* in R&D for improved production technology may arise because of the relatively high fixed costs of such investment limiting the possible positive effect that could arise from demonstration and imitation effects. Note that there is no industry outliner in stimulating spillovers as coefficients corresponding to interaction terms between *FOR* and industry dummy variables, including the hard disk drive and automotive industry, are statistically insignificant and excluded from the reported results.

The model reveals the mild significance of exporting and a firm's decision to invest in R&D leading to product development, while there is no positive and significant effect of exports on a firm's decision to invest in R&D leading to production technology and process innovation. This is consistent with the above findings when we include both domestic and foreign firms; that is, entering an export market tends to help firms get/learn more information about products and consumer preferences than production technology and process innovation. However, the smaller coefficient of this variable, compared to the situation wherein we consider both foreign and domestic firms, reflects the fact that domestic firms still have limited knowledge in the world market, especially in terms of networking, compared to foreign firms. In addition, the negative relationship between exporting and a firm's decision to invest in R&D production technology also reflects the fact that indigenous firms, who export, could access/update new production technology easier than other domestic firms so that they are likely to import production technology, instead of becoming involved in 'technology generation'.

Firm age, firm size, and capital intensity matter in affecting the decision of domestically owned firms to invest in all types of R&D activity (Table 5.5). A positive relationship between these variables and a firm's R&D decision making is found. In particular, the non-linear relationship between firm size and the firm's R&D decision making is revealed in all three types of R&D activity. The catching-up behavior at the firm level is still found in the case of domestically owned firms as suggested by the negative and statistical significance of coefficients corresponding to a firm's productivity variable. The production network (*Network*) tends to positively and significantly affect the probability of a domestic firm investing in R&D product development and production technology, but there is no such evidence for R&D process innovation.

5.5 Conclusions

This chapter examines the impact of globalization, in terms of MNE involvement and exporting, on R&D activity using plant-level data in the Thai manufacturing context. Three types of R&D investment are considered, namely R&D leading to improved production technology, R&D leading to product development, and R&D leading to process innovation. Results show that firm-specific factors, including age, size, productivity, and capital–labor ratios are crucial in determining R&D activity. Government policy, expedited through the Board of Investment, could help stimulate R&D activity, mostly for indigenous firms in the areas of production technology and process innovation, while infrastructure is pivotal in promoting all types of R&D activity.

MNEs do not have a significant positive direct impact on influencing a firm's decision to invest in all types of R&D. This implies that most MNE affiliates still import technology from their parent companies. The negative and significant impact of MNEs on R&D leading to product development also confirms that almost all R&D activity directed at innovating new products is still undertaken within the parent company. However, the automotive and hard disk drive industries are two exceptional cases wherein MNE affiliates have a significant and positive impact on R&D activities in Thailand. Particularly in the case of the automotive industry, the entering of MNEs into the market generates all three types of R&D activity in Thailand, while in the hard disk drive industry, the role of MNEs is found more in product development and production technology. These results confirm the world-class production base status of the country in these two industries.

Though most MNEs are unable to generate a positive and direct impact on R&D activity in the host country, they are able to generate a spillover effect by stimulating indigenous firms to invest in R&D activity, especially for product development and process innovation. Exporting tends to have a positive and significant impact only on a firm's decision to invest in R&D leading to product development. This implies that entering an export market tends to help firms learn more about competing products and customer preferences, but the ability to access the information related to improving production technology and process innovation is limited from the exporting channel. Participating in an international production network promotes firms to invest in all types of R&Ds.

Appendix 5.1

Table Appendix 5.1 Data used in the empirical model

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
$RDTech_{ij}$	27,358	0.06	0.23	0.00	1.00
$RDTechEx_{ij}$	1,558	0.59	0.92	0.00	4.61
$RDProduct_{ij}$	27,358	0.06	0.24	0.00	1.00
$RDProductEx_{ij}$	1,731	0.73	1.01	0.00	4.61
$RDProcess_{ij}$	27,358	0.04	0.20	0.00	1.00
$RDProcessEx_{ij}$	1,118	0.56	0.90	0.00	4.62
MNE_{ij}	27,358	0.01	0.00	0.01	0.02
Ex_{ij}	27,358	0.06	0.17	0.00	0.69
$Size_{ij}$	27,355	15.52	3.76	0.00	26.36
Age_{ij}	27,358	2.18	0.85	0.00	4.60
$PROD_{ij}$	26,125	11.70	1.92	–4.62	19.07
KL_{ij}	27,358	11.53	2.06	4.34	20.32
BOI_{ij}	27,358	0.15	0.35	0.00	1.00
$region_{ij}$	27,358	0.59	0.49	0.00	1.00
$Network_{j}$	17,998	0.02	0.09	0.00	1.00

Note: All variables are in logarithm, except $RDTech_{ij}$, $RDProduct_{ij}$, $RDProcess_{ij}$, BOI_{ij}, and $region_{ij}$
Source: Author's calculations.

Appendix 5.2

Table Appendix 5.2 Correlation coefficient matrix of all relevant variables

$RDTech_{ij}$	1																
$RDTechEx_{ij}$	0.68	1															
$RDProduct_{ij}$	0.63	0.66	1														
$RDProductEx_{ij}$	–0.02	n.a.	n.a.	1													
$RDProcess_{ij}$	n.a.	0.20	n.a.	0.88	1												
$RDProcessEx_{ij}$	n.a.	n.a.	0.84	0.84	0.83	1											
Age_{ij}	0.14	0.13	0.13	0.02	0.02	0.02	1										
Age_{ij}^2	0.15	0.13	0.14	0.01	0.02	0.02	0.98	1									
$Size_{ij}$	0.28	0.05	0.24	–0.08	–0.13	–0.11	0.27	0.30	1								
$Size_{ij}$^2	0.30	0.05	0.26	–0.08	–0.13	–0.12	0.27	0.30	1.00	1							
KL_{ij}	0.18	–0.06	0.15	–0.07	–0.06	–0.08	–0.03	0.00	0.31	0.32	1						
BOI_{ij}	0.24	0.03	0.19	0.02	–0.03	–0.04	0.12	0.14	0.33	0.32	–0.03	1					
MNE_{ij}	0.12	–0.02	0.10	0.04	–0.02	–0.02	0.04	0.05	0.30	0.30	0.10	0.20	1				
$Network_{j}$	0.05	0.00	0.03	0.13	0.10	0.08	–0.02	–0.03	0.08	0.08	–0.06	–0.04	0.17	1			
$region_{ij}$	0.15	0.13	0.14	–0.09	–0.19	–0.14	0.07	0.08	0.32	0.31	0.11	0.09	0.09	0.04	1		
Ex_{ij}	0.18	0.00	0.12	0.02	–0.04	–0.06	0.09	0.08	0.23	0.22	–0.14	0.63	0.27	0.07	0.00	1	
$PROD_{ij}$	0.20	–0.03	0.17	–0.04	–0.06	–0.08	0.13	0.15	0.64	0.64	0.48	0.08	0.25	0.05	0.28	–0.04	1

Note: All variables are in logarithm, except $RDTech_{ij}$, $RDProduct_{ij}$, $RDProcess_{ij}$, BOI_{ij}, and $region_{ij}$

Source: Author's calculations.

Appendix 5.3

R&D investment, by industry

Table Appendix 5.3A R&D leading to improved production technology

ISIC		*Total firms*	*% of firms investing in R&D*	*R&D intensity*	*No. of foreign firms investing in R&D*	*Age (years)*	*Sales (million Baht)*	*Export intensity (% of sales)*	*CR4*	*Foreign participation*
1553	Manufacture of malt liquors and malt	7	71.4	1.8	1	12.6	1326	2.0	0.5	18.0
2320	Manufacture of refined petroleum products	61	41.0	4.0	5	16.0	13170	2.1	0.6	5.2
2913	Manufacture of bearings, gears, gearing, and driving elements	31	35.5	2.3	2	16.0	1526	61.4	0.5	10.0
2423	Manufacture of pharmaceuticals, medicinal chemicals, and botanical products	210	25.2	4.3	3	32.1	191	10.0	0.4	3.7
2421	Manufacture of pesticides and other agro-chemical products	44	22.7	1.3	4	23.6	396	19.0	0.4	34.9
2930	Manufacture of domestic appliances n.e.c.	98	22.4	2.4	11	21.1	1307	26.6	0.5	18.6
2411	Manufacture of basic chemicals, except fertilizers and nitrogen compounds	167	22.2	1.9	7	17.7	623	16.0	0.5	8.5

3592	Manufacture of bicycles and invalid carriages	23	21.7	2.0	0	16.8	593	20.2	0.6	0.0
1532	Manufacture of starches and starch products	67	20.9	4.0	1	18.3	315	20.7	0.6	3.5
2430	Manufacture of man-made fibers	29	20.7	2.8	0	17.8	258	14.3	0.4	0.0
1911	Tanning and dressing of leather	51	19.6	1.2	0	13.7	192	51.9	0.5	0.0
1542	Manufacture of sugar	68	19.1	4.8	1	35.4	1512	52.5	0.4	0.2
2429	Manufacture of other chemical products n.e.c.	121	18.2	1.6	9	13.2	494	24.5	0.4	18.2
1533	Manufacture of prepared animal feeds	142	17.6	2.4	4	17.1	983	8.8	0.6	3.4
3210	Manufacture of electronic valves and tubes and other electronic components	277	17.3	2.8	27	11.8	1309	44.9	0.4	41.5
Average			9.0	3.5	3	17.6	1053	22.7	0.5	13.6
Max			71.4	13.5	27	38.0	14940	99.3	0.7	100.0
Min			0.0	1.0	0	5.0	0	0.0	0.3	0.0

Table Appendix 5.3B R&D leading to product innovation

ISIC		*Total firms*	*% of firms investing in R&D*	*R&D intensity*	*No. of foreign firms investing in R&D*	*Age (years)*	*Sales (million Baht)*	*Export intensity*	*CR4*	*Foreign participation*
1553	Manufacture of malt liquors and malt	7	42.9	2.3	1	11.0	535	3.3	0.5	30.0
2423	Manufacture of pharmaceuticals, medicinal chemicals, and botanical products	210	36.2	4.6	4	31.9	163	8.6	0.4	3.1
2422	Manufacture of paints, varnishes and similar coatings, printing ink, and mastics	153	35.3	7.1	11	18.2	270	5.0	0.4	14.7
2421	Manufacture of pesticides and other agro-chemical products	44	31.8	1.1	6	23.8	395	14.9	0.4	34.9
2320	Manufacture of wooden containers	61	31.1	2.6	0	12.6	2490	1.5	0.6	2.5
1820	Dressing and dyeing of fur; manufacture of articles of fur	7	28.6	1.5	1	25.0	1224	32.5	0.5	20.0
3592	Manufacture of bicycles and invalid carriages	23	26.1	2.3	0	16.8	495	16.8	0.6	0.0
2930	Manufacture of domestic appliances n.e.c.	98	25.5	2.4	8	22.4	2027	18.2	0.5	16.6
1911	Tanning and dressing of leather	51	25.5	2.3	1	12.8	160	32.3	0.5	3.8

2411	Manufacture of basic chemicals, except fertilizers and nitrogen compounds	167	24.6	4.0	13	17.6	555	11.4	0.5	15.0
2429	Manufacture of other chemical products n.e.c.	121	24.0	2.1	10	12.9	180	21.8	0.4	16.3
3330	Manufacture of watches and clocks	19	21.1	12.3	2	22.0	1887	99.5	0.6	25.0
3230	Manufacture of television and radio receivers, sound or video recording or reproducing apparatus, and associated goods	64	20.3	3.8	5	15.7	11550	27.5	0.6	37.8
2511	Manufacture of rubber tires and tubes; retreading and rebuilding of rubber tires	90	20.0	2.4	8	24.8	1159	43.4	0.5	35.7
3190	Manufacture of other electrical equipment n.e.c.	60	18.3	15.4	3	7.6	140	33.6	0.5	15.2
Average			9.3	5.0	3	18.2	890	22.4	0.5	14.2
Max			42.9	31.0	26	38.5	11550	99.5	0.7	100.0
Min			0.0	1.0	0	7.6	0	0.0	0.3	0.0

Table Appendix 5.3C R&D leading to process innovation

ISIC		*Total firms*	*% of firms investing in R&D*	*R&D intensity*	*No. of foreign firms investing in R&D*	*Age (years)*	*Sales (million Baht)*	*Export intensity*	*CR4*	*Foreign participation*
1553	Manufacture of malt liquors and malt	7	42.9	2.3	1	11.0	535	3.3	0.5	30.0
1911	Tanning and dressing of leather	51	27.5	1.4	0	15.2	251	18.6	0.5	0.0
3592	Manufacture of bicycles and invalid carriages	23	21.7	1.4	0	14.0	571	20.0	0.6	0.0
2320	Manufacture of refined petroleum products	61	21.3	1.2	0	9.3	3506	2.2	0.6	6.1
2411	Manufacture of basic chemicals, except fertilizers and nitrogen compounds	167	19.2	2.6	9	17.7	540	12.4	0.5	13.5
2421	Manufacture of pesticides and other agro-chemical products	44	18.2	1.4	2	24.9	351	17.5	0.4	18.6
2423	Manufacture of pharmaceuticals, medicinal chemicals, and botanical products	210	18.1	2.9	2	29.6	180	7.1	0.4	3.9
2429	Manufacture of other chemical products n.e.c.	121	16.5	1.4	10	13.6	243	23.3	0.4	27.6
3330	Manufacture of watches and clocks	19	15.8	5.7	2	24.3	2330	99.3	0.6	33.3

1551	Distilling, rectifying, and blending of spirits; ethyl alcohol production from fermented materials	90	15.6	2.4	1	14.9	3356	10.1	0.5	2.8
3210	Manufacture of electronic valves and tubes and other electronic components	277	14.8	2.6	25	11.4	1134	43.2	0.4	43.5
1820	Dressing and dyeing of fur; manufacture of articles of fur	7	14.3	1.0	0	18.0	388	30.0	0.5	0.0
2930	Manufacture of domestic appliances n.e.c.	98	13.3	2.2	6	23.4	1701	21.5	0.5	24.7
2422	Manufacture of paints, varnishes and similar coatings, printing ink, and mastics	153	13.1	1.9	2	17.0	257	3.4	0.4	5.6
2109	Manufacture of other articles of paper and paperboard	133	12.0	1.6	1	19.7	560	7.6	0.6	1.6
Average			6.3	3.6	2	18.3	1491	22.5	0.5	14.3
Max			42.9	25.0	25	55.0	24750	99.3	0.7	79.7
Min			0.0	1.0	0	5.5	0	0.0	0.3	0.0

Note: Age, sales, export intensity, CR4, and foreign participation are different in each type of R&D since firms who invest in R&D are different among these three types of R&D. Industries included in the tables are the top 15 industries in which the share of firms investing in R&D activities are the highest.
Source: Author's compilation from Census 2006.

Appendix 5.4

Results of panel data analysis

Table Appendix 5.4A Results for both domestic and foreign firms

	Column A *A firm's decision to invest in R&D*		*Column B* *R&D intensity (% of sales)*		*Column C* *A firm's decision to invest in R&D*		*Column B* *R&D intensity (% of sales)*	
	Coefficient	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*
Intercept	–10.77	1.716***	–0.05	0.035	–10.58	1.707***	–0.08	0.036**
MNE_{ij}	–0.34	0.143**	0.00	0.008	–0.30	0.144**	0.003	0.009
Ex_{ij}	0.28	0.126**	–0.01	0.006	0.28	0.127**	0.01	0.008
Age_{ij}	–0.05	0.157	0.010	0.005*	–0.06	0.157	0.013	0.006**
Age_{ij}^2	0.02	0.030	0.00	0.001	0.03	0.03	–0.003	0.001**
$PROD_{ij}$	–0.04	0.025	0.001	0.0008	–0.04	0.025	0.003	0.001**
$Size_{ij}$	0.85	0.184***	0.00	0.004	0.82	0.183***	0.01	0.004*
$Size_{ij}$^2	–0.02	0.004***	0.000	0.0001**	–0.02	0.005***	–0.001	0.0002***
KL_{ij}	0.02	0.016	0.0004	0.0006	0.02	0.016	0.00	0.0006
BOI_{ij}	0.20	0.067***	0.02	0.005***	0.20	0.067***	0.01	0.007
$region_{ij}$	–0.08	0.026***	–0.001	0.0008	–0.08	0.026***	0.001	0.001
$Network_{j}$	–1.14	1.596	0.02	0.024	–0.72	0.883	0.02	0.024
MNE_{ij}×*Auto dummy*					–1.82	1.591	0.16	0.055***
MNE_{ij}×*Hard disk dummy*					–1.62	1.835	0.07	0.037*
Inversed mill ratio	–	–	0.11	0.029***			0.22	0.071***

Year dummy	Yes	Yes	Yes	Yes
Industrial dummy	Yes	Yes	Yes	Yes
No. of obs	11,176	11,246	11,176	11,250
No. of groups	4400	4,436	4,400	4,438
Wald chi^2 ($Prob>chi^2$)	0.000	0.000	0.000	0.000
Log pseudolikelihood	–3506.8326		–3505.0612	
Rsq-within		0.068		0.068
between		0.080		0.080
overall		0.073		0.073

Note: Logarithm is applied, except $Network_{jt}$ (the share of trade in parts and components to total trade); BOI_{ij} and $region_{ij}$. *, **, and *** indicate the significant level at 10, 5, and 1 percent, respectively.
Source: Author's estimations.

Table Appendix 5.4B Results for domestic firms (spillover)

	Column A *A firm's decision to invest in R&D*		*Column B* *R&D intensity (% of sales)*	
	Coefficient	*SE*	*Coefficient*	*SE*
Intercept	−12.17	1.893***	−0.03	0.038
FOR_j	3.10	0.614***	−0.10	0.208
Ex_{ij}	0.30	0.144***	−0.01	0.008
Age_{ij}	−0.04	0.175	0.005	0.006
Age_{ij}^2	0.03	0.033	−0.001	0.001
$PROD_{ij}$	−0.04	0.027	0.001	0.001
$Size_{ij}$	0.97	0.205***	0.004	0.004
$Size_{ij}$^2	−0.02	0.006***	−0.0002	0.0001**
KL_{ij}	0.02	0.017	0.0004	0.0006
BOI_{ij}	0.31	0.079***	0.02	0.008**
$region_{ij}$	−0.06	0.024***	−0.001	0.0008*
$Network_j$	−0.67	0.164***	0.02	0.022
Inversed mill ratio			0.09	0.055
Year dummy	Yes		Yes	
Industrial dummy	Yes		Yes	
No. of obs	10,069		10,069	
No. of groups	4188		4188	
Wald (Prob>chi²)	0.000		0.000	
Log pseudolikelihood	−3082.30			
Rsq-within			0.060	
between			0.090	
overall			0.068	

Note: Logarithm is applied, except $Network_{jt}$ (the share of trade in parts and components to total trade); BOI_{ij} and $region_{ij}$. *, **, and *** indicate the significant level at 10, 5, and 1 percent, respectively.
Source: Author's estimations.

This appendix shows the results when the industrial censuses of 2006, 2011, and 2016 are employed to form a panel data analysis of R&D determinants. As mentioned earlier, only R&D activities in the 2006 census were disaggregated, while the other 2 years provided only aggregate information, that is, (1) whether a firm is involved in R&D activity and (2) if so, how much the firm spent on such activity. The binary dummy variable can be used to determine the decision of a firm to invest in R&D, while the latter is used to determine R&D expenditure as a percentage of total sales. The data for estimation can be seen in Chapter 6, Appendix 6.1. A two-step estimation taking into account the possible endogeneity problem of the export variable is applied. The estimation procedure is similar to that applied for the 2006 census; that is, first, we construct the inverse Mills' ratio from the panel probit model and then we estimate the determinants of R&D expenditure, including the inverse Mills' ratio as an additional regressor. A random-effect panel model is applied for both processes due to the time-invariant of regional variable, while the Hausman test suggests a mild rejection in preferring the random-effect model.

The results resemble to a certain extent the scenario we observed when only the industrial census of 2006 is applied (Table Appendix 5.4A). This could be because the aggregation of R&D expenditure and R&D intensity was relatively small for firms in Thailand, on average less than 2 percent of sales, so that coefficients associated with most fundamentals when R&D intensity is employed as the dependent variable are statistically insignificant. The significance of some fundamentals was revealed when the decision of firms to invest in R&D is considered as the dependent variable. In particular, some firm-specific factors matter in determining a firm's decision to invest in R&D, including a firms' ownership, the ability of firms to participate in export market, and a firm's size. Receiving BOI privileges also affects the probability of firms investing in R&D activities.

Interestingly, the negative and statistically significant relationship between multinational firms (MNE) and a firm's decision to invest in R&D implies that most MNE affiliates are still unlikely to invest in R&D in the host country (Thailand). This reflects the fact that most are likely to import technology (technology transmission) from their parent company. With the exception of the automotive and electronic sectors, where MNEs tend to set up some R&D activities in Thailand, this is reflected by the positive and significant coefficients associated with the interaction term between MNEs and industrial dummy variables of these two sectors in the R&D expenditure equation (Table Appendix 5.4A, column D). This result confirms what was revealed when the disaggregated information of R&D activities in 2006 was employed.

The spillover effect is revealed even when the panel data is applied. Such evidence is supported by the positive and statistical significance of the share of foreign ownership at the industry level (FOR_j) (Table Appendix 5.4B). Although there is evidence that most multinational firms tend to import technology instead of establishing R&D activity in the host country, multinational firms tend to stimulate indigenous firms to invest more in R&D activity. BOI privileges (BOI_{ij}) could spur R&D activity, and from the panel data analysis, its effectiveness tends to be dominated by domestically owned firms (Table Appendix 5.4B). This result resembles the findings uncovered when the 2006 industrial census is employed.

Notes

1 Note that the effort of learning and adapting the associated technology is linked with the dollar-amount of cost so that the local firm has to decide regarding its efforts to learn the associated advanced technology.

2 That is, market research has to be done, option appraisals completed, existing products modified, and new distribution networks set up.

3 Note that this includes a company that hires other companies to conduct R&D activity.

4 Note that all plants with FDI (regardless of the magnitude of the foreign share in capital stock) are considered as foreign plants. The cutting point (i.e., 0 percent) seems to be slightly higher than that widely used by the International Monetary Fund (IMF) and other institutions, such as the Organization for Economic Co-operation and Development (OECD) and the US Department of Commerce, as well as several scholars studying multinational firms (e.g., Lipsey, 2001), that is, 10 percent. However, the choice is dictated by data availability since information on foreign ownership in the census is reported with a wide range.

5 Our paper also examines the role of market structure within R&D activity. The concentration ratio (CR4) is calculated using data on large corporations from Business On-Line, supplemented by a large number of related sources, to estimate the sales of the largest four firms in each industry. However, as found in many previous studies, such as Mishra (2007) and Cohen and Levin (1989) and works cited therein, this variable is statistically insignificant in directly determining R&D investment. However, Jongwanich and Kohpaiboon (2008) found that market concentration has a negative and significant effect on exports. Thus, this implies that market structure could directly influence a firm's R&D decision making and R&D intensity through the export channel. This is supported by most previous empirical studies in that when an export variable is included in the R&D determinant model, market structure (concentration ratio or Herfindahl index) would not be included in the model (e.g., Aw et al., 2011; Meyer, 2009; Salomon and Shaver, 2005).

6 Note that in our empirical model, we also include an interaction term between MNEs and exports, MNEs and production networks, and MNEs and age to capture the indirect effects that may occur between domestic-oriented MNEs and export-oriented MNEs, between MNEs in and out production network, and MNEs of different ages, but the results are statistically insignificant.

7 Note that if we alter the criteria to 10,000 Baht, the number, which would be dropped from our samples, increased to 1,289 samples (another 500 samples).

8 Note that the insignificance of this variable may arise from the fact that the available measurement of government policy used here could not effectively capture the overall policies implemented by the government. The disaggregated details of government policy in each industry, which so far are not available, may help to improve the accuracy of our model.

6 Trade and investment policies on firms' productivity

As mentioned earlier in the book, since the onset of the new millennium, anti-globalization sentiment has grown stronger, especially in the realm of trade and investment liberalization. The use of so-called industrial policy, nonneutral inter-industry (and sometimes interfirm) incentives, including trade protection and investment incentives, has regained policy attention in the last two decades as many countries have been disappointed by pursuing the conventional economic policies geared toward globalization (Pack and Saggi, 2006; Cimoli, Dosi, and Stiglitz, 2009; Chang and Andreoni, 2016). This has led the governments of many countries to step in and try to alter the structure of production in favor of sectors that are expected to offer better prospects for economic growth in a way that would not occur if they operated under purely market forces. Whether industrial policy, particularly in terms of trade and investment incentives, helps boost productivity remains unclear. Chang and Andreoni (2016) argued that non-tariff measures employed in East Asian economies over the past decades contributed to economic success. Melitz (2005), Greenwald and Stiglitz (2006), and Aghion et al. (2015) were in favor of the role of industrial policy in generating economic growth, but the effectiveness of such policy depends on the supporting environment, including the shape of the learning curve, the degree of substitutability between domestic and foreign goods, and domestic competition.

Against this backdrop, this chapter examines the role of industrial policy in firm productivity, using the available panel data for Thai manufacturing, i.e., 2006, 2011, and 2016, to form a case study. A range of industrial policy tools is defined, including tariff measures, subsidies as non-technical non-tariff measures (NTMs),[1] and investment incentives, which comprise the main tools used in Thailand. In addition, the effect of partial trade liberalization, undertaken through free trade agreements (FTAs) between Thailand and its trading partners, on firm productivity is examined. The proliferation of FTAs, to some certain extent, could be treated as one of the instruments comprising industry policy. Liberalization through FTAs is at best partial, as trade barriers are eliminated only for some trading partners, and concessions within each FTA and among various FTAs are different.[2] The study in this chapter contributes to the existing literature in at least four ways. First, we use a wider scope of industrial policy tools than previous studies, including tariff protection, investment promotion measures, and export

DOI: 10.4324/9781003144076-6

subsidies. Empirical works examining the effects of industrial policy employing a wider scope of policy tools remain sparse. To the best of our knowledge, the only comparable study is Aghion et al. (2015) in the context of Chinese medium-sized and large enterprises from 1998 to 2007. China possesses unique features, such as its enormous domestic market, its long experience under a centralized system, and the strong role of the government. Hence, one needs to be cautious in generalizing their findings to much smaller developing countries where governments have a considerably diminished role and are subject to weak institutional factors.

Second, the tariff protections applied here comprise both nominal and effective tariffs. With nominal tariffs, the effects on finished (output) and raw material (input) products are separately examined. The different impacts of such tariff reductions are revealed in empirical studies. For example, Amiti and Konings (2007) and Topalova and Khandelwal (2011) showed that reductions in input tariffs induce more productivity than those in output tariffs in Indonesia and India, respectively. By contrast, Yu (2015) revealed that a reduction in output tariffs generated more productivity in China, while Jongwanich and Kohpaiboon (2017b), using data from Thailand for 1996–2011, argued that both input and output tariffs are crucial within trade policy reform in improving firm productivity, and that effective rates of protection (ERP) matter more in terms of firms' decision making in Thailand. In terms of effective rates of protection, this study includes not only a traditional ERP measure, but also a measure incorporating possible water in tariffs; that is, tariffs imposed are not effective in protecting firms in industries.

Third, to take into account the key inference from a self-selection hypothesis, which is that firms entering export markets are already more productive, the nature of trade policy and firms' market orientation are treated as two separate explanatory variables within the analysis. While both could be on a par in terms of their important influence on productivity, they remain two different entities. The former relates to the policy environment, whereas the latter concerns firms' decision-making processes. In other words, this study carefully delineates the possible effects between trade (export and import) and trade policy (such as cross-border protection) on productivity. The impacts of global production networks on productivity are also examined in this chapter. Fourth, our paper examines the effects of FTA-induced trade liberalization on firm productivity. Few empirical works have investigated these effects, focusing predominately on its impact on developed country firms instead (e.g., Lilleva, 2008; Hayakawa, 2012). To examine the effect of such FTAs, a new ERP across industries is estimated, using the weighted average of tariffs between most-favored-nation (MFN) rates and the preferential tariffs offered in FTAs. Import values and preferential import values are used as the alternative weight in estimating the ERP. Such an estimate is able to capture partial trade liberalization through FTAs in Thailand.

6.1 Industrial policy: Literature survey

The debate over implementing industrial policy first introduced in the 18th century continues unabated. On the one hand, based on neoclassical economic theory, selective industrial policies tend to distort the allocative efficiency of markets. Markets encourage a competitive environment among firms, reward efficient entrepreneurs, and drive inefficient firms out of the market. In addition, firms must undertake innovation to maintain their competitiveness. Many scholars (e.g., Baldwin, 1969; Krueger, 1978, Bhagwati, 1978) in the early 1970s believed that government failure was worse than market failure and that trade and investment liberalization, together with macroeconomic stability, represented the basic requirements for productivity improvements, skill upgrading, growth, and industrialization. Two influential works, Krueger (1978) and Bhagwati (1978), showed that export growth supported by well-publicized and stable government commitment comprised the most favorable conditions for economic growth. Particularly, Bhagwati (1978) pointed out that an export-promoting strategy seems to be more neutral among industries and the incentives provided tend to be less chaotic. Edwards (1998), Sachs and Warner (1995), and Dollar (1992) acknowledged that liberalization is conducive to economic growth.[3] Harrison and Rodriguez-Clare (2010) emphasized that based on various econometric studies, there was no significant impact of tariff protection on economic growth/productivity and no favorable evidence to justify subsidies to foreign investment. By contrast, they show that numerous studies highlight the adverse impact of trade protection and quotas on productivity improvements/economic growth. Esser et al. (1996) and Taylor (1998) based on the experience of Latin America, Di Maio (2009) from within the machine tool industry in Latin America, and Altenburg (2011) reporting on the breeder reactor industry in Germany and the Concorde project in France revealed failures of the import-substitution strategy. In particular, these industries were unable to become competitive and productive after liberalization.

On the other hand, there is evidence that industrial policy has played an important and successful role in supporting latecomer industrialization, mainly because of pervasive market failures. Such market breakdowns include coordination failure, in which firms will not invest until others undertake necessary related investments; dynamic scale economies and knowledge spillovers, where industrial policy helps to determine future production possibilities under learning-by-doing economies; and information externality, within which governments are able to encourage the discovery of future business opportunities (Pack and Saggi, 2006; Chang and Andreoni, 2016). Industrial policy is needed to nurture firms in a nascent industry in the early stages of development and allow them to experience learning-by-doing and benefit dynamic economies. Firms could then eventually compete with (foreign) mature competitors and operate profitably without continued protection (List, 1856). The granting of such protection is justified in the presence of dynamic learning effects which are external to firms, known as the infant industry argument (Corden, 1997).[4] Hausmann, Hwang, and Rodrik (2007) and Hausmann and Rodrik (2003) argued that due to the nature of investment, especially that involved with innovation, i.e., cost discovery become socialized if their pioneer (innovate) projects are successful but if the projects fail, the cost or losses remain private, without any interventions, the investment levels of these products are likely to be sub-optimal. Industrial policy, including 'subsidizing initial entrants in new (innovate) activities' is crucial in properly diversifying production structures and moving a country to a higher income level (Hausmann, Hwang, and Rodrik, 2007).[5] Lall (2004), Robinson (2009), and Harrison and Rodriguez-Clare (2010) argue that the failure of industrial policy occurred due to the fact that the policies were often not adopted for strategic purposes to promote a comparative advantage sector, but were used for other purposes, such as generating government income or protecting special-interest sectors.

The use of industrial policy, popular during the import-substitution industrialization eras in the 1950s and 1970s, was rejected during the 1980s and 1990s. However, since the late 1990s, many countries have been revisiting these policies as many countries have encountered great disappointment resulting from pursuing conventional economic policies under the Washington Consensus. Consequently, policymakers in these countries started searching for alternative development strategies. The crises that hit many countries, from the Mexican and Asian financial crises to the global financial crisis, have tended to accelerate the revival of industrial policy initiatives. In addition, a number of recent studies have offered new seeds of thought regarding the use of industrial policies, addressing the shortcomings of past failures and highlighting the conditions necessary for such initiatives to work effectively going forward. In particular, there is much general agreement in the development economics and political economy literature about the factors that underpin rapid economic development,[6] with industrial policy proponents arguing that policy interventions of different kinds (regulatory and supportive, generic and specific) are needed to generate new and competitive activities (Esser et al., 1996; Freeman, 2008; Chang and Andreoni, 2016). As argued in Chang and Andreoni (2016), a wider range of protection policy tools, including both tariff protection and investment promotion measures, must proceed hand-in-hand with other complementary measures, such as monopoly rights of production, exchange rate intervention, and active intervention in research and development (R&D, referred to as learning-in-production).

Industry characteristics, such as learning potential, the shape of the learning curve, and the degree of substitutability between domestic and foreign goods, are also taken into consideration in order to make industrial policies effective (Melitz, 2005). Recently, Aghion et al. (2015) raised a highly policy-relevant issue: a conducive environment must be in place to ensure that industrial policy works as planned, that is, to promote innovation and growth. In the absence of domestic competition, firms may choose to operate in different sectors to face lower competition in the product market, leading to high sectoral concentration and low incentives to innovate. A theoretical model based on endogenous growth theory was tested and supported empirically in a study of medium-sized and large Chinese enterprises from 1998 to 2007. Whether the key findings of this paper could be generalized to other countries, especially small developing nations, remains debatable since it is unlikely a developing country with economic fundamentals comparable to China could be found.

It is noteworthy that where the effects of trade policy on firms' performance are concerned, there are at least two pertinent considerations of relevance prominent in policy circles. The first is related to learning by exporting and a self-selection hypothesis, as mentioned in Chapter 5 when the impact of exporting on R&D activities is concerned. In short, the former indicates that the productivity of firms which participate in foreign markets is likely to be higher than those which do not. Firms active in overseas markets learn or acquire information from foreign contacts and consumers, thereby improving innovation/productivity. Hobday (1995), using 55 firms from Hong Kong, Korea, Taiwan, and Singapore; Pietrobelli (1998) with 26 Chilean firms; Kraay (1999) employing Chinese data; and Hahn (2004) using Korean data, for example, all supported learning by exporting. In contrast, the self-selection hypothesis posits that only the more productive firms are able to export; that is, firms self-select into export markets. Under this hypothesis, exporting would not (initially) improve productivity, and the positive correlation which occurs between exports (trade) and productivity (growth) is because firms which participate in export markets are already productive operations. Bernard and Jensen (1999), utilizing information from the USA; Isgut (2001) using Colombian data; Arnold and Hussinger (2005) employing Germany information; and Alvarez and López (2005) with Chile as a case study all support such a self-selection hypothesis.

Two implications can be drawn from these two hypotheses in analyzing trade policy effects on firm's productivity. One is the possible bi-directional relationship between innovation/productivity and exports, as mentioned in Chapter 5. Another is that the nature of trade policy and firms' market orientation must be treated as two separate explanatory variables within productivity analysis. While both could be on a par in terms of their important influence on productivity, they remain two different entities. The former relates to the policy environment, whereas the latter concerns firms' decision-making processes (Jongwanich and Kohpaibbon, 2017). López (2005) shows that trade openness helps boost productivity and economic growth where the self-selection process of exporting firms is concerned. However, he points out that this could represent a case of a conscious self-selection process wherein firms purposefully increase their productivity in order to enter a foreign market. In such a scenario, trade policy affecting a firm's decision to produce for export markets, including export-promotion policies, would also influence firm-level productivity.[7]

A second aspect concerns the possible different favorable effects of input and output tariff reductions on firms' productivity. Relevant studies include Amiti and Konings (2007), who used an Indonesian dataset, and Goldberg et al. (2010) and Topalova and Khandelwal (2011), both of which employed Indian datasets, and found that the favorable effect of the former is much larger than that of the latter. In contrast, Yu (2015) used Chinese plant-level data and revealed the more considerable effects of output tariff reduction. The difference in their findings perhaps suggests that the means with which tariff reduction affects firms' productivity potentially varies from country to country, leaving a need for further in-depth, country-specific analysis.

Interestingly, the main mechanism through which input and output tariff reductions affect productivity in these studies is price elasticity. When an input tariff is lowered, firms tend to import more foreign inputs. Similarly, a lower output tariff induces more imported goods. Irrefutably, this could potentially enhance firms' productivity. Nonetheless, such a conclusion exists under the assumption that the effect of (input, output, or both) tariff reduction on productivity takes place in a frictionless manner. This seems a restrictive assumption as argued in a number of case studies,[8] and within East Asian literature in particular. Corden (1966) and Balassa (1965) proposed the well-developed concept known as ERP to determine the influence of trade policy on competitive pressure. Under ERP, it does not matter whether any effective protection granted comes from either altering input tariffs, output tariffs, or both. Lowering ERP level tends to generate more competitive pressure on firms and is likely to induce higher firm productivity. This raises two important implications for the empirical research. The first concerns whether decomposing input and output tariffs are justified. Whether firms consider these input and output tariffs separately in making their production/investment decisions remain an empirical question. The second issue involves the possibly ambiguous effect of input tariffs. In line with the ERP concept (see next section), solely lowering an input tariff while leaving an output tariff unchanged would, in turn, lead to an increase in the ERP granted to firms. This could limit competitive pressures and lower any incentives for firms to commit resources to productivity improvement processes. Hence, the net effect on the productivity of input tariff cuts would be ambiguous.

6.2 Empirical model

The empirical model used in this paper is based on the standard equation of productivity determinants. Such determinants include firm- and industry-specific factors. There are four firm-specific constituents of firm *i* in industry *j*. The first two constituents of firm *i* in industry *j* concern market orientation measured by two proxies. One involves the export–sale ratio (exp_{ijt}) introduced in the model. Firms whose output is intended for export tend to be alert to any productivity improvement opportunities and eventually enhance firms' productivity. Hence, the coefficient associated with exp_{ijt} is expected to be positive. The second aspect of market orientation is the extent to which imported raw materials are used (rim_{ijt}). Firms which import raw materials benefit from the technology embodied in such materials, and tend to have higher productivity. The coefficient associated with rim_{ijt} is also expected to be positive. The other three firm-specific factors are ownership (own_{ijt}), R&D investment (RD_{ijt}), and skill intensity ($skill_{ijt}$). Firm ownership is introduced in the model due to the consensus in the foreign direct investment (FDI) literature (e.g., Caves 2007) that foreign firms are generally more productive than their indigenous counterparts, so own_{ijt} is expected to be positive. The firms' efforts to increase productivity, such as R&D investment (RD_{ijt}) and skill intensity ($skill_{ijt}$), are included as firm-specific control variables. Firm productivity is theoretically positively affected by these variables.

Four industry-specific factors are included in the empirical model. The export–output ratio (XOR_{jt}) and import penetration ratio (MPR_{jt}) are included to capture the effects of international competitive pressure on firms' productivity. To capture domestic competitive pressure, which could have implications for implementing industry policy, as pointed out by Aghion et al. (2015), the sales concentration ratio (CON_{jt}) is used. Industries with high barriers to entry are likely to be concentrated and are often capital and/or skills intensive. This could make firms less responsive to any potential technological improvements, so it negatively affects productivity.[9] All of these variables, except CON_{jt}, are expected to reflect a positive relationship with productivity.

Three aspects of industrial policy are examined in this study. The first concerns the role of trade protection, which is measured by both nominal (t_{jt}) and effective rates of protection (ERP_{jt}). For the former, we include output (finished products, $outputtariff_{jt}$) and input (raw materials, $inputtariff_{it}$) separately. An input–output table (IO table) is applied to determine the input structure in calculating input tariffs in each industry.

There are four alternatives employed to measure the effective rate of protection. The first is to measure the so-called ERP for import-competing products (ERP_1_{jt}) where a higher value reflects greater protection given to domestic firms, regardless of whether such protection is from a change in input or output tariffs, or both. The formula of the first ERP_{kt} is Equation (6.1):

$$ERP\_1_{kt} = \frac{t_{kt} - \sum_{i=1}^{n} a^{*}_{ikt} t_{it}}{1 - \sum_{i=1}^{n} a^{*}_{ikt}} \tag{6.1}$$

where t_{kt} = tariff on product (finished products) k and time t

t_{it} = tariff on product (raw materials) i and time t

a^{*}_{ikt} = share of product i used in producing product k at time t.

The input–output table is applied to determine the share of raw materials used in producing product k. Note that concordance between IO and ISIC (International Standard Industrial Classification) is employed to convert ERP at the product level (ERP_{kt}) to ERP at the 4-digit industry level (ERP_1_{jt}).

The second formula is intended to capture possible water in tariffs wherein the output tariffs imposed become ineffective. One of the key possible circumstances of such an ineffective tariff occurring is when firms improve productivity and export products. Since only a proportion of firms in an industry can export, the ERP capturing water in tariffs (ERP_2_{jt}) is calculated as the weighted average between ERP for import-competing products (ERP_1_{jt}) and the ERP for exporting (ERP_export_{jt}), as in Equation (6.2):

$$ERP\_2_{jt} = (1 - \alpha_{jt}) \cdot ERP\_1_{jt} + \alpha_{jt} \cdot ERP\_export_{jt} \tag{6.2}$$

where α_{jt} is the share of exports in the output of industry j at time t.

In terms of ERP exporting (ERP_export_{jt}), tariffs on finished products (t_{jt}) are treated as zero since the tariffs imposed become ineffective in protecting producers who export those products. Tariffs on raw materials are also treated as zero as exporters can apply for duty drawbacks under section 19 BIS. However, exporters must pay tariffs in advance before applying for duty drawbacks. This creates opportunity costs for exporters, which in this study are captured by interest rates. In other words, t_{it} in the case of ERP for exports is equal to market interest rates.

In order to examine the effects of the partial trade liberalization induced by FTAs signed, a weighted tariff between MFN and FTA preferential rates (t_{jt}^*) is used as expressed in Equation (6.3).

$$t_{jt}^{*} = \left(1 - \sum_{k=1}^{n} \theta_k\right) t_{jt}^{MFN} + \sum_{k=1}^{n} \theta_k t_{jkt}^{FTA} \tag{6.3}$$

where t_{jt}^{MFN} = MFN tariff on product *j* at time *t*

t_{jkt}^{FTA} = FTA tariff on product *j* at time *t* Thailand offered to FTA partner *k*

θ_k = import share of FTA partner *k* to total import.

Thus, ERP_3_{jt} is calculated using the new tariffs on finished products as in Equation (6.3) to capture the effect of partial trade liberalization.

To capture both the effect of partial trade liberalization and water in tariffs, ERP_4_{jt} is introduced. The formula of ERP_4_{jt} is similar to that characterized in Equation (6.2), which involves the weighted average between ERP taking into account the effect of partial trade liberalization (ERP_3_{jt}) and the ERP for exporting (ERP_export_{jt}), as follows:

$$ERP\_4_{jt} = (1 - \alpha_{jt}) \cdot ERP\_3_{jt} + \alpha_{jt} \cdot ERP\_export_{jt} \tag{6.4}$$

where ERP_export_{jt} is the ERP for exporting products, and α_{jt} represents the share of exports in the output of industry j at time t.

The second aspect involves investment incentives granted to domestic and foreign plants (BOI_{ijt}). Obtaining BOI investment incentives is *de facto* compulsory for foreign plants in order to overcome the many constraints involved in operating a business in Thailand, such as prohibition on land ownership and constraints on work permits granted to foreign professionals, from which BOI-promoted foreign firms are exempt, as mentioned in Chapter 3. This implicitly encourages foreign investors to apply for BOI promotion privileges. This is in sharp contrast to indigenous firms where only some apply for BOI promotion privileges, most of which firms are likely to be exporters.

The final aspect of industrial policy covered in this study concerns the subsidies granted to an industry ($Subsidy_{jt}$). Many assistance programs (such as packing credits and special concessions) are offered to exporting firms. This could be regarded as a policy attempt to nurture firms within the boarder scope of industrial policy. Hence, it is captured in our analysis. All in all, the empirical model used in our analysis is presented in Equation (6.5):

$$\begin{aligned} \boldsymbol{Productivity}_{ijt} = {} & \alpha_0 + \alpha_1 \boldsymbol{exp}_{ijt} + \alpha_2 \boldsymbol{rim}_{ijt} + \alpha_3 \boldsymbol{own}_{ijt} + \alpha_4 \boldsymbol{RD}_{ijt} \\ & + \alpha_5 \boldsymbol{skill}_{ijt} + \alpha_6 \boldsymbol{XOR}_{jt} + \alpha_7 \boldsymbol{MPR}_{jt} + \alpha_8 \boldsymbol{CON}_{jt} \\ & + \alpha_9 \boldsymbol{trade\ protection}_{jt} + \alpha_{10} \boldsymbol{BOI}_{ijt} + \alpha_{11} \boldsymbol{Subsidy}_{jt} + \varepsilon_{ijt} \end{aligned} \quad (6.5)$$

As postulated in a previous study, the effectiveness of industrial policy may be conditioned by the level of domestic competition (Aghion et al., 2015). To test this hypothesis empirically, interaction terms between the initial level of sale concentration ratio and three aspects of industry policy ($CON_{jt0} * industrypolicy_{jt}$) are introduced, comprising $CON_{jt0} * BOIdomestic_{ijt}$, $CON_{jt0} * trade\ protection_{jt}$, and $CON_{jt0} * Subsidy_{jt}$.[10] A negative sign of the coefficients associated with these three variables is expected. In the absence of domestic competition, firms may choose to operate in different sectors to encounter lower competition in the product market, leading to high sectoral concentration and low incentives to innovate. In such circumstances, a firms' productivity improvement would become lower. Equation (6.5) is modified to include the postulated hypothesis empirically as follows:

$$\begin{aligned} \boldsymbol{Productivity}_{ijt} = {} & \alpha_0 + \alpha_1 \boldsymbol{exp}_{ijt} + \alpha_2 \boldsymbol{rim}_{ijt} + \alpha_3 \boldsymbol{own}_{ijt} + \alpha_4 \boldsymbol{RD}_{ijt} \\ & + \alpha_5 \boldsymbol{skill}_{ijt} + \alpha_6 \boldsymbol{XOR}_{jt} + \alpha_7 \boldsymbol{MPR}_{jt} + \alpha_8 \boldsymbol{CON}_{jt} \\ & + \alpha_9 \boldsymbol{trade\ protection}_{jt} + \alpha_{10} \boldsymbol{BOI}_{ijt} + \alpha_{11} \boldsymbol{Subsidy}_{jt} \\ & + \beta_1 \boldsymbol{CON}_{jt0} * \boldsymbol{trade\ protection}_{jt} \\ & + \beta_2 \boldsymbol{CON}_{jt0} * \boldsymbol{BOI}_{ijt} + \beta_3 \boldsymbol{CON}_{jt0} * \boldsymbol{Subsidy}_{jt} + \varepsilon_{ijt} \end{aligned} \quad (6.6)$$

Note that due to a multicollinearity problem, proxies of 'international production network' ($Network_{jt}$) are employed as alternatives in replacing export–output ratio (XOR_{jt}) and import penetration ratio (MPR_{jt}) in the model. Industries involved more in the production network tend to be more dynamic, such as those in the electronic and electrical appliance industry, and are likely to have higher productivity.

6.3 Data and econometric procedure

The data set used in this study is derived from the Thai industrial census, conducted by the National Statistical Office. So far, four censuses are available (i.e., 1996, 2006, 2011, and 2016). As plant-level data in Thailand is still at the early development stage, a fraction of observations can be matched and a panel data analysis can be conducted only among the three latest censuses (2006, 2011, and 2016), involving 14,617 observations. In this paper, panel data from the three latest censuses is used.

Data cleaning in our study starts with examining the possibility of duplicated observations, that is, samples with different plant identification numbers reporting the same values of key variables. Presumably, this is largely driven by multi-plant cases where all affiliates fill in a particular questionnaire using identical company-level information wherein all affiliates are included. Seven key variables are used to identify duplication: (i) years in operation, (ii) total employment, (iii) wage compensation, (iv) raw materials, (v) initial raw material stocks, (vi) initial finished product stocks, and (vii) initial fixed assets. When duplicated samples are found, only one is kept in the sample and the others are removed. We drop observations which report annual sales of less than ฿12,000 Baht (less than $400), annual value added of less than 10,000 Baht, and/or less than 10,000 Baht of initial fixed assets. To mitigate the discretionary criteria employed, we run a sensitivity analysis. In addition, small/micro enterprises, defined as plants employing less than ten workers, are excluded as they would behave differently from, and might not participate directly with, larger plants. The final feature that must be addressed is industrial classification. Generally, the ISIC revision 3 is employed to analyze the three censuses with observations matched as a panel dataset by plant identification. There are 3,395 cases where the ISIC assigned to a given plant identification changes among these three censuses because of changes in product coverage. They are dropped from the analysis. Note that all the nominal variables (e.g., sales, raw materials expenses, and inventory) are converted into 2001 prices, using the price deflator at the 4-digit ISIC disaggregation.

Two alternatives are applied to measure firms' productivity ($Productivity_{ijt}$), value added per worker ($VAperW_{ijt}$), and total factor productivity (TFP_{ijt}) measured by the Levinsohn and Petrin (LP) approach (Levinsohn and Petrin, 2003). With the first measure, value added is calculated as the difference between the sales value adjusted by inventory changes net of raw materials and intermediates. *Number of workers* refers to total workers, including both operational and office staff, regarded as constituting blue- and white-collar workers, respectively. For the second measure, total factor productivity (TFP_{ijt}) measured by the LP approach is applied since it addresses the endogeneity problem widely cited in estimating the production function.[11] According to the LP approach, intermediate inputs are used as a proxy for unobserved determinants and mitigate any endogeneity bias that might occur in ordinary least squares (OLS) estimations. The value added used in the LP approach is the same as when calculating value added per worker, whereas the capital used in the LP approach is proxied by the initial fixed asset of plants. The intermediate inputs used are adjusted by changes in their inventories.

Figure 6.1 (a, b) shows productivity, measured by both value added per workers and total factor productivity (TFP) measured by Levinsohn and Petrin (2003), in Thailand by ISIC Rev.3, while Table 6.1 illustrates the top 20 industries having the highest productivity levels in 2016. On average, productivity improved noticeably in 2016 compared to that in 2011, when Thailand encountered severe flooding, but when compared to 2006, productivity slightly increased. Productivity measured by Levinsohn and Petrin (2003) offers a similar picture, with slightly lower productivity changes between the periods considered. Manufacture of engines and turbines (ISIC 2911); manufacture of ovens, furnaces, and furnace burners (ISIC 2914); manufacture of starches and starch products (ISIC1532);

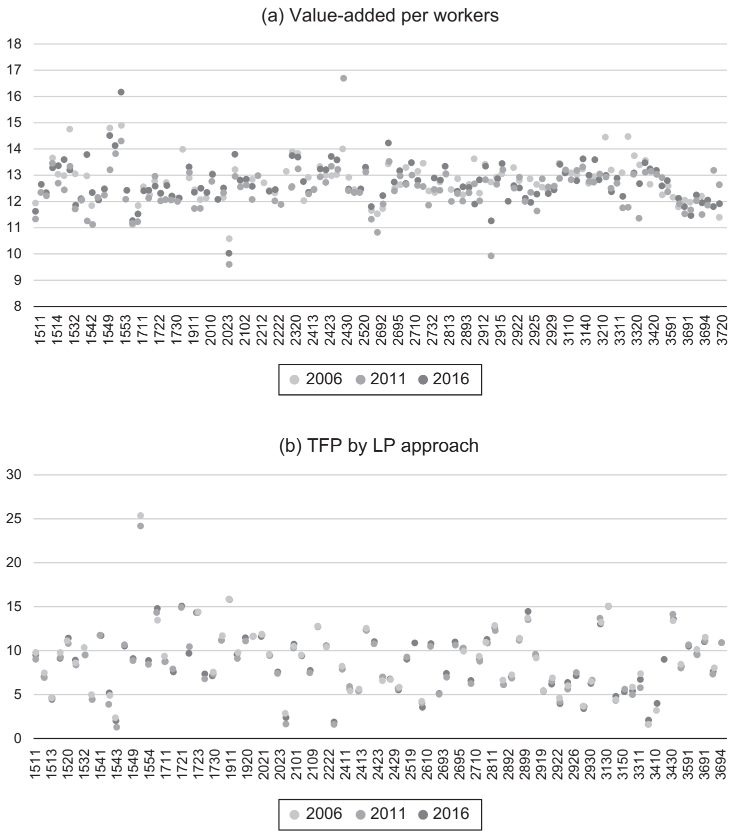

Figure 6.1 Productivity in Thailand, by ISIC Rev.3, during 2006–2016. Note: Productivity shown here includes only firms in the panel data analysis and is in logarithm. Observations of productivity measured by LP approach are less than those of value added per worker approach due to missing fixed assets intermediate input information in calculating TFP by using LP approach. Source: Author's compilation.

and manufacture of television and radio transmitters (ISIC3220) were the products in which productivity in 2016 reduced by more than 10 percent compared to 2006 and caused overall productivity to improve only slightly in 2016. However, various industries showed productivity improvements, for example, manufacture of food products and beverages (under ISIC15), manufacture of machinery and equipment (ISIC29), and manufacture of electrical machinery and apparatus (ISIC31) (Table 6.1). For those industries, productivity levels in 2016 were higher than in both 2011 and 2006. Note that productivity, as measured by Levinsohn and Petrin (2003), suggests a similar picture.

Firm-specific variables measuring market orientation are available in the questionnaire, comprising the export–sales ratio (exp_{ijt}) and the proportion of imported

Table 6.1 Top 20 industries having the highest productivity level in 2016

ISIC Rev3 (4- digit)		*Percent change*		
		2016/2011	*2016/2006*	*2011/2006*
1553	Manufacture of malt liquors and malt	12.91	8.42	–3.98
1551	Distilling, rectifying, and blending of spirits; ethyl alcohol production	9.67	–2.10	–10.74
2694	Manufacture of cement, lime, and plaster	5.27	5.93	0.63
2101	Manufacture of pulp, paper, and paperboard	6.60	4.45	–2.01
1542	Manufacture of sugar	22.47	6.42	–13.10
2320	Manufacture of refined petroleum products	9.42	–1.13	–9.64
2424	Manufacture of soap and detergents, cleaning and polishing preparations	2.80	5.73	2.85
2411	Manufacture of basic chemicals, except fertilizers and nitrogen compounds	3.24	–1.03	–4.14
3140	Manufacture of accumulators, primary cells, and primary batteries	2.16	3.08	0.90
1531	Manufacture of grain mill products	9.30	4.77	–4.14
3190	Manufacture of other electrical equipment n.e.c.	6.64	4.94	–1.60
2429	Manufacture of other chemical products n.e.c.	2.65	4.03	1.34
2710	Manufacture of basic iron and steel	3.80	0.31	–3.35
3410	Manufacture of motor vehicles	2.78	–0.51	–3.21
3000	Manufacture of office, accounting, and computing machinery	4.49	–0.17	–4.46
2919	Manufacture of other general-purpose machinery	1.53	2.60	1.05
1520	Manufacture of dairy products	5.33	2.49	–2.70
2913	Manufacture of bearings, gears, gearing, and driving elements	3.84	–0.73	–4.40
2813	Manufacture of steam generators, except central heating hot water boilers	2.05	2.27	0.21
1911	Tanning and dressing of leather	1.59	3.32	1.71

Note: Productivity shown here are measured by value added per worker. The calculation includes only firms in the panel data analysis. Productivity measured by Levinsohn and Petrin (2003) yields a similar picture.
Source: Author's compilation.

to total raw materials used (rim_{ijt}). In the questionnaire, foreign ownership (percentage of total equity) is also included. The ratio of blue-collar to total workers is a proxy of $skill_{ijt}$, so the expected sign is negative. To measure RD_{ijt}, two proxies are used as alternatives. The first is the binary dummy variable (RDD_{ijt}), which is equal to one when establishments commit to R&D investment, whereas the second is the ratio of R&D expenditure to total sales (RDS_{ijt}). BOI-promoted establishments are measured by the binary dummy (BOI_{ijt}), which is equal to one if an establishment receives BOI privileges, and zero otherwise.

To calculate trade protection, measured by both nominal (t_{jt}) and effective rates of protection (ERP_{jt}), the interindustry linkage relationship is derived from Thailand's input–output table compiled by the National Economic and Social Development Board (NESDB). Since the input–output table for Thailand is updated every 5 years, three tables are available for 2005, 2010, and 2015, which are employed to match the industrial censuses of 2006, 2011, and 2016, respectively. The output and input tariffs for 2006, 2011, and 2016 are from HS2002 6-digits. Concordance between HS code, ISIC, and IO table is applied in calculating four alternative ERPs at the industry level as mentioned earlier, that is, ERP import-competing products (ERP_1_{jt}); ERP considering water in tariffs (ERP_2_{jt}); ERP capturing the effect of partial trade liberalization (ERP_3_{jt}); and ERP combining the effects of partial trade liberalization and water in tariffs (ERP_4_{jt}). The interest rates applied to reflect the opportunity costs of exporters are sourced from the weighted average of minimum lending rates (MLR) offered by various commercial banks in Thailand. Note that the 2006 ERP_{jt} reflects the pre-FTA era. Substantial tariff commitments took place after 2006 (90 percent in 2010 for the ACFTA, 93 percent of tariff lines in 2010 for the TAFTA, and 100 percent in 2010 for the AEC). In the case of the JTEPA, there were two tariff cuts, before and after 2011. Hence, the effect of FTAs is captured in the two series (the 2011 and 2016 ERP_{jt}).

To construct $Subdsidy_{jt}$, this study uses the WTO data set on subsidies and countervailing measures. The data set includes two categories of subsidies: prohibited and actionable. The former refers to subsidies granted with the requirement that recipients meet a certain export target or use domestic goods instead of imported. In the latter, the subsidy is defined in broader terms; that is, it will proceed when there is convincing evidence of adverse effects by the complaining country. In this data set, 11 Thai manufacturing sectors were charged with countervailing measures in 2000–2006.[12] A binary dummy variable is introduced to examine the effect of the subsidy on firm productivity, valued at one for those industries listed in the data set in 2006, and zero otherwise.

Concentration (CON_{jt}) is measured by the Hirschman Herfindahl index (HHI_{jt}) expressed in Equation (6.7). It was constructed from information gathered from each census after cleaning procedures had been undertaken, as discussed previously.

$$HHI_j = \sum_{i=1}^{n} \left(S_{ij}\right)^2 \tag{6.7}$$

where S_{ij} is the market share of firm *i* in industry *j* and *n* is the number of firms.

The export–output ratio (XOR_{jt}) and import penetration ratio (MPR_{jt}) at the industry level are used as control variables. The data used to calculate these variables is retrieved from the United Nations Comtrade database (UNCOMTRADE), whereas gross output data is from the National Economic and Social Development Board. The standard concordance between the HS and ISIC is applied to convert XOR_{jt} and MPR_{jt} from HS code to the ISIC 4-digit level. As in Chapter 5, we use trade data to capture the aspect of the international production network ($Network_{jt}$). This is measured by the ratio of parts and components (P&C) trade (the sum of imports and exports) to total goods trade. The list of P&Cs is derived from a careful disaggregation of trade data based on Revision 3 of the Standard International Trade Classification (SITC, Rev 3) extracted from the United Nations trade data reporting system (UN Comtrade database) (Kohpaiboon, 2010; Jongwanich, 2011, 2017). Trade data compiled from UN Comtrade is matched with International Standard of Industrial Classification (Rev 3).

All in all, the empirical model used in this study is summarized in Equations (6.8), (6.9), and (6.10) with the expected signs in parentheses:

$$\begin{aligned} Productivity_{ijt} &= \alpha_0 + \alpha_1 exp_{ijt} + \alpha_2 rim_{ijt} + \alpha_3 own_{ijt} + \alpha_4 RD_{ijt} \\ &+ \alpha_5 skill_{ijt} + \alpha_6 XOR_{jt} + \alpha_7 MPR_{jt} + \alpha_8 HHI_{jt} \\ &+ \alpha_9 outputtariff_{jt} + \alpha_{10} inputtariff_{jt} \\ &+ \alpha_{11} BOI_{ijt} + \alpha_{12} Subsidy_{jt} + \varepsilon_{ijt} \end{aligned} \quad (6.8)$$

$$\begin{aligned} Productivity_{ijt} &= \alpha_0 + \alpha_1 exp_{ijt} + \alpha_2 rim_{ijt} + \alpha_3 own_{ijt} + \alpha_4 RD_{ijt} \\ &+ \alpha_5 skill_{ijt} + \alpha_6 XOR_{jt} + \alpha_7 MPR_{jt} + \alpha_8 HHI_{jt} \\ &+ \alpha_9 ERP_{jt} + \alpha_{10} BOI_{ijt} + \alpha_{11} Subsidy_{jt} + \varepsilon_{ijt} \end{aligned} \quad (6.9)$$

$$\begin{aligned} Productivity_{ijt} &= \alpha_0 + \alpha_1 exp_{ijt} + \alpha_2 rim_{ijt} + \alpha_3 own_{ijt} + \alpha_4 RD_{ijt} + \alpha_5 skill_{ijt} \\ &+ \alpha_6 XOR_{jt} + \alpha_7 MPR_{jt} + \alpha_8 HHI_{jt} + \alpha_9 ERP_{jt} + \alpha_{10} BOI_{ijt} \\ &+ \alpha_{11} Subsidy_{jt} + \beta_1 ERP_{jt} * HHI_{jt0} + \beta_2 BOI_{ijt} * HHI_{jt0} \\ &+ \beta_3 Subsidy_{jt} * HHI_{jt0} + \varepsilon_{ijt} \end{aligned} \quad (6.10)$$

Where

$Productivity_{ijt}$ = Productivity of establishment *i* of industry *j* at time *t* measured by two alternatives:

(1) $VAperW_{ijt}$ = value added per worker of establishment *i* of industry *j* at time *t*

(2) TFP_{ijt} = total factor productivity of establishment *i* of industry *j* at time *t*

exp_{ijt}= export–sales ratio of establishment i of industry j at time t
rim_{ijt} = imported raw materials as a share of total raw materials of establishment i of industry j at time t
own_{ijt} = foreign share of establishment i of industry j at time t
RD_{ijt} = R&D effort by establishment i of industry j at time t measured by two alternatives:
(1) RDD_{ijt} = the binary dummy variable, equal to one when there is R&D effort and zero otherwise,
(2) RDS_{ijt} = the R&D expense to sale of establishment i of industry j at time t
$skill_{ijt}$ = the ratio of blue-collar to total workers of establishment i of industry j at time t
$outputtariff_{jt}$ = output tariffs of industry j at time t
$inputtariff_{jt}$ = input tariffs of industry j at time t
ERP_{ij}= effective rate of protection of industry j at time t measured by four alternatives as in Equations (6.1)–(6.4).
(1) ERP_1_{jt}= ERP import-competing products
(2) ERP_2_{jt}= ERP considering water in tariffs
(3) ERP_3_{jt}= ERP capturing the effect of partial trade liberalization
(4) ERP_4_{jt} = ERP combining the effect of partial trade liberalization and water in tariffs
XOR_{jt} = export–output ratio of industry j at time t
MPR_{jt} = import penetration ratio of industry j at time t
HHI_{jt} = Hirschman Herfindahl producer concentration of industry j at time t
BOI_{ijt} = a zero–one binary dummy which equals one when an establishment i of industry j is BOI-promoted and zero otherwise
$Subsidy_{jt}$ = a zero–one binary dummy which equals one when industry j was subject to subsidy charges on the WTO database at time t

The panel data analyses are performed to estimate Equations (6.8)–(6.10). The Blundell and Bond (1998) panel system *Generalized Method of Moments* (GMM) regression is also applied as an alternative methodology, but the lag value of endogenous variables, either using value added per worker or total factor productivity, is statistically insignificant. Therefore, panel data analysis is chosen to be employed. A random effect model is applied since one of our variables of interest, subsidies, is time-invariant, while industrial and time-specific dummy variables are included to control for differences among industries and across years. As mentioned earlier, due to a multicollinearity problem, a proxy of 'international production network' ($Network_{jt}$) is employed as an alternative replacing export–output ratio (XOR_{jt}) and import penetration ratio (MPR_{jt}) in the model. The lag value of market orientation is also employed as an instrument to capture any possible bi-directional relationship. The lag values of industrial policy, especially trade protection in terms of ERP, are also used to capture the possible lag effects of policy materializing and to redress any possible endogeneity bias. The data used in the empirical model is summarized in Appendices 6.1 and 6.2.

6.4 Empirical results

Table (6.2) presents the panel estimation results when value added per worker ($VAperW_{ijt}$) is used to represent firms' productivity, while table (6.3) shows the results when TFP is employed as the dependent variable. Column (A) in both tables presents the results when nominal tariffs, separated into input and output, are employed to proxy trade protection. Columns (B), (C), (F), and (G) illustrate the results when effective rate of protection in terms of ERP_1_{jt}, ERP_2_{jt}, ERP_3_{jt}, and ERP_4_{jt} are employed, respectively. The results when lag values of ERP are performed are in Column (D), while in Column (E) R&D expenses to sales, instead of the binary dummy variable, is used to represent the R&D efforts undertaken by each establishment. Columns (C1) and (G1) show the results when a proxy of the global production network is included in the model. Table (6.4) presents the results when the interaction terms between industry policy and competition environment are included in the empirical model. Columns (A)–(D) represent the results when value added per worker is considered as the dependent variable, while columns (E)–(H) comprise results when total factor productivity is used to represent productivity.

The results when either value added per worker or total factor productivity are employed as the dependent variable are comparable (Tables 6.2–6.4). Regarding industry policies, only lowering trade protection and providing investment incentives through the board of investment (BOI) generate a positive and significant impact on improving firm productivity. By contrast, government subsidy is statistically insignificant in stimulating firm productivity throughout most of our analysis (Tables 6.2 and 6.3). In particular, the coefficient associated with this variable becomes negative and statistically significant when value added per worker is used to represent firm productivity (Table 6.2: Columns C and D). This reflects the fact that the assistance programs (such as packing credits and special concessions) granted to exporting firms were not effective in enhancing firm productivity and, in some cases, firms in the subsidized sectors tend to perform significantly poorer in terms of productivity improvement than other firms. In contrast to providing incentives through BOI, subsidies tend to be more industry-specific, so that choosing the right industry is crucial in influencing the effectiveness of such policy. In terms of Thailand, it seems that the 11 industries subsidized (and encountering countervailing measures) mostly involved metal products in which Thailand tends to have less comparative advantage. Thus, subsidies are likely to be used for firms' survival purposes, instead of for productivity improvement or innovation reasons.

With respect to the BOI, it is noteworthy that when it interacted with the key provincial variables in Thailand where important manufacturing factories are located, such as the electronic sectors in Pathum Thani, Phra Nakhon

Table 6.2 Results when productivity is proxied by value added per worker

Value-added per worker	*Column A*		*Column B*		*Column C*		*Column C1*		*Column D*		*Column E*		*Column F*		*Column G*		*Column G1*	
	Coef.	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*
own_{ijt}	0.658	0.084***	0.658	0.084***	0.657	0.084***	0.658	0.084***	0.658	0.084***	0.646	0.084***	0.656	0.084***	0.656	0.084***	0.657	0.084***
exp_{ijt}	0.245	0.068***	0.245	0.068***	0.246	0.068***	0.251	0.069***	0.247	0.068***	0.268	0.069***	0.242	0.068***	0.242	0.068***	0.247	0.069***
rim_{ijt}	0.513	0.074***	0.516	0.074***	0.513	0.074***	0.508	0.074***	0.512	0.074***	0.532	0.074***	0.521	0.074***	0.520	0.074***	0.514	0.074***
RDD_{ijt}	0.295	0.033***	0.295	0.033***	0.295	0.033***	0.297	0.034***	0.296	0.033***			0.295	0.033***	0.295	0.033***	0.297	0.034***
RDS_{ijt}											0.018	0.049						
$skill_{ijt}$	−0.101	0.092	−0.103	0.091	−0.111	0.092	−0.110	0.092	−0.117	0.091	−0.137	0.092	−0.081	0.091	−0.083	0.091	−0.082	0.091
HHI_{jt}	−0.097	0.031***	−0.098	0.030***	−0.100	0.03***	−0.097	0.030***	−0.098	0.03***	−0.103	0.03***	−0.097	0.03***	−0.097	0.03***	−0.096	0.030***
BOI_{ijt}	0.268	0.034***	0.265	0.034***	0.266	0.034***	0.266	0.035***	0.265	0.034***	0.285	0.034***	0.267	0.034***	0.267	0.034***	0.267	0.035***
$inputtariff_{jt}$	−0.981	0.414**																
$outputtariff_{jt}$	1.549	1.013																
ERP_1_{jt}			−0.135	0.062**														
ERP_2_{jt}					−0.224	0.085***	−0.208	0.084***			−0.227	0.085***						
ERP_2_{jt-1}									−0.281	0.086***								
ERP_3_{jt}													−0.089	0.073				
ERP_4_{jt}															−0.138	0.093*	−0.135	0.078*
$Subsidy_{jt}$	−0.038	0.051	−0.063	0.052	−0.077	0.053*	−0.079	0.042**	−0.086	0.053*	−0.080	0.053*	−0.036	0.049	−0.040	0.05	−0.046	0.049
XOR_{jt}	−0.121	0.285	−0.131	0.287	−0.169	0.288			−0.158	0.287	−0.161	0.29	−0.160	0.301	−0.178	0.301		
MPR_{jt}	−0.265	0.392	−0.203	0.387	−0.169	0.385			−0.161	0.385	−0.117	0.386	−0.065	0.383	−0.069	0.383		
$Network_{jt}$							0.884	0.439**									0.962	0.545*
time dummy	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
industrial dummy	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
No. of observations	11,222		11,222		11,222		11,246		11,222		11,222		11,222		11,222		11,246	
No.of groups	4,424		4,424		4,424		4,436		4,424		4,424		4,424		4,424		4,436	

(*Continued*)

Table 6.2 Continued

Value-added per worker	*Column A*		*Column B*		*Column C*		*Column C1*		*Column D*		*Column E*		*Column F*		*Column G*		*Column G1*	
	Coef.	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*
Wlad chi^2 ($prob>chi^2$)	0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000	
Rsq-within	0.035		0.035		0.035		0.034		0.035		0.033		0.034		0.034		0.034	
between	0.319		0.319		0.319		0.321		0.319		0.309		0.319		0.319		0.321	
overall	0.246		0.246		0.246		0.247		0.247		0.239		0.246		0.246		0.247	

Note: All variables are in logarithmic formulae, except the dummy variables, i.e., RDD_{ijt}, BOI_{ijt}, $Subsidy_{jt}$; trade protection variables, which are in percentage points; and $skill_{ijt}$ XOR_{jt} MPR_{jt}, $Network_{jt}$, which are in ratios. *, **, and *** indicate the significant level at 10, 5, and 1 percent, respectively. Coef. represents coefficient while Std. Err is standard error.
Source: Author's calculations.

Table 6.3 Results when productivity is proxied by total factor productivity (TFP)

	Column A		*Column B*		*Column C*		*Column C1*		*Column D*		*Column E*		*Column F*		*Column G*		*Column G1*	
	Coef.	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*
own_{ijt}	0.366	0.080***	0.366	0.080***	0.365	0.080***	0.369	0.080***	0.366	0.080***	0.351	0.080***	0.365	0.080***	0.365	0.080***	0.368	0.080***
exp_{ijt}	0.436	0.067***	0.437	0.067***	0.437	0.067***	0.435	0.068***	0.438	0.067***	0.459	0.068***	0.435	0.067***	0.435	0.067***	0.432	0.068***
rim_{ijt}	0.439	0.072***	0.443	0.072***	0.441	0.072***	0.443	0.073***	0.441	0.072***	0.461	0.073***	0.446	0.072***	0.446	0.072***	0.448	0.073***
RDD_{ijt}	0.314	0.033***	0.314	0.033***	0.314	0.033***	0.314	0.033***	0.314	0.033***			0.314	0.033***	0.314	0.033***	0.314	0.033***
RDS_{ijt}											0.077	0.095						
$skill_{ijt}$	−0.258	0.088***	−0.257	0.088***	−0.263	0.088***	−0.268	0.089***	−0.267	0.088***	−0.288	0.088***	−0.243	0.087***	−0.244	0.087***	−0.247	0.088***
HHI_{jt}	−0.074	0.029***	−0.077	0.028***	−0.078	0.028***	−0.071	0.028***	−0.077	0.028***	−0.082	0.028***	−0.076	0.028***	−0.076	0.028***	−0.070	0.028***
BOI_{ijt}	0.271	0.033***	0.268	0.033***	0.269	0.033***	0.269	0.034***	0.268	0.033***	0.287	0.033***	0.270	0.033***	0.270	0.033***	0.270	0.034***
$inputtariff_{jt}$	−0.814	0.417**																
$outputtariff_{jt}$	1.581	1.001																
ERP_1_{jt}			−0.080	0.058														
ERP_2_{jt}					−0.140	0.08**	−0.150	0.080**			−0.145	0.08**						
ERP_2_{jt-1}									−0.182	0.083**								
ERP_3_{jt}													−0.069	0.075				
ERP_4_{jt}															−0.097	0.096	−0.112	0.092
$Subsidy_{jt}$	−0.028	0.049	−0.044	0.049	−0.054	0.050	−0.046	0.050	−0.061	0.050	−0.057	0.05	−0.029	0.047	−0.031	0.047	-0.022	0.047
XOR_{jt}	0.424	0.285*	0.428	0.285*	0.400	0.286			0.406	0.285	0.424	0.287*	0.397	0.297	0.389	0.298		
MPR_{jt}	−0.281	0.384	−0.201	0.374	−0.186	0.373			−0.183	0.373	−0.136	0.373	−0.111	0.373	−0.116	0.373		
$Network_{jt}$							1.384	0.680**									1.310	0.687**
time dummy	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
industrial dummy	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
No. of observations	11,060		11,060		11,060		11,060		11,060		11,060		11,060		11,060		11,060	
No.of groups	4,341		4,341		4,341		4,341		4,341		4,341		4,341		4,341		4,341	

(*Continued*)

Table 6.3 Continued

	Column A		*Column B*		*Column C*		*Column C1*		*Column D*		*Column E*		*Column F*		*Column G*		*Column G1*	
	Coef.	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*
Wlad chi^2 ($prob>chi^2$)	0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000	
Rsq-within	0.017		0.016		0.017		0.017		0.017		0.014		0.016		0.016		0.017	
between	0.895		0.895		0.895		0.895		0.896		0.893		0.896		0.896		0.895	
overall	0.847		0.847		0.847		0.847		0.847		0.845		0.847		0.847		0.847	

Note: All variables are in logarithmic formulae, except dummy variables, i.e., RDD_{ijt}, BOI_{ijt}, $Subsidy_{jt}$; trade protection variables, which are in percentage points; and $skill_{ijt}$ XOR_{jt} MPR_{jt}, $Network_{jt}$, which are in ratios. *, **, and *** indicate the significant level at 10, 5, and 1 percent, respectively. Coef. represents coefficient while Std.Err is standard error.

Source: Author's calculations.

Table 6.4 Results when industrial policies and competition environment are considered together

	Value added per worker								*TFP*							
	Column A		*Column B*		*Column C*		*Column D*		*Column E*		*Column F*		*Column G*		*Column H*	
	Coef.	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*
own_{ijt}	0.642	0.075***	0.646	0.075***	0.647	0.075***	0.642	0.075***	0.403	0.075***	0.401	0.074***	0.401	0.074***	0.398	0.074***
exp_{ijt}	0.234	0.063***	0.231	0.063***	0.232	0.063***	0.234	0.063***	0.402	0.062***	0.405	0.062***	0.405	0.062***	0.408	0.062***
rim_{ijt}	0.427	0.064***	0.425	0.064***	0.424	0.064***	0.432	0.064***	0.346	0.063***	0.346	0.063***	0.346	0.063***	0.350	0.063***
RDD_{ijt}	0.298	0.031***	0.298	0.031***	0.298	0.031***	0.299	0.031***	0.343	0.030***	0.343	0.030***	0.343	0.030***	0.343	0.030***
$skill_{ijt}$	–0.088	0.027***	–0.094	0.027***	–0.093	0.027***	–0.069	0.085	–0.072	0.025***	–0.071	0.026***	–0.070	0.026***	–0.229	0.083***
HHI_{jt}	–0.060	0.086	–0.062	0.085	–0.066	0.085			–0.220	0.083***	–0.221	0.083***	–0.224	0.083***		
BOI_{ijt}	0.398	0.087***	0.509	0.093***	0.508	0.093***	0.464	0.092***	0.211	0.085***	0.204	0.092***	0.203	0.092***	0.168	0.091***
$BOI_{ijt}*HHI_{jt0}$	–0.035	0.024*							–0.020	0.023						
$BOI_{ijt}*HHI_{jt}$			–0.068	0.026***	–0.067	0.026***	–0.053	0.025***			–0.022	0.025	–0.022	0.025	–0.033	0.025
ERP_2_{jt}	–0.094	0.164	–0.138	0.169	–0.189	0.177	–0.070	0.169	–0.190	0.181	–0.161	0.193	–0.185	0.203	–0.124	0.201
$ERP\_2_{jt}*HHI_{jt0}$	0.035	0.047							–0.018	0.051						
$ERP\_2_{jt}*HHI_{jt}$			0.021	0.047			0.041	0.047			–0.009	0.053			0.012	0.055
$ERP\_2_{jt-1}*HHI_{jt}$					0.023	0.049							–0.006	0.056		
$Subsidy_{jt}$	0.083	0.139	0.080	0.14	0.064	0.14	–0.018	0.137	0.137	0.138	0.134	0.138	0.123	0.138	0.049	0.136
$Subsidy_{jt}*HHI_{jt0}$	0.032	0.032							0.043	0.032						
$Subsidy_{jt}*HHIjt$			0.031	0.032	0.029	0.032	0.004	0.031			0.042	0.032	0.041	0.032	0.020	0.031
XOR_{jt}	–0.202	0.269	–0.213	0.268	–0.204	0.267	–0.167	0.267	0.309	0.277	0.321	0.275	0.331	0.275	0.387	0.274
MPR_{jt}	0.143	0.329	0.149	0.329	0.157	0.329	0.274	0.328	–0.054	0.318	–0.054	0.318	–0.048	0.318	0.064	0.316
time dummy	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
industrial dummy	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
No. of observations	13,645		13,645		13,645		13,645		13,301		13,301		13,301		13,301	
No.of groups	4,751		4,751		4,751		4,751		4,700		4,700		4,700		4,700	
Wlad chi^2 ($prob>chi^2$)	0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000	
Rsq-within	0.031		0.032		0.032		0.030		0.600		0.601		0.601		0.600	
between	0.343		0.344		0.344		0.344		0.899		0.899		0.899		0.899	
overall	0.228		0.228		0.228		0.228		0.850		0.850		0.850		0.850	

Note: All variables are in logarithmic formulae, except dummy variables, i.e., RDD_{ijt}, BOI_{ijt}, $Subsidy_{jt}$; trade protection variables, which are in percentage points; and $skill_{ijt}$ XOR_{jt} MPR_{jt}, which are in ratios. *, **, and *** indicate the significant level at 10, 5, and 1 percent, respectively. Coef. represents coefficient while Std.Err is standard error.

Source: Author's calculations.

Si Ayutthaya, and Samut Prakan; the automotive sectors (and automotive parts) in Samut Prakan, Prachinburi, and Phra Nakhon Si Ayutthaya (as well as Chachoengsao); and food in Samut Sakhon, Samut Songkhram, Nakhon Pathom, and so on, the interaction terms in various areas, not only in Chon Buri, Rayong, and Chachoengsao (comprising the Eastern Economic Corridor [EEC] area as mentioned in Chapter 3), are positive and statistically significant (see the results in Appendix 6.3). This reflects the fact that the BOI is able to noticeably promote firm productivity beyond the EEC area. Thus, providing special BOI incentives to a particular area, such as the EEC initiated in 2017, while ignoring various original manufacturing areas may result in unsustainably moving toward Thailand 4.0. As also shown in Appendix 6.3, firms in various areas in Thailand tend to have the potential to upgrade even without BOI privileges, as provincial dummy variables in our productivity functions are positive and significant. Note that the positive impact of the BOI on firm productivity was also revealed when a cross-sectional analysis was conducted using the Thai Industrial Censuses of 2006 and 2011 (Jongwanich and Kohpaiboon, 2017).

When a conducive environment is considered together with industrial policies, as proposed by Aghion et al. (2015), our results reveal that only when value added per worker is employed as the dependent variable and the BOI is considered as representing industry policy, a conducive environment, or higher domestic competition, matters in enhancing such policy in generating higher firm productivity. Considering the interaction term between the BOI and Hirschman Herfindahl (HHI_{jt}) producer concentration, both the initial value of HHI ($BOI_{ijt}*HHI_{jt0}$) and the current value ($BOI_{ijt}*HHI_{jt}$) are negative and statistically significant (Table 6.4: Columns A–D). Such negative and significant results reflect the fact that the BOI measures granted to firms in a lower producer concentration, representing a more conducive environment, tend to generate higher firm productivity. As mentioned earlier, this is possible since in the absence of domestic competition, firms have a lower incentive to innovate and improve their productivity, so that any privileges granted through the BOI become less effective.

However, for other industry policy variables, that is, trade protection and subsidies, the interaction terms between industry policies, and producer concentration, are all statistically insignificant (Table 6.4). In addition, when TFP_{ijt} is employed as the independent variable, the role of a conducive environment in enhancing industry policy becomes weaker, even in the case of granting BOI privileges. These results contrast with the findings of Aghion et al. (2015), who focused on China as a case study. The much smaller domestic market and relatively comparable producer concentration among industries in Thailand may explain the less relevant role of a competitive environment in enhancing industry policies in generating higher firm productivity. More than 60 percent of all industries in Thailand during our periods under consideration had producer concentration ratios lower than 0.10, and around 80 percent of all industries had concentration ratios below 0.20. Nevertheless, the coefficient corresponding to HHI_{jt} itself is found to be negative and statistically significant. This highlights the necessary and important role of enabling environmental variables, such as domestic competition, which must be in place to directly foster productivity, though such an environment could not help in enhancing the role of industrial policy.

In terms of trade protection, when nominal tariffs are considered, our results reveal that only cutting input tariffs was able to stimulate firm productivity. A reduction in output tariffs is powerless statistically in improving such productivity. The powerful role uncovered in terms of lowering intermediate tariffs is in line with the findings of Amiti and Konings (2007) and Topalova and Khandelwal (2011). However, the statistical insignificance of output tariffs raises some concerns. In particular, it is possible that firms in Thailand consider both input and output tariffs simultaneously concerning their business activities. Meanwhile, exporting firms are unlikely to receive any benefits from cutting output tariffs as their prices tend to follow world levels, thereby reducing the explanatory power of this variable in generating overall productivity improvements. This evidence is also shown in Jongwanich and Kohpaiboon (2017), who employed cross-sectional data analysis to study the Thai economy in 2006 and 2011. Jongwanich and Kohpaibbon (2007), applying the demand and supply framework to examine the determinants of protection in Thailand during the early 2000s where tariff reductions were significant, found that protection bargains in Thai manufacturing are struck on ERP, instead of nominal tariff rates (see Chapter 2).

To capture both input and output tariffs, effective rate of protection (ERP_{jt}) is introduced with four alternatives (Equations 6.1–6.4). Our results show that the coefficients of all four ERP alternatives are negative and significant, except in the case where partial trade liberalization is captured in calculating ERP (ERP_3_{jt}) (Tables 6.2 and 6.3). Interestingly, the coefficient associated with ERP_2_{jt} where water in tariffs is considered is the highest among the four alternatives. For example, in the case of using value added per worker as the dependent variable, a 1 percentage point reduction in effective tariffs, concerning the water in tariffs encountered by exporting firms (ERP_2_{jt}), increases firm productivity by 0.22 percent, compared to only 0.14 percent in the cases of ERP_1_{jt} (ERP import-competing products) and ERP_4_{jt} (ERP concerning partial trade liberalization through FTAs and water in tariffs) (Table 6.2: Columns B, C, and G). The highest value of the coefficient associated with ERP_2_{jt} suggests that cutting both input and output tariffs simultaneously, and, perhaps, substantially, would have a pronounced impact enhancing firm productivity. Note that the results resemble the case when a lag value of ERP is introduced into the empirical analysis (Tables 6.2 and 6.3: Columns D).[13]

The statistical insignificance of ERP_3_{jt} suggests that the FTA-led trade liberalization effects fail to add substantial competitive pressure and induce firms to improve productivity. This reflects the nature of the FTA commitments that Thailand has made so far. As mentioned in Chapter 3, Thailand often expresses a reluctance to offer preferential tariffs to FTA partners. Sectors that are subject to high tariffs are also often on the sensitive list in FTA negotiations. This will remain a challenge to the Thai government in fully materializing the potential of the FTAs signed so far.

Regarding the control of firm-specific variables in the analysis, coefficients corresponding to all firm-specific determinants reach the theoretical expected sign and to a certain extent are greater than those corresponding to industrial policy variables. Firms more exposed to the world market exhibit higher productivity. This can take place through either exporting output abroad (exp_{ijt}), sourcing imported raw materials (rim_{ijt}), or both. The coefficients associated with these two variables are strongly significant at 1 percent and close to each other when total factor productivity is considered as the dependent variable (Table 6.3), but the coefficient associated with imported raw materials is noticeably higher when value added per worker is used (Table 6.2). Remaining capital stock in the value added could probably favor imported raw materials, thereby generating higher coefficients associated with this variable in the case where $VAperW_{ijt}$ is employed as the dependent variable. Foreign firms have higher productivity than indigenous ones, reflected by the positive and statistical significance of the coefficient associated with the share of foreign ownership (own_{ijt}) (Tables 6.2 and 6.3). The coefficients corresponding to $skill_{ijt}$ and RDD_{ijt} are negative and positive, respectively, both of which are statistically significant at the 1 percent level, especially in the case where TFP_{ijt} is used to reflect firms' productivity (Table 6.3). All things being equal, firms committing to an R&D effort as well as hiring white-collar workers gain more productivity than those which do not. Note that the statistical insignificance of the coefficient associated with RDS_{ijt} could be explained by either the rather narrow definition of R&D adoption used in the questionnaire, which emphasizes product innovation or the relatively low and comparable R&D expenditure among firms (Tables 6.2 and 6.3: Column E). Thus, our study results are skewed in favor of RDD_{ijt} as opposed to RDS_{ijt}.

It is noteworthy that with data limitations, this study could not directly include another possible impact of free trade agreements (FTAs) in determining firms' productivity improvements in Thailand, that is, the impact of preferential schemes offered by Thailand's FTA partner countries. If such schemes could stimulate exports effectively, with the significant effect of the market orientation variable, especially export–output ratio, on firms' productivity (as pointed out earlier), preferential schemes received from FTAs would represent another potential channel in encouraging firm productivity in Thailand. However, as shown in Chapter 3, the FTA utilization rate of Thai exporters varies by FTAs and on average during 2016–2019 was only around 53 percent; that is, only half of Thai exports used the preferential tariffs offered by Thai FTA partners. Jongwanich and Kohpaiboon (2017), in examining how Thai exporters respond to free trade agreement (FTA) preferential schemes using the administrative records of FTA implementation at the product level in Thailand during 2001–2015, showed that the costs incurred by the rule of origins (RoOs) are the key obstacle preventing Thai exporters utilizing such FTAs. The cost is substantially high for developing countries. In some cases, such as Vietnam and China, the cost estimate reaches double digits, at 12.6 and 14.1 percent, respectively. From these findings, the relatively low FTA utilization by Thai exporters could probably limit the role of FTAs in stimulating firm productivity through the export channel. To harness the trade-inducing effects of FTAs, reducing the costs incurred, especially from the presence of RoOs, should be the prime focus.

Another interesting point regarding the export channel concerns the implementation of non-tariff measures (NTMs), especially technical measures such as sanitary and phytosanitary (SPS) and technical barriers to trade (TBT). Due to data limitations, non-tariff measures such as SPS and TBT cannot be directly included in the productivity analysis. Most previous studies (including Jongwanich, 2009; Kee, Nicita, and Olarreaga, 2009; Cadot and Gourdon, 2015; Ing and Cadot, 2017; Cadot, Gourdon, and van Tongeren, 2018; and Bratt, 2017) examined such impacts, but instead concentrated on exports, either volume, prices, or both. Most found technical NTMs tend to generate negative impacts on trade. For example, Jongwanich (2009) examined the impact of food safety standards on the volume of processed food exports in developing countries, including Thailand, using the detention data from the US Food and Drug Administration *(FDA)* to which information on a country's performance in meeting food safety standards was reported during 1990–2006. A panel data econometric analysis of processed food exports in developing countries was undertaken. The Sanitary and Phytosanitary Standard (SPS) was incorporated into the model to capture the impact of food safety standards. The empirical model showed that food safety standards imposed by developed countries impeded processed food exports from developing countries. Cadot, Gourdon, and van Tongeren (2018) applied the MAST nomenclature dataset containing 121 measures and 86 countries, including Thailand, to examine both the price and quantity impacts of NTMs. Trade costs associated with NTMs as reflected by estimated ad valorem equivalents (AVEs) were revealed. AVEs for TBT in manufacturing tended to be lower than AVEs for SPS in agriculture and trade costs associated with NTMS, except SPS, tended to reduce trade volume.

Such evidence, to a certain extent, casts doubt on the role of NTMs in terms of technical measures in stimulating firm productivity, especially through the export channel in Thailand. However, as pointed out by Bratt (2017) and Cadot, Gourdon, and van Tongeren (2018), complying with technical NTM measures could yield some positive impacts on complainant firms, including upgrading product quality, improving product design, and building consumer trust. Thus, the task of complying with technical NTMs should not be viewed just as a barrier to trade, but also as an opportunity to upgrade quality standards and market sophistication. The supply-side capacity of the country needs to be improved to increase the probability that the country can successfully meet foreign standards. This would eventually improve firm productivity in the country.

Among other industry-specific factors, the coefficient associated with the export–output ratio (XOR_{jt}) turns out to be statistically significant, with a positive expected sign in some cases where TFP is employed as the dependent variable (Table 6.3: columns A, B, and E). *Certaris paribus*, firms in industries more exposed to the global market tend to have higher productivity. By contrast, the import threat measured in MPR_{jt} is statistically insignificant in all cases. Such a finding could be due to the dualistic trade policy adopted in Thailand whereby high tariffs are associated with effective tariff exemption schemes. Under such circumstances, firms can be either export-oriented to access a larger market or serve local niches, which are not in direct competition with imported products. The $Network_{jt}$ is positive and significant, confirming the robustness of the fact that participating in global production networks potentially results in higher productivity improvements (Tables 6.2 and 6.3: Columns C1 and G1). This result is consistent with the study of Jongwanich and Kohpaiboon (2017), which employed cross-sectional data in 2006 and 2011 to determine the impact of GVC participation on firm productivity. This probably suggests that the participation in the global production network of Thai firms has been beyond simple assembly functions. The previous chapter showed that participation in the global production network encourages firms to become involved in R&D activities, including improved production technology, product development, and process innovation, which in turn could help improve firm productivity.

6.5 Conclusions

This chapter examines the role of industrial policy on firm productivity, using a three-year panel data set (2006, 2011, and 2016) focusing on the Thai manufacturing sector as a case study. The range of industrial policy tools was widely defined, including tariff measures, subsidies, and investment incentives, all of which represent the main tools used in Thailand. The tariff protection measures considered in this study encompass both nominal and effective tariffs. With nominal tariffs, the effects of tariffs on finished (output) and raw material (input) products are separately examined. In addition, in terms of effective rates of protection (ERP), this study includes an emphasis on possible water in tariffs and the effects of partial trade liberalization undertaken through the FTAs signed between Thailand and its trading partners in determining tariff measures.

The results fail to support the position that all industrial policies are effective in enhancing firm productivity in Thailand. Only lowering tariff protection and providing investment incentives through the board of investment (BOI) generate a positive and significant impact on improving firm productivity, and by region, it seems that productivity improvements induced by measures implemented by the BOI go beyond the Eastern Economic Corridor (EEC) area. Providing subsidies tends to result in the deterioration of such productivity. Regarding tariff measures, it seems that simultaneous and, perhaps, substantial reductions of both input and output tariffs (measured through ERP) appear to have a pronounced impact on enhancing firm productivity. Among trade protection measures, the effective rate of protection, which concerns water in tariffs encountered by exporting firms, has the greatest effect on firm productivity, whereas the FTA-led trade liberalization effect fails to add substantial competitive pressure that would compel firms to improve productivity. Such statistical insignificance reflects the nature of the FTA commitments that Thailand has made so far. This remains the challenge to any Thai governments going forward, which have yet to materialize the potential benefits represented by signed FTAs.

Establishing a conducive environment, entailing domestic competition, matters in helping generate higher firm productivity in Thailand. This highlights the necessary and important role of an enabling environment, which must be in place to foster such productivity. However, in Thailand, such competition has not been strong enough to enhance industry policies in generating firm productivity, except in the case of providing investment incentives through the BOI.

Firm-specific variables are of marked significance, and the coefficients associated with these variables tend to be higher than those associated with industrial policies. The results show that firms which are more exposed to the world market, either via exporting output abroad, sourcing imported raw materials, or both, exhibit higher productivity. Foreign firms also have higher productivity than indigenous. Firms committing to a concerted R&D effort in addition to hiring white-collar workers see greater productivity gains than those which do not. The dynamism of industries involved in a production network is also likely to require more R&D investment to keep the industry upbeat and competitive in international markets.

Appendix 6.1

Table Appendix 6.1 Data used in the empirical model

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
$VAperW_{ijt}$	14,356	12.46	1.32	4.57	18.55
TFP_{ijt}	13,721	9.19	2.90	–1.55	27.84
own_{ijt}	14,616	0.05	0.16	0.00	0.69
exp_{ijt}	14,616	0.09	0.20	0.00	0.69
rim_{ijt}	14,616	0.08	0.17	0.00	0.69
RDD_{ijt}	14,616	0.12	0.32	0.00	1.00
RDS_{ijt}	14,616	0.01	0.10	0.00	3.35
$skill_{ijt}$	14,616	0.55	0.16	0.00	0.69
HHF_{jt}	14,600	–3.38	0.98	–5.52	–0.01
BOI_{ijt}	14,616	0.16	0.37	0.00	1.00
$inputtariff_{jt}$	14,153	0.06	0.04	0.00	0.21
$outputtariff_{jt}$	14,153	0.11	0.09	0.00	0.60
ERP_1_{jt}	14,596	–0.01	0.27	–0.82	0.99
ERP_2_{jt}	14,596	0.00	0.20	–0.67	0.81
ERP_3_{jt}	14,596	0.01	0.14	–0.28	1.14
ERP_4_{jt}	14,596	0.01	0.11	–0.16	0.86
ERP_2_{jt-1}	14,596	0.00	0.18	–0.65	0.81
$Subsidy_{jt}$	13,965	0.06	0.23	0.00	1.00
XOR_{jt}	14,322	0.26	0.25	0.00	0.69
MPR_{jt}	14,322	0.14	0.17	0.00	0.69
$network_{jt}$	13,965	0.08	0.17	0.00	0.69

Note: All variables are in logarithmic formulae, except the dummy variables, i.e. RDD_{ijt}, BOI_{ijt}, $Subsidy_{jt}$; trade protection variables, which are in percentage points; and $skill_{ijt}$ XOR_{jt} MPR_{jt}, which are in a ratio formula.

Source: Author's calculations.

Appendix 6.2

Table Appendix 6.2 Correlation coefficient matrix of all relevant variables

$VAperW_{ijt}$	1																				
TFP_{ijt}	0.31	1																			
own_{ijt}	0.19	−0.01	1																		
exp_{ijt}	0.14	0.01	0.40	1																	
rim_{ijt}	0.17	0.03	0.36	0.40	1																
RDD_{ijt}	0.15	0.02	0.07	0.12	0.11	1															
RDS_{ijt}	0.05	0.00	0.02	0.05	0.04	0.39	1														
$skill_{ijt}$	−0.02	−0.03	−0.05	−0.12	−0.11	−0.06	−0.16	1													
HHF_{jt}	0.03	−0.27	0.06	0.03	0.09	0.04	0.03	0.01	1												
BOI_{ijt}	0.20	0.02	0.42	0.54	0.33	0.15	0.12	−0.23	0.05	1											
$inputtariff_{jt}$	−0.03	−0.09	−0.03	0.01	−0.04	0.03	0.00	0.08	0.16	−0.04	1										
$outputtariff_{jt}$	−0.10	0.01	−0.01	0.10	−0.04	0.01	−0.01	−0.04	0.08	0.03	0.48	1									
ERP_1_{jt}	−0.03	0.09	0.01	0.06	0.03	0.00	0.12	−0.53	0.01	0.16	−0.37	0.12	1								
ERP_2_{jt}	−0.03	0.06	0.01	0.08	0.03	0.01	0.13	−0.55	−0.01	0.17	−0.33	0.12	0.97	1							
ERP_3_{jt}	−0.02	0.01	−0.01	0.02	−0.01	0.00	0.05	−0.16	0.15	0.07	−0.12	0.18	0.41	0.43	1						
ERP_4_{jt}	−0.02	0.00	−0.01	0.02	−0.01	0.00	0.06	−0.19	0.15	0.07	−0.10	0.19	0.42	0.45	0.98	1					
ERP_2_{jt-1}	−0.03	0.05	0.01	0.08	0.03	0.01	0.13	−0.55	−0.01	0.16	−0.31	0.11	0.95	0.99	0.43	0.45	1				
$Subsidy_{jt}$	0.02	0.07	0.02	0.00	0.03	0.00	0.04	−0.19	−0.16	0.07	−0.16	−0.16	0.17	0.14	0.06	0.05	0.13	1			
XOR_{jt}	0.04	−0.22	0.05	0.05	0.03	0.04	0.02	0.03	0.25	0.04	0.27	0.00	−0.17	−0.14	−0.07	−0.07	−0.13	−0.16	1		
MPR_{jt}	0.06	−0.13	0.06	0.00	0.08	0.05	0.03	0.05	0.46	0.02	0.06	−0.15	−0.11	−0.11	−0.05	−0.06	−0.10	−0.11	0.76	1	
$network_{jt}$	0.09	−0.10	0.21	0.09	0.15	0.01	0.00	0.02	0.09	0.16	0.02	0.06	0.01	0.01	0.00	0.00	0.00	0.02	0.18	0.21	1

Note: All variables are in logarithmic formulae, except the dummy variables, i.e., RDD_{ijt}, BOI_{ijt}, $Subsidy_{jt}$; trade protection variables, which are in percentage points; and $skill_{ijt}$ XOR_{jt} MPR_{jt}, which are in a ratio formula.
Source: Author's calculations.

Appendix 6.3

Table Appendix 6.3 Results when variables representing provinces are included

	Value added per worker		*TFP*			*Value added per worker*		*TFP*	
	Column A		*Column B*			*Column A1*		*Column B1*	
	Coef.	*Std.Err*	*Coef.*	*Std.Err*		*Coef.*	*Std.Err*	*Coef.*	*Std.Err*
own_{ijt}	0.613	0.086***	0.040	0.080	own_{ijt}	0.556	0.084***	–0.040	0.077
exp_{ijt}	0.272	0.069***	0.341	0.067***	exp_{ijt}	0.284	0.067***	0.355	0.066***
rim_{ijt}	0.503	0.074***	0.263	0.070***	rim_{ijt}	0.490	0.073***	0.265	0.069***
RDD_{ijt}	0.296	0.033***	0.295	0.033***	RDD_{ijt}	0.266	0.033***	0.269	0.032***
$skill_{ijt}$	–0.101	0.092	–0.239	0.088***	$skill_{ijt}$	–0.088	0.090	–0.232	0.087***
HHI_{jt}	–0.100	0.030***	–0.074	0.028***	HHI_{jt}	–0.101	0.030***	–0.074	0.028***
BOI_{ijt}	0.120	0.057**	0.113	0.056**	BOI_{ijt}	0.233	0.034***	0.230	0.033***
BOI_{ijt}*Bangkok	0.079	0.078	0.097	0.074	Bangkok	0.428	0.040***	0.353	0.041***
BOI_{ijt}*Samut Prakan	0.203	0.080***	0.246	0.082***	Samut Prakan	0.758	0.048***	0.804	0.047***
BOI_{ijt}*Nonthaburi	0.367	0.339	0.543	0.305*	Nonthaburi	0.635	0.128***	0.702	0.123***
BOI_{ijt}*Pathum Thani	0.374	0.151**	0.156	0.124	Pathum Thani	0.520	0.088***	0.429	0.085***
BOI_{ijt}*Phna Nakhon Si Ayutthaya	0.124	0.129	0.056	0.130	Phna Nakhon Si Ayutthaya	0.490	0.077***	0.478	0.079***
BOI_{ijt}*Savaburi	0.250	0.131**	0.305	0.122**	Savaburi	0.599	0.101***	0.662	0.098***
BOI_{ijt}*Chon Buri	0.290	0.103***	0.311	0.106***	Chon Buri	0.755	0.074***	0.809	0.076***
BOI_{ijt}*Rayong	0.490	0.129***	0.333	0.113***	Rayong	0.642	0.091***	0.493	0.088***
BOI_{ijt}*Chachoengsao	0.205	0.143	0.211	0.138	Chachoengsao	0.487	0.084***	0.512	0.090***
BOI_{ijt}*Prachin Buri	0.178	0.111*	0.279	0.119**	Prachin Buri	0.540	0.084***	0.574	0.098***
BOI_{ijt}*Samut Sakhon	0.172	0.131	0.187	0.125	Samut Sakhon	0.630	0.053***	0.637	0.054***

(*Continued*)

Table Appendix 6.3 Continued

	Value added per worker		*TFP*			*Value added per worker*		*TFP*	
	Column A		*Column B*			*Column A1*		*Column B1*	
	Coef.	*Std.Err*	*Coef.*	*Std.Err*		*Coef.*	*Std.Err*	*Coef.*	*Std.Err*
BOI_{ijt}*Samut Songkhran	0.008	0.353	–0.100	0.259	Samut Songkhran	0.314	0.155**	0.003	0.146
BOI_{ijt}*Songkhla	0.192	0.145	0.234	0.142*	Songkhla	0.494	0.113***	0.466	0.113***
BOI_{ijt}*Surin	0.426	0.349	0.079	0.245	Surin	0.582	0.149***	0.287	0.147**
ERP_2_{jt}	–0.125	0.062**	–0.073	0.058	ERP_2_{jt}	–0.136	0.062**	–0.083	0.058
$Subsidy_{jt}$	–0.079	0.053	–0.019	0.05	$Subsidy_{jt}$	–0.083	0.052	–0.023	0.050
XOR_{jt}	–0.119	0.286	0.467	0.274*	XOR_{jt}	–0.125	0.286	0.459	0.272*
MPR_{jt}	–0.158	0.388	–0.242	0.379	MPR_{jt}	–0.174	0.388	–0.265	0.378
$Network_{jt}$	0.950	0.545*	1.209	0.676	$Network_{jt}$	0.927	0.638	1.246	0.670
time dummy	Yes		Yes		time dummy	Yes		Yes	
industrial dummy	Yes		Yes		industrial dummy	Yes		Yes	
No. of observations	11,222		11,089		No. of observations	11222		11,089	
No.of groups	4,424		4,359		No.of groups	4424		4,359	
Wlad chi² (prob>chi²)	0.0000		0.0000		Wlad chi² (prob>chi²)	0.0000		0.0000	
Rsq-within	0.0347		0.0104		Rsq-within	0.0351		0.0109	
between	0.3228		0.9001		between	0.3390		0.9081	
overall	0.2483		0.8518		overall	0.2607		0.8593	

Note: All variables are in logarithmic formulae, except dummy variables, i.e. RDD_{ijt}, BOI_{ijt}, $Subsidy_{jt}$; trade protection variables, which are in percentage points; and $skill_{ijt}$ XOR_{jt} MPR_{jt}, which are in ratios. *, **, and *** indicate the significant level at 10, 5, and 1 percent, respectively. Coef. represents coefficient while Std.Err is standard error.

Source: Author's calculations.

Notes

1 Due to data limitations, other non-tariff measures (NTMs) such as sanitary and phytosanitary and technical barriers to trade cannot be included in the productivity analysis. Most previous studies (e.g., Jongwanich, 2009; Kee, Nicita and Olarreaga, 2009; Cadot and Gourdon, 2015; Ing and Cadot, 2017; Cadot, Gourdon and van Tongeren, 2018; Bratt, 2017) examined impacts of NTMs on trade, either prices or quantity, or both.

2 For example, ASEAN–China, which was signed into effect in 2003, started with an early harvest program to eliminate tariffs on fruits and vegetables. Then tariffs for other products continued to be reduced and eliminated. In 2009, tariff reduction in Thailand under this FTA was 33.3 percent before increasing to 90 percent in 2010. In China, tariff reduced by 60 percent in 2009 and by more than 90 percent in 2010. In almost all FTAs, tariff reductions tended to be higher and faster in manufacturing than in agricultural products. Among FTAs, the speed and magnitude of tariff reductions were different. For example, tariff reductions under AANZFTA (ASEAN–Australia–New Zealand) were faster than AIFTA (ASEAN–India), which came into effect in 2010. Among all the FTAs in effect in Thailand, average tariffs under TNZCEP (Thailand–New Zealand), TAFTA (Thailand–Australia) and AANZFTA (ASEAN–Australia–New Zealand) were the lowest, at 0.64, 1.10, and 1.18 percent in 2014–2016, respectively; while the TPCEP (Thailand–Peru) and TCFTA (Thailand–Chile) average tariffs were the highest, standing at 9.50 and 6.50, respectively.

3 However, Rodriguez and Rodrik (2001) and Harrison and Hanson (1999) criticized previous empirical works, mostly on the grounds of model misspecification, inappropriate data sets, and unsuitable econometric techniques. Such critics argue that there is no credible evidence to support trade liberalization having positive consequences for economic growth.

4 Subsequently, an additional condition is added to justify the protection–growth nexus, that is the cumulative net benefits provided by the protected industry should exceed the cumulative costs of protection. This is known as the Mill-Bastable test (Corden, 1997).

5 A number of empirical studies show a positive relationship between export diversification and productivity/economic growth (e.g., Agosin, 2006; Feenstra and Kee, 2008; Calderon and Schmidt-Hebbel, 2008). While most previous studies examine export diversification and exports using cross-country analysis, Jongwanich (2020) examines this issue at the industry level using Thailand as a case study during 2002–2016. The results show that the effects of export diversification on economic growth vary across industries. Export diversification helps boost growth only in some sectors, including electronics, automotive and chemicals, and plastic and rubber, while in the processed food and textiles and apparel industries, specialization matters more in promoting growth. In almost all industries, a non-linear relationship between diversification and economic growth is not revealed, except in textiles and apparel. The role of extensive margins, both in terms of new products and new market destinations, in promoting economic growth in Thailand is limited.

6 They include macroeconomic stability; openness to trade, investment, and technology; a stable and business-friendly commercial environment; mechanisms that ensure broad-based, inclusive development; and investment in supply-side capabilities, ranging from infrastructure to human capital (Hill and Kohpaiboon, 2017).

7 Later works such as Melitz and Ottaviano (2008) or Bernard, Redding, and Schott (2011) propose different mechanisms of the selection effect. The former focuses on the fact that liberalization increases demand elasticity and lower markups. This

forces unproductive firms to exit the market. In the latter, the selection effect takes place between ex ante endowment-driven comparative advantage and disadvantage industries.

8 For example, Kessing (1983), Kessing and Lall (1992), Westphal, Rhee, and Pursell (1979), Aw and Batra (1998), Wortzel and Wortzel (1981), Hobday (1995), Pietrobelli (1998), Pack and Saggi (1997), and Nelson and Pack (1999).

9 Note that as argued in the well-known creative destruction thesis by Schumpeter, a highly concentrated industry may give firms a greater incentive to innovate, so that the coefficient associated with producer concentration could become positive.

10 Note that the interaction terms between the actual level of sales concentration ratios and trade protection ($CON_{j,t}$ * $trade\ protection_{j,t}$) are also employed as an alternative to test the hypothesis of whether the effectiveness of industrial policy may be conditioned by the level of domestic competition.

11 Note that the results when the LP approach is applied are similar to those referred to in Olley-Pakes (1996), but the former yields better diagnostic results. It is noteworthy that the key difference between the LP and OP approaches is that the former uses intermediate inputs in estimating productivity, while the latter uses investment. Levinsohn and Petrin (2003) point to the disadvantage of using investment in estimating TFP as in the OP approach, especially in terms of data exclusion, due to no investment being reported in many plants.

12 The 11 industries are composed of rubber tires and tubes; retreading and rebuilding of rubber tires (ISIC 2511); manufacture of other rubber products (ISIC2519); manufacture of plastics products (ISIC 2520); manufacture of basic iron and steel (ISIC 2710); manufacture of structural metal products (ISIC 2720); manufacture of structural metal products (ISIC 2811); manufacture of tanks, reservoirs, and containers of metal (ISIC 2812); manufacture of steam generators, except central heating hot water boilers (ISIC 2813); treatment and coating of metals; general mechanical engineering on a fee or contract basis (ISIC 2892); manufacture of cutlery, hand tools, and general hardware (ISIC 2893); and manufacture of other fabricated metal products n.e.c. (ISIC 2899).

13 Note that this is applicable for all four alternatives of ERP_{jt}, though Tables 6.2 and 6.3 show the results only when ERP concerning the water in tariffs encountered by exporting firms is employed in the model.

7 Globalization and labor market outcomes

While the previous chapter examined the impact of trade and investment liberalization on productivity improvements in Thailand, this chapter investigates the effect of such liberalization on labor market outcomes, including a shift toward hiring more skilled labor and creating a wage skilled premium. The status of the trade–labor outcomes nexus remains an ongoing debate in the context of economic globalization. On the one hand, the standard neoclassical trade model postulates that opening up to international trade would lead to specialization across countries according to their comparative advantages. For developing countries like Thailand, whose comparative advantage is still determined by an abundance of unskilled workers, embracing international trade would potentially raise the price of unskilled worker-intensive goods due to export opportunities, while simultaneously causing a decline in the price of skilled-labor intensive products as a result of the ensuing import surge. Changes in relative prices would affect the relative demand for skilled and unskilled workers. Therefore, it is expected that the wage gap between unskilled and skilled workers (henceforth referred to as the wage premium) would decline and generate a favorable effect on income equality (see for example Mishra and Kumar, 2005; Bigsten and Durevall, 2006; Amiti and Cameron, 2012).

On the other hand, the empirical evidence from a number of studies (such as Galiani and Sanguinetti, 2003; Attansaio et al., 2004 and Goldberg and Pavcnik, 2007) shows that globalization increases the wage skilled premium within industries, within firms, and at the economy-wide level, especially in developing countries. One explanation is that in developing countries, the unskilled labor-intensive sectors were protected most prior to trade reform. In other words, the protection of such sectors induces the demand for unskilled workers at a rate greater than would be expected under normal free trade circumstances. Hence, liberalizing trade causes resources, including labor, to be reallocated, and the wage gap increases (see also Currie and Harrison, 1997, Hanson and Harrison, 1999).

In addition to the ongoing debate concerning the effects of liberalization on skilled labor and wage premiums, the phenomenon of the expanding global production network has brought the issue regarding developing countries' labor market outcomes. Given the fact that developed countries are relatively

DOI: 10.4324/9781003144076-7

well endowed with skilled labor, activities outsourced to developing countries within global production networks tend to be unskilled-labor intensive. From this fact, it can be seen that on the one hand, such a phenomenon could reduce the wage skill premium in developing countries. The shift in favor of the demand for skilled workers in developed countries would imply an increase in the demand for unskilled labor in developing countries. However, if such a phenomenon persists, this might result in a country becoming a low-skilled or low-quality worker trap. This would raise concerns over overall economic development as well as sustainable economic growth within such developing countries, or the so-called middle-income trap.

On the other hand, skilled workers and wage premiums could increase as a result of the phenomenon of global production networks. As argued by Feenstra (2004), Leamer, Schott, and Peter (2005) and Kiyota (2012) regarding factor intensity reversals, firms operating in developing and developed countries are facing different cones of production. For a given activity, it can be regarded as unskilled in the North, but skilled and labor intensive in the South. In other words, unskilled labor-intensive activities outsourced by firms in developed countries might require relatively skilled workers in developing countries to perform. Therefore, it is possible that the demand for skilled to unskilled workers increases simultaneously in both developing and developed countries, so that an increase in the wage skill premium could also be observed in developing countries.

Despite their immense policy relevance, studies focusing on these issues, particularly the latter one, are rare in the Southeast Asian context. There are numerous studies examining the themes, especially persistence in the wage gap, but research attention has either been on developed or Latin American developing countries.[1] With this gap in the empirical literature, in this chapter our aim is to examine the impact of globalization on workers' skills and wage premiums using the firm-level data of Thai manufacturing to construct a case study. As in the previous chapter, trade and investment policies, as well as the proxy of global production sharing, are included to examine their impact on labor market outcomes. The tariff protection applied here is in terms of both nominal and effective tariffs. For nominal tariffs, the effects on finished (output) and raw material (input) products are separately investigated. In terms of effective rates of protection (ERP), both a traditional ERP measure and a measure incorporating possible water in tariff – that is, the tariffs imposed are not effective in protecting firms in industries – are applied. The effect of FTAs is also considered in examining the impact of ERP on workers' skills and wage premiums.

7.1 Analytical framework

This section lays down the analytical framework illustrating the effect of globalization on wages and workers' skills. The standard neoclassical trade model postulates that opening up to international trade would lead to specialization across countries according to their particular comparative advantages. For developing countries whose comparative advantage is determined by the abundance of unskilled workers, opening up to international trade would raise the price of unskilled worker-intensive goods due to export opportunities. In contrast, these countries would experience a decline in the price of the skilled-labor-intensive products as a result of the resulting import surge. Changes in the relative prices would affect the relative demand for skilled and unskilled workers. Therefore, it is expected that the wage premium between skilled and unskilled workers would decline. This would generate a favorable effect on reducing income equality.

Such a theoretical postulation is not always supported empirically. In some cases, the gap has even widened (Goldberg and Pavcnik, 2007. Davis and Mishra, 2007). Earlier explanations for the persistence of wage premiums emphasized friction in the labor market that constrains resource reallocation and the structure of protection. Nonetheless, they could not satisfactorily explain the persistence of the wage premiums observed. For example, imperfect labor mobility could be at best a short-term phenomenon and be less important over time. It is unlikely to be different across firms. Interestingly, the premium is also observed not only at the economy-wide level but also within industries and among firms (Pavcnik et al., 2004; Verhoogen, 2008).

Recently, the research direction has shifted toward a greater emphasis on the role of firm heterogeneity. Pioneered by Melitz (2003), many researchers have been paying particular attention to the fact that firms in a given industry can have different productivity levels and so behave noticeably differently. This includes the wages paid to their workers. In particular, Amiti and Davis (2011) developed a general equilibrium model that features firm heterogeneity as well as empirical evidence derived from the Indonesian economy to explain the persistence of wage premiums. While the model workhorse is based on Melitz (2003), where firm productivity is not unique, Amiti and Davis (2011) added two important features to the existing literature. First, a fair-wage constraint is incorporated into the model in order to forge a link between wages paid and firm performance. That is, workers employed in high-productivity firms receive higher wages. Secondly, the firm heterogeneity dimension in Amiti and Davis (2011: 5) could come from firms themselves and modes where firms are globally integrated, including exporting final goods, importing intermediates, or both. The key theoretical proposition in Amiti and Davis (2011) is that the wages paid by firms exporting final goods, importing intermediates, or doing both are higher than in firms without direct links to global markets. The proposition is extended to examine the wage premium–trade liberalization nexus in Amiti and Cameron (2012).

In Amiti and Cameron (2012),[2] the effect of input and output tariffs is also highlighted along with firm-specific factors and modes where firms are globally integrated. The effect revealed in the study is to a large extent in line with the Stopler-Samuelson theorem; that is, domestically produced inputs are perfect substitutes for imported ones and input production is more skilled-worker intensive, while cutting input tariffs encourages firms to import instead of buying locally produced products. This reduces the demand for skilled workers and, *certaris paribus*, the wage premium would be narrower. The effect of output tariffs would have the same result. The only difference is that the switching effect takes place when firms are shifting production between multiple products with different factor intensities. Otherwise, firms must continue in business due to the presence of sunk and fixed costs in the export business so that the insignificant effect of output tariffs is hypothetical only. In addition, Amiti and Cameron (2012) introduced interaction terms to capture the extent to which firms are engaged in international businesses (export and import) and their effects on wage premiums over and above giving input and output tariffs.

Apart from considering firm heterogeneity, a number of empirical studies have tried to determine the role of wages and workers skills based on the job competition model proposed by Thurow, 1975 and 1979 (see, for example, Groot and Maassen van den Brink, 2000; Borghans and de Grip, 2000; and Büchel and Pollmann-Schult, 2001). The model involves a matching process in which two queues are considered, i.e., the person queue and the job queue. The latter is arranged by the skills required by firms, while the former is sorted by the qualifications they have acquired. The key implication from this framework is that enlarging the pools of formally educated skilled workers or offering public training programs to encourage skill formation without considering the job queue offered by firms could result in over-education. Firm characteristics are crucial in influencing the job queue, and they vary their assessment of a given (skilled) worker by his/her anticipated benefits to operations. Under this framework, the wages for specific occupations possibly do not react commensurately to changes in demand and supply within the labor market.

In addition, similar to installing machinery and equipment, hiring skilled workers incurs fixed and sunk costs to firms as recruitment processes are rather complicated and costly (Blatter et al., 2012). Once a candidate is hired, it still takes time, and possibly extra training, for him or her to become a fully productive employee (Blatter et al., 2012; Ejarque and Nilsen, 2008; Manning, 2006; and Merz and Yashiv, 2007). Conceivably, skilled workers and physical capital are complementary to each other (Greliches, 1969; Krusell et al., 2000). This could be connected to efforts by firms to implement industrial upgrading and innovate, as such firms are more likely to hire skilled workers. This is known as the skill-enhancing trade hypothesis. The decision of firms to hire skilled workers is also related to the business environment within which they operate. There is evidence that firms in a competitive environment tend to be active in productivity improvements, so they are likely to hire skilled workers or commit to in-house skill formation (Hall and Soskice, 2001; Sivadasan, 2009; Aghion et al., 2015). Note that the competitive environment could emanate from domestic markets, abroad or both. All in all, it suggests that firm- and industry-specific factors have an impact on the demand for skilled workers.

Another branch of the literature focuses on the effect of participating in global production sharing. As mentioned above, global production sharing refers to the circumstance whereby whole production processes are divided into separated stages and economically allocated to various locations according to competitiveness. There are three phases in the global spread of production sharing (Athukorala and Kohpaiboon, 2010; Athukorala and Nasir, 2012). It begins with the two-way exchange between the home and host countries, where P&Cs assembly/testing in the host country are incorporated into the final assembly of goods in the home country. The next phase concerns component assembly networks encompassing many host countries, whereas R&D, final assembly, and headquarter functions are still retained in the home country. The final phase incorporates the fully-fledged production networks involving component production/assembly/tenting and final assembly encompassing host countries. In the last phase, only R&D and headquarter functions are performed predominantly in the home country. This affects the relative demand for skilled and unskilled workers in countries participating in global production sharing.

The effect of relative worker demand in developing countries is ambiguous. On the one hand, relatively unskilled-labor-intensive activities are located in developing countries according to their comparative advantages. When specialization in the global production network continues, the wage gap between unskilled and skilled workers contracts. Nonetheless, the discussion above makes the implicit assumption that there is a single production cone where there is no factor intensity reversal and that firms in developed and developing countries face the same factor endowment vector. In reality, a number of studies point out that such an assumption is rather restrictive (Leamer and Levinsohn, 1995; Feenstra, 2004; Leamer et al., 2005; and Kiyota, 2012). For example, while much of the footwear in the world is produced in developing countries, the US retains a small number of plants, such as New Balance, which has a plant in Norridegewock, Maine. Operations there are fully computerized. This is a far cry from plants in Asia and China, which use traditional production technology and rely heavily on workers. Therefore, for any given activity, it can be regarded as unskilled in the US, but skilled and labor-intensive in the southern nations, such as those mentioned. Unskilled-labor-intensive activities outsourced by firms in developed countries might require relatively skillful workers in developing countries in order to be performed. Therefore, it is possible that the demand for skilled to unskilled workers increases in both developing and developed countries simultaneously, so that the wage gap continues to be persistently observed.

7.2 Wages and employment in Thai manufacturing: First look

In consideration of employment and wages in Thailand, Figure 7.1 shows that the share of employment to total employment in the manufacturing sector remained relatively stable at around 17 percent during 2014–2019, while the share of employment in the service sectors increased to around 52 percent from 2014 onward, up from around 47 percent in 2011. Within the agriculture sector, the share of employment declined significantly from 40 percent in 2013 to around 32 percent in 2019. Using a labor force survey,[3] it can be observed that most of the workers moving to the service sector originate from the agricultural sector, instead of manufacturing. Average wages, measured by Baht per month, in the manufacturing and service sectors increased sharply in 2011–2014, before appreciating just gradually during 2015–2019. In contrast, wages in agriculture

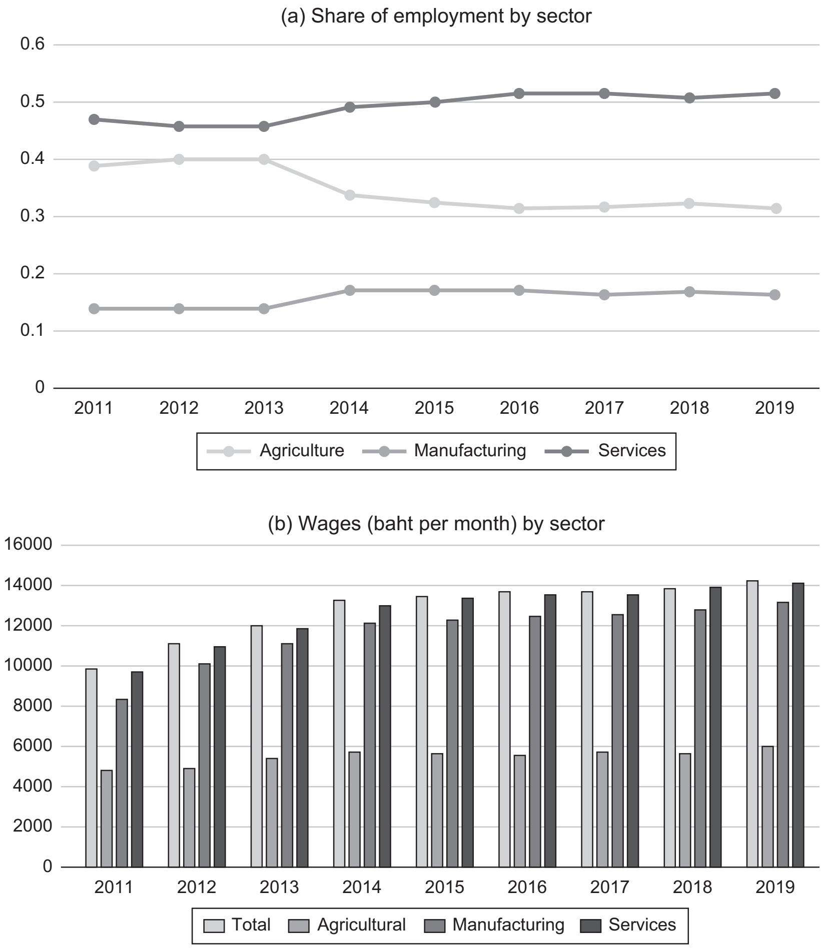

Figure 7.1 Employment and wages in Thailand, by industry. Source: National Statistical Office, Thailand

remained relatively low and stable post-2011. In the service and manufacturing sectors, the wage rate was around twice that of agriculture. Agriculture is the only sector in which the wage rate in some years, such as 2015 and 2018, was adjusted to be lower than headline inflation.

In the manufacturing sector, more than 30 percent of workers worked in food and beverages, followed by clothing and textiles and electronics. Comparing 2012 and 2017, employment increased noticeably in the food sector, while a declining trend was observed in some sectors, including clothing and textiles, automotive, and electronics (Figure 7.2). In other sectors, employment during these two periods remained relatively stable. The picture for wages is different in sectors with a relatively lower share of labor, such as automotive, chemicals and

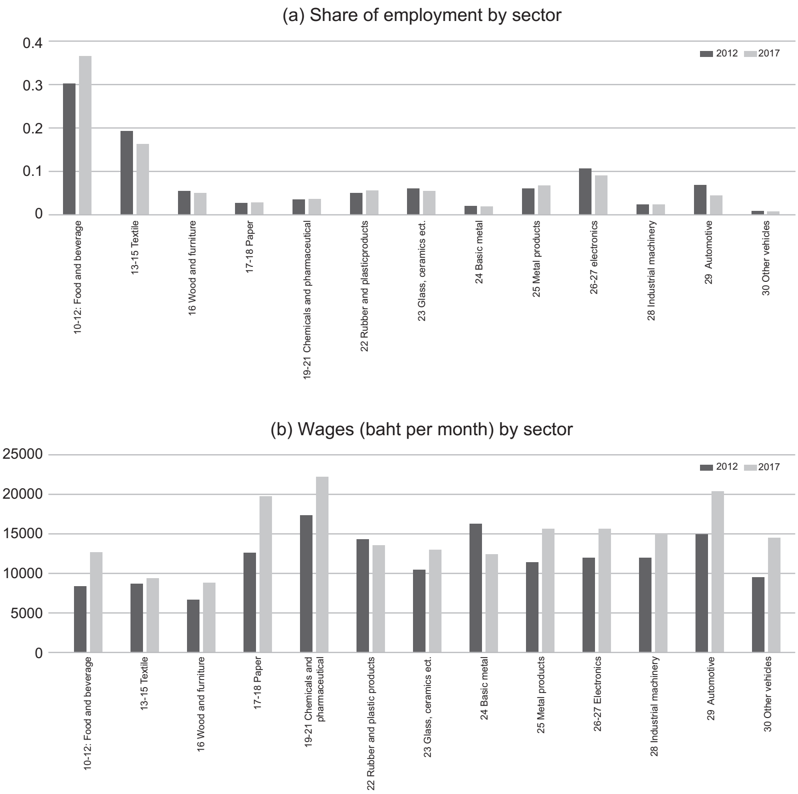

Figure 7.2 Employment and wages in the Thai manufacturing sector. Source: National Statistical Office, Thailand

pharmaceutical, paper, and electronics, which tended to offer higher wages. In the clothing and textiles and food sectors, workers received lower wages (as well as net income),[4] while workers in automotive, chemicals and pharmaceutical, and paper were paid the highest.

Based on Thailand's industrial censuses, wage differentials across industries in Thailand were observed during 2006–2016 (Figure 7.3). The non-negative value of wage differentials confirms that wages paid to white-collar staff were higher than those paid to blue-collar employees across all industries. The low density of wage premiums shown in 2011 and 2016 implies that wage premiums tended to increase in many industries. Excluding industries where the ratio of the wages associated with skilled workers to that with unskilled exceeded 10,[5] wage premiums in 2006 on average stood at around 1.7, while those in 2011 and 2016 were around 1.9 and 2.0, respectively. The variance in the wage gap across industries also soared during this period, standing at 1.35 and 1.13, an increase from 0.90 in 2006. Although the wage gap increased, the pattern in the wage gap tended to be similar to a certain extent. It seems that labor-intensive industries, such as the processing of fruit and vegetables

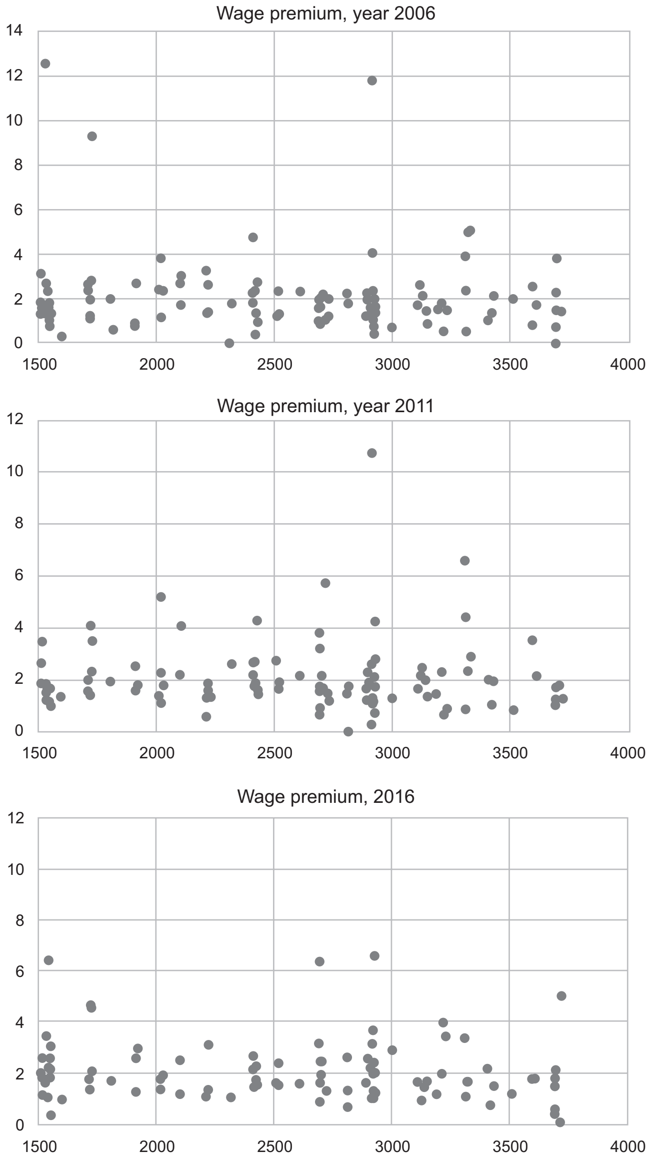

Figure 7.3 Wage premiums in Thai manufacturing, by industry during 2006–2016. Source: Author's calculation from Thailand's industrial censuses in 2006, 2011, and 2016

(code 1513); the manufacture of soft drinks (1554); the manufacture of carpets and rugs (1722); the manufacture of knitted and crocheted fabrics (1730); resource-based industries, e.g. the manufacture of basic iron and steel (2710); the manufacture of sugar (1542); the manufacture of basic chemicals (2411); and the manufacture of pharmaceuticals, medicinal chemicals, and botanical products (2423) tend to have a higher wage gap than capital-intensive industries, including the manufacture of motor vehicles (3410); the manufacture of bodies for motor vehicles (3420); the manufacture of other transport equipment (3599); and the manufacture of jewelry and related articles (3691). This could be because, in the latter group, such industries need more skilled workforces to work with capital-related tasks than unskilled, so most workers are categorized as skilled workers. Differences in white-collar and blue-collar wages are, therefore, limited in those industries. This finding indicates that it is crucial to control industry-specific factors in the empirical model. In addition to the industry level, Figure 7.4 shows the wage gaps experienced by firms during 2006–2016. The same picture has been derived from utilizing firm-level data, that is, wage premiums varied across firms in each industry and the premiums tended to increase during this period. This, to a certain extent, implies that the role of firm heterogeneity, involving such variables as firm size and mode of engaging international activities, tends to be crucial in determining the size of wage gaps.

Interestingly, although wage premiums tended to increase at both the firm and industry level during 2006–2016, the proportion of skilled to unskilled workers did not significantly alter during this period, especially when the industry level is considered. The scatter plot shown in Figure 7.5 demonstrates a similar pattern between skilled and unskilled workers in each industry during these three periods. The skilled–unskilled worker ratio on average slightly declined from 0.83 in 2006 to 0.73 in 2011 and picked up marginally to 0.76 in 2016, though the variance of this ratio declined throughout the periods observed. When considering this ratio with wage premiums and productivity (in Chapter 6), this may raise concerns in terms of moving Thailand toward Industry 4.0, in which more skilled workers need to be promoted to work with increasingly sophisticated technology. Productivity levels in 2016, though improved when compared to 2011, seemed to be unchanged when compared to those of 2006. Evidence of rising wage premiums without shifting the ratio of skilled to unskilled workers may eventually lead to a significant widening in income inequality and adversely impact the path toward sustainable economic development. The ratio of skilled to unskilled workers when firm-level data is considered confirmed the evidence provided at the industry level. In particular, it seems that the ratio in 2006 was lowered than in 2011 and 2016 (see Figure 7.6). Whether trade and investment policies have contributed to this development is explained later in the empirical result section.

It is noteworthy that the nature of the Thai labor market is largely weakly unionized. Establishing labor unions, as well as any form of the labor movement, has been allowed since 1978, when the Labour Act was amended, allowing firms to set up labor unions under the auspices of the Labour Relations Law. However, so far, any threat regarding labor unions has been of relatively little concern within Thai manufacturing. The relatively low level of human capital[6] in Thailand

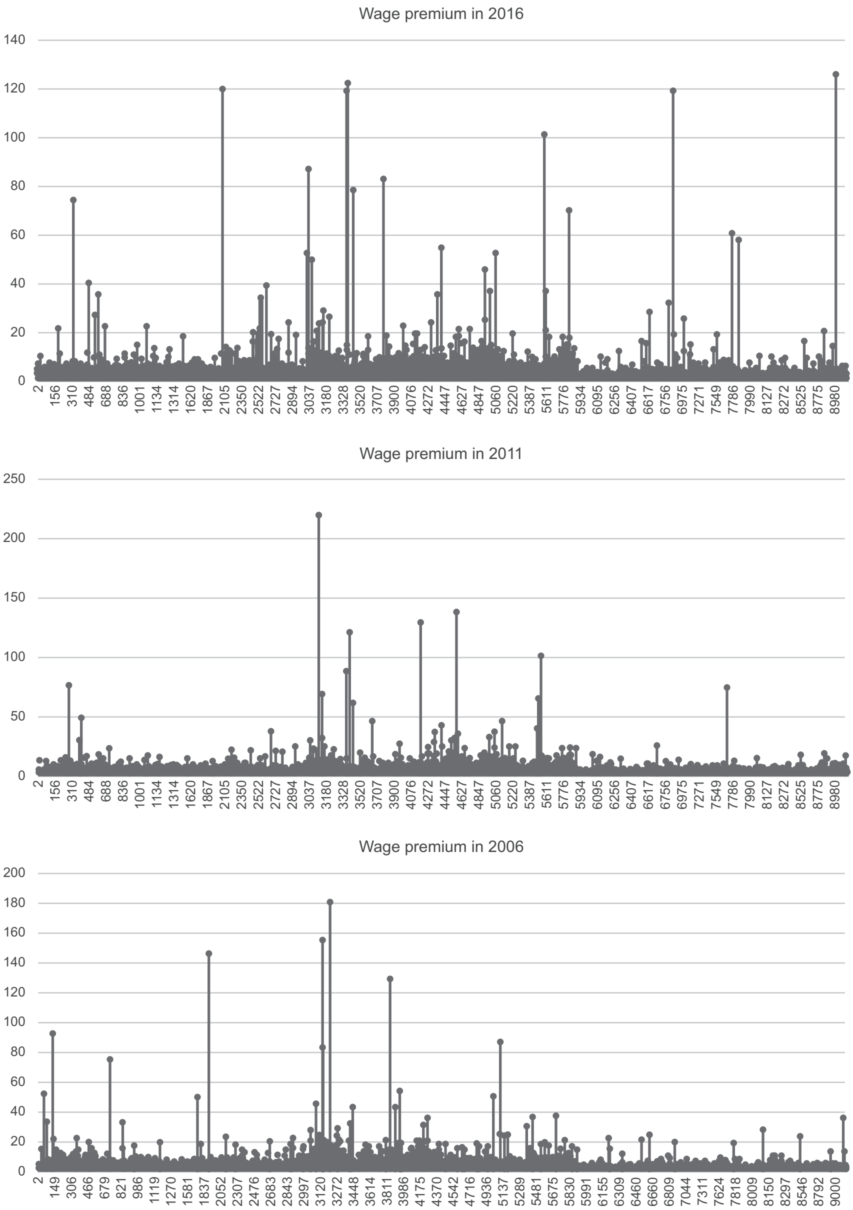

Figure 7.4 Wage premiums in Thai manufacturing, by firm during 2006–2016. Source: Author's calculation from Thailand's industrial censuses in 2006, 2011, and 2016

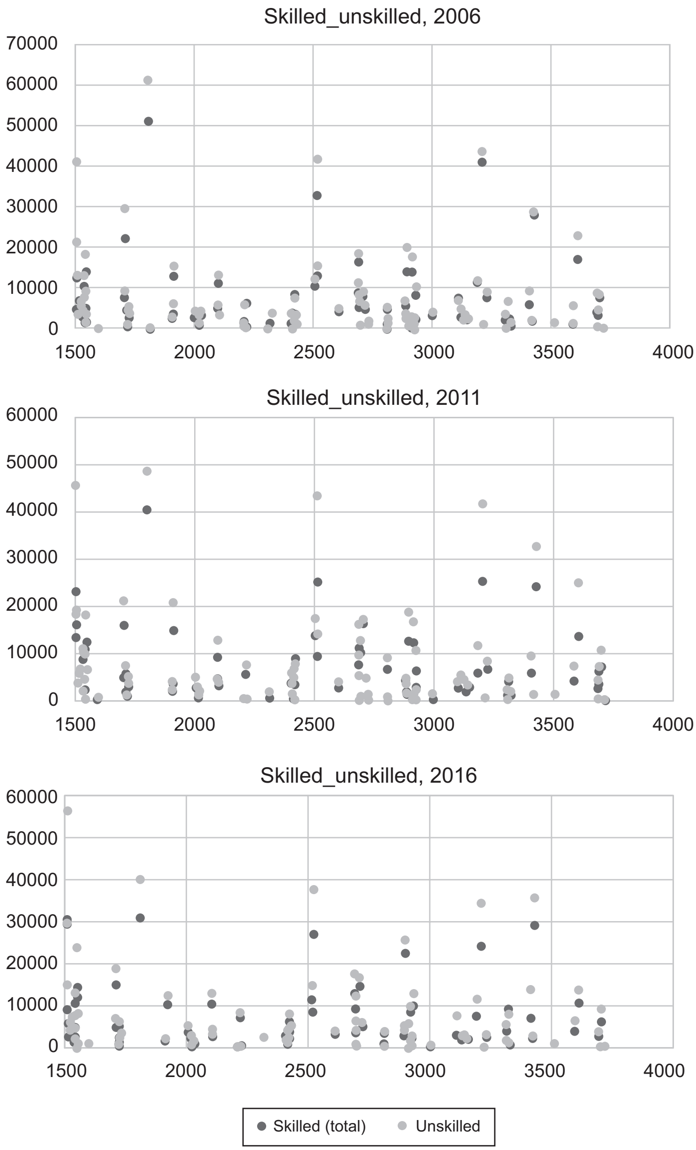

Figure 7.5 Skilled and unskilled workers in Thai manufacturing, by industry during 2006–2016. Source: Author's calculation from Thailand's industrial censuses in 2006, 2011, and 2016

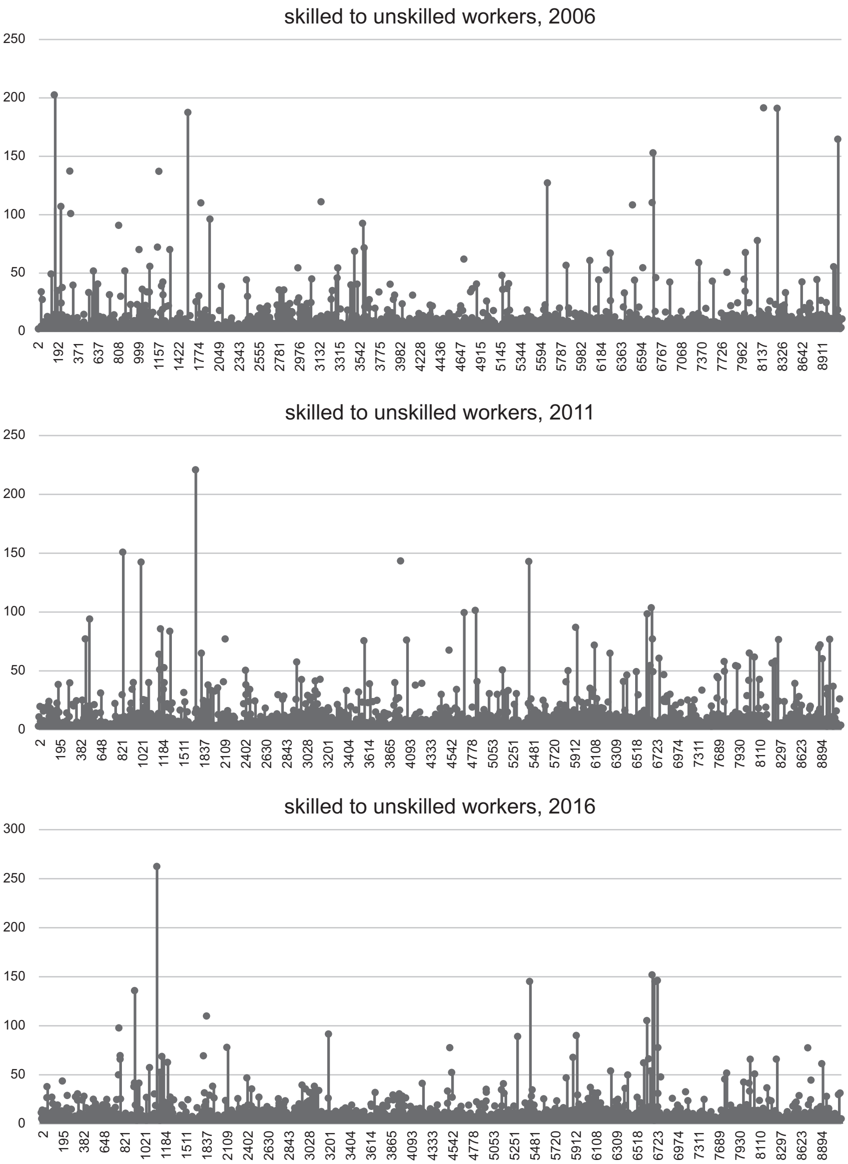

Figure 7.6 Skilled and unskilled workers in Thai manufacturing, by firm during 2006–2016. Source: Author's calculation from Thailand's industrial censuses in 2006, 2011, and 2016

could somewhat explain the lack of strong labor unions. The Thai government has set up a minimum daily wage with close consultation from the tripartite wage committee (employers, employees, and government officials) since 1973. It is revised every year, with some exceptions, to maintain the cost of living and labor demand conditions, and in January 2020, the minimum wage was set at a range of 313–336 Baht per day (around US$ 10–11.2 at exchange rate 30 Baht per US$). There is no restriction regarding labor mobility for Thai workers among sectors in Thailand, as mentioned in Chapter 3, based on the Foreign Business Act, introduced in 1999. However, there are some sectors in which foreigners are not allowed to engage in for special reasons, but most of them are in the agriculture/mining and service sectors. Restrictions relevant to manufacturing sectors are limited. Informal sectors seem to be significant in Thailand, as shown by the relatively low proportion of social security workers (under sections 33, 39, and 40 of the Social Security Act, which has been in force since 1990) in terms of the total labor force, accounting for only about 40 percent in 2018–2019. The significance of the informal sectors could influence labor market outcomes in the formal sectors, in particular by creating disincentives for workers to move up the positional ladder and gain a higher income. However, due to data limitations, this perspective will not be included in our analysis.

Regarding skills formation, the Department of Skill Development (DSD), Ministry of Labor is the agency in charge. This is conducted in addition to the efforts of formal education reform under the responsibility of the Ministry of Education. DSD's responsibility falls under the Skill Development Promotion Act BE 2545 (2002), amended in 2014.[7] The main role of the DSD is to enhance the skills of existing workers through two main activities. The first involves offering training programs focusing on skills formation implemented by the DSD. The programs are targeted at all workforces, including those yet to enter the labor market, those in the labor market, and those wanting to change their occupation. So far, the number of trainees in DSD programs has annually accounted for less than 500,000 workers with a declining trend now observed.[8] This accounted for less than 1.3 percent of the workforce. While training programs are set to cover all of the workforce as mentioned above, most training attendants comprise employees in labor markets. DSD also performs skills accreditation. There are two types of skills to be accredited, one is basic and the other a national skills test. Only the latter matters in terms of expected wage compensation. Noticeably, the range of skills covered in DSD training programs is rather wide, covering construction, industrial, mechanics, electrician, technician, industrial agriculture, and services skills. It seems that the true purpose of the training programs is to offer alternative skills for workers as an insurance policy. In particular, workers who are unsecure within their current job and want to work in the service sector or set up their own micro-enterprises are attracted to such training programs. Their motivation to enroll did not seem to be involved much with skills enhancement. Recently there were changes in the training activities observed on the DSD website (March 6, 2019) to place firms in a better position to harness the Industry 4.0 revolution. There are many activities designed to enhance firm productivity, especially in the area of automation skills. The effort includes the adoption of programmable logic controller (PLC) in manufacturing, computer coding for machines, the installation of the internet-of-things (IoT) technology within agriculture plantations, embedded system design for industry, and 3D animation. At this present point in time, it remains difficult to assess the relative effectiveness of such initiatives.

The second consideration concerns financial and tax incentives for firms to undertake in-house training and promote skill formation. In particular, a 200 percent tax deduction on training expenses and a tax exemption on the machinery and equipment used for the training programs are granted. This is associated with the assistance offered by the DSD, including direct loans to enterprises undertaking skill enhancement programs, consultation services on skills enhancement, and advice on training programs from the Skill Formation Fund offices under the Skill Development Promotion Act.

7.3 The empirical model

The empirical model employed in Amiti and Cameron (2012) is used as a point of departure. The wage premium $(Ws/Wu)_{ijt}$, the ratio of wage compensation of skilled workers to unskilled workers is a function of a set of firm-specific factors including export (exp_{ijt}) and import (rim_{ijt}) status, firm ownership (own_{ijt}), and firm size ($size_{ijt}$).[9] The extent to which firms participate in the global economy would influence their decision to hire skilled workers and affect the wage premium. There are two aspects of global participation present in this study. First, firms involved in international trade (either exporting or importing or both) are likely to hire more skilled workers. All other things being equal, exporting firms face more intense competition. As echoed in the firm heterogeneity literature, exporting firms must surpass productivity thresholds to survive in the face of competition. Hence, these firms might hire more skilled workers to enhance their productivity as opposed to domestic-oriented firms (Greenaway et al., 1999; Milner and Wright, 1998; Hine and Wright, 1997; Roberts and Skoufias, 2007). Importing often involves complicated procedures ranging from selecting suppliers, negotiating price and quality, and understanding the technology embedded in imported products, together with dealing with documentation and customs officials. Hence, importing firms are also likely to hire more skilled workers. To measure a firms' market orientation, the export–output ratio (exp_{ijt}) and the proportion of imported to total inputs (raw materials and intermediates) (rim_{ijt}) are used. As skilled workers are expected to increase along with the participation of firms in the global market, the expected signs of these two variables in influencing wage premiums are both positive.

Another aspect of global participation concerns firm ownership (own_{ijt}). Clearly, foreign firms are more likely to hire skilled workers. This is because firms investing abroad are often associated with certain proprietary assets (Caves, 2007). This is done to ensure the established affiliates can compete with their indigenous counterparts, which are more familiar with the local business environment in host investment-receiving countries. To harness the associated advanced technology, skilled workers are needed, and this will possibly widen the wage skill premium.

As argued in the innovation literature (such as Pavitt et al., 1987; Vaona and Pianta, 2008), innovation decision making is positively related to a firm's size ($size_{ijt}$). This is based on Schumpeterian creative deconstruction, where larger establishments are in a better position to cover the fixed costs incurred from innovative activities (Schumpeter, 1942). As the rational to hire skilled workers is similar to innovation activities to some extent, it is expected that the larger the firm's size, the more likely it is to hire skilled workers and widen the wage premium (Blatter et al., 2012; Ejarque and Nilsen, 2008; Manning, 2006; Merz and Yashiv, 2007). In addition, four extra firm-specific variables are introduced in this study. They are the capital–labor ratio ($klratio_{ijt}$), capturing the degree of capital deepening at the plant level; the ratio of female to male workers ($female\_male_{ijt}$), to examine any possible gender bias; firms investing in research and development (RD_{ijt}); and firms obtaining BOI investment incentives (BOI_{ijt}).

Capital deepening ($klratio_{ijt}$) by firms potentially affects the demand for skilled workers and thereby wage premiums, but the nature of such an influence is inconclusive. It can be either positive or negative, depending on how physical capital and skilled workers interact with each other. When skilled workers are likely to be complemented with physical capital, a positive relationship of this variable with wage premiums is expected. Otherwise, it could be negative. A firm's capital deepening is measured by the proportion of fixed assets at the beginning of a period to total workers. R&D activities by nature are skilled-worker intensive, so that firms committing to R&D activities (RDD_{ijt}) are likely to hire more skilled workers and widen the wage gap between skilled and unskilled employees. As shown in the previous chapter, to measure RD_{ijt}, two proxies are used as alternatives. The first is the binary dummy variable (RDD_{ijt}), which is equal to one when establishments commit to R&D investment, whereas the second is the ratio of R&D expenditure to total sales (RDS_{ijt}). BOI-promoted establishments (BOI_{ijt}) are included in this study and are expected to have a positive relationship with wage skill premiums. Obtaining BOI investment incentives is *de facto* compulsory for foreign plants in order to overcome constraints involved in operating a business in Thailand, and indigenous firms who apply for BOI promotion privileges are likely to be exporters. As mentioned earlier, these firms are likely to engage more with skilled labor, thereby widening the wage skill premium.

Note that since the definition of blue- and white-collar workers in deriving their corresponding wages in a micro dataset can vary from one to another, dataset-specific aspects in this regard must be taken into consideration. For Thailand's industrial censuses, the number of blue-collar workers employed for operational jobs is further disaggregated into skilled and unskilled workers. The former refers to supervisors who have long experience and are skillful at monitoring production lines, and so should be classified as white-collar workers. Unfortunately, in the dataset, wage compensation paid to operational workers is not separate, and this makes it impossible to re-define a more precise wage compensation picture of true white-collar employees. Hence, to mitigate this problem, $skill\_total_{ijt}$, the ratio of skilled to total production workers, is introduced as a measure controlling firm-specific variables within the wage premium equation. A higher value of

$skill\_total_{ijt}$ implies that the denominator in the wage premium includes some employees belonging to the actual skilled workers category.

Similar to Amiti and Cameron (2012), input and output tariffs are separated and included as industry-specific factors in determining the possible different effects of input and output trade liberalization on wage premiums. As mentioned earlier, when domestically produced inputs are perfect substitutes for imported goods and input production is more skilled-worker intensive, cutting input tariffs encourages firms to import instead of buying locally produced products. This reduces the demand for skilled workers and, *certaris paribus*, the wage premium becomes narrower. The effect of output tariffs would have the same result, whereby a reduction in output tariffs would lead to a decline in the wage skill premium. However, it is possible that a reduction in output tariffs would not have any significant impact because of the switching effect taking place when firms shift production between multiple products with different factor intensities. Otherwise, firms must continue in business due to the presence of the sunk and fixed costs involved in export businesses. The interaction terms between trade liberalization variables and the extent to which firms are engaged in international business (export and import) are introduced. A positive sign is expected for the interaction terms on wage skill premiums.

However, as shown in the previous chapter, both input and output tariffs are simultaneously crucial in affecting firm productivity, so the ERP is introduced to capture such effects. This variable could possibly affect the demand for skilled workers and wage premiums in the context of Thai manufacturing. Four alternatives of ERP are introduced in the model: ERP import-competing products (ERP_1_{jt}); ERP considering water in tariffs (ERP_2_{jt}); ERP capturing the effect of partial trade liberalization (ERP_3_{jt}); and ERP combining the effects of partial trade liberalization and water in tariffs (ERP_4_{jt}). The variable measurements of these four alternatives are shown in Chapter 6.

Engaging in global production sharing ($Network_{jt}$) can have implications for wage skill premiums. Ideally, to capture the effect of the global production network on wage premiums, details at the firm level (including whether firms are actually engaged in MNE production networks, whether they import tailor-made raw materials for specific customers, and so on) are needed. Unfortunately, such details at the firm level are not available to be included in the Thai dataset. As in Chapter 6, in this study, trade data is employed to capture the aspect of the international production network ($Network_{jt}$). It is measured by the ratio of parts and components (P&C) trade (the sum of imports and exports) to total goods trade. The list of P&Cs is derived from a careful disaggregation of trade data based on Revision 3 of the Standard International Trade Classification (SITC, Rev 3), extracted from the United Nations trade data reporting system (UN Comtrade database) (Kohpaiboon, 2010; Jongwanich, 2011 and 2017). Trade data compiled from the UN Comtrade is matched with the International Standard of Industrial Classification (ISIC, Rev 3).

The final departure from Amiti and Davis (2012) is to introduce additional industry-specific factor, i.e., industrial concentration (HHI_{jt}) instead of heavily relying on the industry-specific dummy. In general, industries with high barriers to entry are likely to be concentrated as it is relatively difficult for new entrants to become involved. Such industries are often capital and/or skill intensive. Hence, in a highly concentrated industry, the demand for skilled workers would be higher and a wage premium is observed. On the other hand, the effect of industrial concentration could be negative. As argued in the firm heterogeneity literature, productivity could vary across firms in a given industry. Over a period of time, low productivity firms would fade away, so the observed industrial concentration would be the outcome within which only high productive firms operate. This could occur in an unskilled-worker-intensive industry where developing countries like Thailand gain international competitiveness. In addition, it is possible that firms in a low-concentration industry face a higher competitive environment than those in a higher industrial concentration. As argued by Hall and Soskice (2001), Sivadasan (2009), and Aghion et al. (2015), firms in a competitive environment tend to be more active in implementing productivity improvements so they are likely to hire skilled workers or commit to in-house skill formation, thereby increasing wage premiums. In this study, industrial concentration is measured by the Hirschman Herfindahl index (HHI_{jt}), expressed in Equation (6.7) (Chapter 6).

All in all, the empirical model employed in this study is as follows:

$$\begin{aligned}(W_s / W_u)_{ijt} &= \alpha_0 + \alpha_1 exp_{ijt} + \alpha_2 rim_{ijt} + \alpha_3 own_{ijt} + \alpha_4 size_{ijt} \\ &+\alpha_5 klratio_{ijt} + \alpha_6 female\_male_{ijt} + \alpha_7 RD_{ijt} \\ &+\alpha_8 BOI_{ijt} + \alpha_9 skill\_total_{ijt} + \alpha_{10} outputtariff_{jt} \\ &+\alpha_{11} output\_\mathrm{exp}_{ijt} + \alpha_{12} inputtariff_{jt} \\ &+\alpha_{13} input\_rim_{ijt} + \alpha_{14} HHI_{jt} + \varepsilon_{ijt}\end{aligned} \tag{7.1}$$

$$\begin{aligned}(W_s / W_u)_{ijt} &= \alpha_0 + \alpha_1 exp_{ijt} + \alpha_2 rim_{ijt} + \alpha_3 own_{ijt} + \alpha_4 size_{ijt} \\ &+\alpha_5 klratio_{ijt} + \alpha_6 female\_male_{ijt} + \alpha_7 RD_{ijt} \\ &+\alpha_8 BOI_{ijt} + \alpha_9 skill\_total_{ijt} + \alpha_{10} ERP_{jt} \\ &+\alpha_{14} HHI_{jt} + \varepsilon_{ijt}\end{aligned} \tag{7.2}$$

where

$(Ws/Wu)_{ijt}$ = the wage premium of firm *i* in industry *j*, measured by the ratio between the wage compensation per workers of white collar (non-production and skilled production workers) to blue collar (operation workers) at time *t*
exp_{ijt} = the share of exports of firm *i* in industry *j*;
rim_{ijt} = the share of raw material imports of firm *i* in industry *j*;
own_{ijt} = the foreign share of establishment *i* of industry *j* at time *t*
$size_{ijt}$ = the size of firm *i* in industry *j* at time t measured by output
$klratio_{ijt}$ = the capital–labour ratio of firm *i* in industry *j* at time t
$female\_male_{ijt}$ = the ratio of female to male workers of firm *i* in industry *j* at time t

RD_{ijt} = R&D efforts by establishment *i* of industry *j* at time *t* measured by two alternatives:

(1) RDD_{ijt} = the binary dummy variable, equal to one when there are R&D efforts and zero otherwise,

(2) RDS_{ijt} = the R&D expense to sales of establishment *i* of industry *j* at time *t*

BOI_{ijt} = a zero-one binary dummy which equals one when an establishment *i* of industry *j* is BOI-promoted and zero otherwise

$skill\_total_{ijt}$ = the ratio of skilled production workers to total production workers of firm *i* in industry *i* at time *t*

$outputtariff_{jt}$ = output tariffs of industry *j* at time *t*

$inputtariff_{jt}$ = input tariffs of industry *j* at time *t*

$output\_exp_{ijt}$ = the interaction term between output tariff and export share of firm *i* in industry *j* at time *t*

$input\_rim_{ijt}$ = the interaction term between input tariff and the share of raw material imports of firm *i* in industry *j* at time *t*

ERP_{ij} = the effective rate of protection of industry *j* at time *t* measured by four alternatives as in Equations (7.1)–(7.4)

(1) ERP_1_{jt} = ERP import-competing products

(2) ERP_2_{jt} = ERP considering water in tariffs

(3) ERP_3_{jt} = ERP capturing the effect of partial trade liberalization

(4) ERP_4_{jt} = ERP combining the effect of partial trade liberalization and water in tariffs

HHI_{jt} = Hirschman Herfindahl producer concentration of industry *j* at time *t*

$\varepsilon_{i,j}$ = Disturbance terms of firm *i* in industry *j*

As shown in the previous section, considering wage premium *per se* would potentially not accurately capture the impact of globalization on employment and workers' skills. The wage skill premium could increase while the number of skilled jobs, compared to unskilled, stayed unchanged. Thus, to capture the impact of globalization on employment and workers' skills, three equations are introduced as follows:

$$\begin{aligned}(L_s / L_{Total})_{ijt} &= \alpha_0 + \alpha_1 exp_{ijt} + \alpha_2 rim_{ijt} + \alpha_3 own_{ijt} + \alpha_4 size_{ijt} \\ &+ \alpha_5 klratio_{ijt} + \alpha_6 vapw_{ijt} + \alpha_7 female\_male_{ijt} \\ &+ \alpha_8 RD_{ijt} + \alpha_9 BOI_{ijt} + \alpha_{10} Tariff_{jt} + \alpha_{11} HHI_{jt} + \varepsilon_{ijt}\end{aligned} \tag{7.3}$$

$$\begin{aligned}(L_s)_{ijt} &= \alpha_0 + \alpha_1 exp_{ijt} + \alpha_2 rim_{ijt} + \alpha_3 own_{ijt} + \alpha_4 size_{ijt} \\ &+ \alpha_5 klratio_{ijt} + \alpha_6 vapw_{ijt} + \alpha_7 female\_male_{ijt} \\ &+ \alpha_8 RD_{ijt} + \alpha_9 BOI_{ijt} + \alpha_{10} Tariff_{jt} + \alpha_{11} HHI_{jt} + \varepsilon_{ijt}\end{aligned} \tag{7.4}$$

$$(L_u)_{ijt} = \alpha_0 + \alpha_1 exp_{ijt} + \alpha_2 rim_{ijt} + \alpha_3 own_{ijt} + \alpha_4 size_{ijt}$$
$$+\alpha_5 klratio_{ijt} + \alpha_6 vapw_{ijt} + \alpha_7 female\_male_{ijt} + \quad (7.5)$$
$$\alpha_8 RD_{ijt} + \alpha_9 BOI_{ijt} + \alpha_{10} Tariff_{jt} + \alpha_{11} HHI_{jt} + \varepsilon_{ijt}$$

where L_s, L_u, and L_{total} are skilled, unskilled, and total workers, respectively.
$Tariff_{jt}$ represents both nominal, divided into input and output tariffs, and effective rates of protection (ERP_{jt}), which has four alternatives, as shown in Equations (7.1) and (7.2).

Note that skilled and unskilled workers are separately estimated in Equations (7.4) and (7.5), since from Figures 7.5 and 7.6, the variation between skilled and unskilled workers tends to be minimal in our study periods, so it is likely that the relationship between dependent – defined as the ratio of skilled to total workers – and all independent workers cannot be revealed. Total workers are used as denominators instead of unskilled workers, since several establishments revealed zero unskilled worker. Value added per worker ($vapw_{ijt}$) is included in Equations (7.3) and (7.4) to control for the supply side in determining the employment equilibrium, while other dependent variables represent demand-side controlled variables. The non-linear relationship between dependent and independent variables, especially firm size, capital–labor ratios, and market orientation, are taken into consideration in the analysis.

As our dependent variable is censored to zero, denoting that it cannot be of negative value and there are a number of zero observations, the standard log-linear panel-estimation model (fixed and random effect) is not applicable and would possibly lead to bias and inconsistent estimators. To deal with several zero skilled/unskilled labor variables, our econometric procedure in this study uses Poisson pseudo-maximum-likelihood (PPML) and a negative binomial (NB) model estimation. The latter is more flexible, as argued by Burger et al. (2009), as the conditional mean and variance of the distribution are not necessarily equal in the latter model, while in the former a restrictive assumption whereby the conditional mean and variance of the distribution are equal needs to be applied. In order to redress the potential endogeneity of the tariff and value-added variable, the control function approach (see Lin and Wooldridge, 2019) for panel data with PPML and NB is applied in this study.[10] Note that the data set used in this chapter is derived from the Thai industrial census, conducted by the National Statistical Office and, as shown in the previous chapter, three censuses are included in the study: 2006, 2011, and 2016. The data used in the empirical model is summarized in Appendices 7.1 and 7.2.

7.4 Results

Tables 7.1, 7.2, and 7.3 present the empirical results concerning employment and wages. Column A in Table 7.1 displays the results in which input and output tariffs are included in the model separately in examining the ratio of skilled to

Table 7.1 Empirical results: The ratio of skilled to total workers

	Column A		Column B		Column B1		Column C		Column C1		Column D		Column E		Column F	
	Skill to total workers		Skill to total workers		Skill to total workers		Skill to total workers		Skill to total workers		Skill to total workers		Skill to total workers		Skill to total workers	
	Coef.	Std.Err	Coef.	Std.Err	Coef.	Std.Err	Coef.	Std.Err	Coef.	Std.Err	Coef.	Std.Err	Coef.	Std.Err	Coef.	Std.Err
own_{ijt}	0.485	0.180***	0.648	0.289**	0.697	0.312**	0.654	0.289**	0.700	0.310**	0.676	0.295***	0.680	0.297**	0.524	0.206**
exp_{ijt}	−0.104	0.259	−0.386	0.351	−0.489	0.395	−0.383	0.349	−0.481	0.393	−0.501	0.378	−0.496	0.379	−0.374	0.312
exp_{ijt}^2	−0.551	0.313*	−0.397	0.276	−0.302	0.293	−0.366	0.268	−0.276	0.286	−0.128	0.274	−0.142	0.273	−0.128	0.277
rim_{ijt}	0.030	0.083	0.250	0.122**	0.266	0.129**	0.229	0.117**	0.244	0.124**	0.190	0.113*	0.191	0.113*	0.135	0.083
$klratio_{ijt}$	−0.261	0.212	−0.542	0.366	−0.606	0.396	−0.549	0.365	−0.609	0.394	−0.565	0.374	−0.571	0.377	−0.369	0.255
$klratio_{ijt}$^2	0.020	0.014	0.039	0.025	0.044	0.026	0.039	0.024	0.043	0.026	0.040	0.025	0.041	0.025	0.027	0.017
size_{ijt}	1.384	1.024	2.804	1.734	3.074	1.86*	2.769	1.729	3.025	1.849	2.829	1.757	2.849	1.769	1.970	1.23
$size_{ijt}$^2	−0.009	0.007	−0.020	0.013	−0.022	0.014	−0.020	0.013	−0.022	0.014	−0.021	0.013	−0.021	0.013	−0.014	0.009
$female\_male_{ijt}$	0.005	0.003	0.001	0.004	0.003	0.005	0.003	0.004	0.004	0.004	0.007	0.003*	0.007	0.004*	0.006	0.003
RDD_{ijt}	−0.052	0.034	−0.099	0.047**			−0.100	0.047**								
RDS_{ijt}					0.508	0.281*			0.478	0.278*	0.434	0.265*	0.438	0.267*	0.324	0.200*
BOI_{ijt}	−0.072	0.033**	−0.090	0.042**	−0.115	0.053**	−0.088	0.042**	−0.112	0.053**	−0.099	0.0499**	−0.099	0.049**	−0.076	0.038**
$VAPW_{ijt}$	−1.587	1.104	−3.072	1.867*	−3.365	2.005*	−3.026	1.862	−3.303	1.992	−3.094	1.893*	−3.117	1.907*	−2.183	1.341
HHI_{jt}	0.135	0.116	−0.066	0.033**	−0.063	0.0319**	−0.049	0.028*	−0.047	0.027*	−0.041	0.026	−0.040	0.025	−0.028	0.020
$Network_{jt}$	0.812	0.506	−0.011	0.188	−0.010	0.188	0.036	0.174	0.037	0.175	−0.012	0.188	−0.002	0.185	0.026	0.183
$inputtariff_{jt}$	−0.411	1.036														
$outputtariff_{jt}$	32.093	22.906														
ERP_1_{jt}			1.008	0.695	1.011	0.689										
ERP_2_{jt}							0.896	0.617	0.903	0.615						
ERP_3_{jt}											0.272	0.178				
ERP_4_{jt}													0.286	0.219	0.325	0.198*
$Subsidy_{jt}$															0.143	0.084*

time dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	10,268	10,268	10,268	10,268	10,268	10,268	10,268	10,268
No.of groups	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675
Wlad chi^2 $(prob>chi^2)$	156.21 (0.000)	150.56 (0.000)	148.98 (0.000)	150.54 (0.000)	148.97 (0.000)	149.26 (0.000)	149.12 (0.000)	149.22 (0.000)
Log-likelihood	–4227.1925	–4227.3353	–4227.4815	–4227.3467	–4227.4933	–4227.4784	–4227.4699	–4227.4657

Note: Without any overdispersion, the control function approach for panel data with PPML is applied for determining the ratio of skilled to total workers and possible endogeneity problems of $VAPW_{ijt}$ and tariffs (both nominal and effective rates). All variables, except $female\_male_{ijt}$; RDD_{ijt}; BOI_{ijt}, $Network_{ijt}$, $inputtariff_{jt}$, $outputtariff_{jt}$, ERP_{jt} and $Subsidy_{jt}$, are in the logarithm formula. ***, **, and * = 1, 5, and 10 percent significance, respectively.
Source: Author's estimations.

total workers, while Columns B–E show the results when *ERP_1* to *ERP_4* are employed, respectively. Columns B1, C1, and D and E illustrate results for where the R&D expenses to sales (*RDS*) is used as an independent variable, instead of the dummy variable (*RDD*). The last column, Column F, is included to show the results when non-tariff measures like subsidies (as mentioned in Chapter 6) are included in our analysis. Without any overdispersion, the control function approach for panel data with PPML is applied to determine the ratio of skilled to total workers. However, as mentioned earlier, due to the insignificant variation between skilled and unskilled workers, Table 7.1 shows that most independent variables are insignificant in explaining the ratio of skilled workers. Foreign ownership (own_{ijt}) is one of the variables which show a positive significance in all cases. This implies that foreign firms tend to hire more skilled workers than indigenous. As mentioned earlier, to harness the associated advanced technology, which is brought into the host countries by foreign firms, skilled workers are needed.

Another variable concerns firms' market orientation, especially in the case of imports. As argued earlier in the empirical model context, import activities involve complicated procedures, including selecting suppliers, negotiating price and quality, and understanding the technology embedded into imported products, as well as dealing with documentation and customs officials. These tasks require skilled workers. The insignificance of exporting could probably be due to the restricted variation in our samples as we will show later that this variable is crucial in explaining the number of workers, especially skilled (see Table 7.2). Research and development (RD_{ijt}) and *BOI* variables are significant, especially when ERPs are used as a proxy of trade liberalization/restrictions. When *RD* is proxied by binary dummy variables, the coefficient is negative and significant, implying that firms investing in R&D tend to hire less-skilled workers, but when *RD* is proxied by R&D expenses to sales, the coefficient turns out to be positive and significant. The amount of R&D expenditure matters in encouraging a higher proportion of skilled workers; that is, the higher the R&D expenses, the greater the proportion of skilled workers in the total Thai manufacturing workforce.

The coefficient associated with the *BOI* is negative and significant, suggesting that firms receiving BOI privileges tend to hire more unskilled workers than skilled. This stands in contrast to our hypothesis, which expected that foreign firms and indigenous firms, mostly exporters, would likely hire more skilled workers, pushing up the proportion of skilled workers in the Thai manufacturing workforce. However, the negative relationship may occur because a number of Thai exporting firms who obtain BOI privilege are still original equipment manufacturers (OEMs), including those in the electronic and electrical appliances, garments, and food products sectors. The volume of export orders matters so that unskilled workers are needed to perform tasks (see the results below when the determinants of skilled and unskilled workers are seprately examined), while only a few firms can upgrade to become original

Table 7.2 Empirical results: Unskilled and skilled workers

	Column A		*Column A1*		*Column B*		*Column B1*		*Column C*		*Column C1*		*Column C2*		*Column C3*		*Column C4*		*Column C5*	
	unskilled		*skilled*		*unskilled*		*skilled*		*unskilled*		*unskilled*		*skilled*		*skilled*		*unskilled*		*skilled*	
	Coef.	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*
own_{ijt}	−0.424	0.121***	0.086	0.068	−0.425	0.121***	0.084	0.068	−0.425	0.121***	−0.442	0.121***	0.090	0.068	0.085	0.068	−0.427	0.121***	0.093	0.068
exp_{ijt}	−0.435	0.357	0.700	0.198***	−0.432	0.357	0.685	0.198***	−0.430	0.357	−0.355	0.357	0.685	0.198***	0.689	0.198***	−0.429	0.357	0.686	0.198***
exp_{ijt}^2	0.925	0.544*	−1.374	0.304***	0.919	0.544*	−1.378	0.303***	0.913	0.545*	0.803	0.545	−1.371	0.304***	−1.375	0.304***	0.913	0.544*	−1.351	0.304***
rim_{ijt}	0.029	0.107	0.151	0.059**	0.022	0.107	0.171	0.059***	0.024	0.108	0.044	0.108	0.163	0.060***	0.165	0.060***	0.024	0.107	0.151	0.060**
$klratio_{ijt}$	−0.123	0.089	0.241	0.051***	−0.040	0.089	0.241	0.051***	−0.039	0.089	−0.038	0.089	0.234	0.051***	0.231	0.051***	−0.044	0.089	0.229	0.050***
$klratio_{ijt}$^2	0.002	0.003	−0.015	0.002***	−0.001	0.003	−0.015	0.002***	−0.001	0.003	−0.001	0.003	−0.014	0.002***	−0.014	0.002***	−0.001	0.003	−0.014	0.002***
$size_{ijt}$	0.089	0.132	−0.355	0.078***	0.060	0.132	−0.348	0.078***	0.060	0.132	0.066	0.132	−0.339	0.078***	−0.341	0.078***	0.059	0.132	−0.338	0.078***
$size_{ijt}$^2	−0.004	0.003	0.008	0.002***	−0.003	0.003	0.008	0.002***	−0.003	0.003	−0.003	0.003	0.008	0.002***	0.008	0.002***	−0.003	0.003	0.008	0.002***
$female\_male_{ijt}$	−0.038	0.008***	0.002	0.003	−0.037	0.008***	0.000	0.003	−0.037	0.008***	−0.037	0.008***	0.0003	0.003	0.00004	0.003	−0.037	0.008***	0.001	0.004
RDD_{ijt}	0.216	0.046***	0.077	0.025***	0.218	0.046***	0.069	0.025***	0.218	0.046***			0.070	0.025***			0.219	0.046***	0.072	0.025***
RDS_{ijt}											−0.075	0.149			0.064	0.075				
BOI_{ijt}	−0.001	0.052	−0.017	0.028	−0.004	0.052	−0.004	0.028	−0.005	0.052	0.007	0.052	−0.004	0.028	−0.002	0.028	−0.005	0.052	−0.002	0.028
$VAPW_{ijt}$	0.208	0.031***	0.313	0.024	0.208	0.032***	0.312	0.023***	0.208	0.031***	0.204	0.031***	0.315	0.023***	0.316	0.023***	0.208	0.031***	0.316	0.024***
HHI_{jt}	−0.046	0.022**	−0.005	0.015	−0.042	0.0212*	−0.026	0.015*	−0.041	0.021*	−0.039	0.021*	−0.022	0.015	−0.022	0.015	−0.039	0.022*	−0.020	0.015
$Network_{jt}$	−0.066	0.112	0.320	0.087***	−0.059	0.112	0.304	0.087***	−0.061	0.112	−0.067	0.112	0.324	0.087***	0.319	0.087***	−0.063	0.112	0.331	0.087***
$inputtariff_{jt}$	0.571	0.747	2.748	0.561***																
$outputtariff_{jt}$	0.041	0.282	0.344	0.228																
ERP_1_{jt}					−0.017	0.175	0.602	0.142***												
ERP_2_{jt}									0.028	0.299	−0.015	0.299	0.569	0.235***	0.573	0.235**	0.027	0.272	0.332	0.199*
ERP_3_{jt}																				
ERP_4_{jt}																				
$Subsidy_{jt}$																	0.049	0.08	0.025	0.051
time dummy	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
No. of observations	8,764		10,268		8,764		10,268		8,764		8,764		10,268		10,268		8,764		10,268	
No.of groups	3,115		3,675		3,115		3,675		3,115		3,115		3,675		3,675		3,115		3,675	
Wlad chi² (prob>chi²)	198.73 (0.000)		1267.13 (0.000)		194.24 (0.000)		1257.16 (0.000)		194.23 (0.000)		173.61 (0.000)		1244.44 (0.000)		1243.5 (0.000)		195.03 (0.000)		1243.5 (0.000)	
Log–likelihood	−17550.427		−29676.629		−17552.92		−29679.627		−17552.921		−17563.213		−29685.976		−29686.654		−17552.536		−29686.654	

(*Continued*)

Table 7.2 Continued

	Column D		*Column D1*		*Column E*		*Column E1*		*Column E2*		*Column E3*		*Column E4*		*Column E5*	
	unskilled		*skilled*		*unskilled*		*unskilled*		*skilled*		*skilled*		*unskilled*		*skilled*	
	Coef.	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*
own_{ijt}	–0.406	0.121***	0.088	0.068	–0.407	0.121***	–0.425	0.121***	0.088	0.068	0.082	0.068	–0.412	0.121***	0.091	0.068
exp_{ijt}	–0.492	0.358	0.681	0.199***	–0.482	0.358	–0.401	0.357	0.684	0.199***	0.689	0.199***	–0.478	0.358	0.696	0.199***
exp_{ijt}^2	1.017	0.546**	–1.319	0.305***	0.999	0.545**	0.878	0.545*	–1.323	0.304***	–1.329	0.305***	0.995	0.545*	–1.343	0.304***
rim_{ijt}	0.045	0.107	0.132	0.059**	0.047	0.107	0.068	0.107	0.130	0.059**	0.132	0.059**	0.044	0.107	0.131	0.059**
$klratio_{ijt}$	–0.029	0.089	0.234	0.050***	–0.031	0.089	–0.029	0.089	0.234	0.050***	0.231	0.050***	–0.035	0.089	0.230	0.051***
$klratio_{ijt}$^2	–0.002	0.003	–0.014	0.002***	–0.002	0.003	–0.002	0.003	–0.014	0.002***	–0.014	0.002***	–0.002	0.003	–0.014	0.002***
$size_{ijt}$	0.072	0.132	–0.339	0.078***	0.074	0.132	0.081	0.132	–0.340	0.078***	–0.342	0.078***	0.072	0.132	–0.337	0.078***
$size_{ijt}$^2	–0.004	0.003	0.008	0.002***	–0.004	0.003	–0.004	0.003	0.008	0.002***	0.008	0.002***	–0.004	0.003	0.008	0.002***
$female\_male_{ijt}$	–0.037	0.008***	0.002	0.003	–0.037	0.008***	–0.037	0.008***	0.002	0.003	0.002	0.003	–0.037	0.008***	0.002	0.004
RDD_{ijt}	0.223	0.046***	0.072	0.025***	0.222	0.046***			0.072	0.025***			0.223	0.046***	0.072	0.025***
RDS_{ijt}							–0.080	0.149			0.055	0.075				
BOI_{ijt}	–0.019	0.052	0.005	0.028	–0.019	0.052	–0.008	0.052	0.006	0.028	0.009	0.028	–0.018	0.052	0.006	0.028
$VAPW_{ijt}$	0.212	0.031***	0.317	0.023***	0.212	0.031***	0.207	0.031***	0.317	0.023***	0.318	0.023***	0.212	0.031***	0.317	0.023***
HHI_{jt}	–0.055	0.022**	–0.019	0.015	–0.055	0.022**	–0.052	0.022**	–0.018	0.015	–0.019	0.015	–0.050	0.022**	–0.020	0.015
$Network_{jt}$	–0.068	0.112	0.357	0.086***	–0.063	0.111***	–0.072	0.112	0.359	0.086***	0.354	0.086***	–0.065	0.112	0.358	0.087***
$inputtariff_{jt}$																
$outputtariff_{jt}$																
ERP_1_{jt}																
ERP_2_{jt}																
ERP_3_{jt}	0.662	0.247***	–0.099	0.168												
ERP_4_{jt}					0.872	0.323***	0.873	0.324***	–0.187	0.217	–0.191	0.217	0.778	0.313***	–0.197	0.204
$Subsidy_{jt}$													0.067	0.067	–0.043	0.036
time dummy	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
No. of observations	8,764		10,268		8,764		8,764		10,268		10,268		8,764		10,268	
No.of groups	3,115		3,675		3,115		3,115		3,675		3,675		3,115		3,675	
Wlad chi^2 ($prob>chi^2$)	200.84 (0.000)		1237.98 (0.000)		200.85 (0.000)		180.31 (0.000)		1238.5 (0.000)		1237.34 (0.000)		200.53 (0.000)		1239.33 (0.000)	
Log-likelihood	–17549.391		–29689.265		–17549.348		–17559.657		–29689.081		–29689.801		–17549.535		–29688.831	

Table 7.3 Empirical results: Wage skill premiums

	Column A		*Column B*		*Column C*		*Column D*		*Column E*		*Column F (IV with CFA)#*		*Column G (IV with CFA)#*		*Column H*		*Column I*	
	Coef.	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*	*Coef.*	*Std.Err*
own_{ijt}	0.123	0.255	0.112	0.250	0.063	0.26	0.065	0.259	0.086	0.254	0.069	0.254	0.074	0.253	0.096	0.257	0.092	0.256
exp_{ijt}	2.487	0.813***	2.609	0.821***	2.532	0.814***	2.529	0.813***	2.568	0.839***	2.638	0.858***	2.585	0.834***	2.355	0.806***	2.356	0.808***
exp_{ijt}^2	–3.416	1.206***	–3.450	1.203***	–3.514	1.212***	–3.529	1.21***	–3.594	1.248***	–3.941	1.454***	–3.679	1.281***	–3.205	1.195***	–3.210	1.197***
rim_{ijt}	0.322	0.232	0.694	0.349**	0.363	0.231	0.367	0.232	0.344	0.241	0.501	0.367	0.403	0.28	0.342	0.232	0.343	0.232
$klratio_{ijt}$	0.305	0.168**	0.299	0.166*	0.307	0.170*	0.294	0.172*	0.308	0.172*	0.318	0.173*	0.308	0.173*	0.286	0.169*	0.284	0.1705*
$klratio_{ijt}$^2	–0.015	0.007**	–0.015	0.007**	–0.015	0.007**	–0.014	0.007**	–0.015	0.007**	–0.016	0.007**	–0.015	0.007**	–0.014	0.007**	–0.014	0.007**
size_{ijt}	0.491	0.34	0.490	0.338	0.487	0.339	0.499	0.336	0.473	0.348	0.501	0.338	0.470	0.344	0.514	0.333	0.533	0.331
$size_{ijt}$^2	–0.010	0.009	–0.010	0.009	–0.010	0.009	–0.010	0.009	–0.010	0.009	–0.010	0.009	–0.009	0.009	–0.011	0.009	–0.011	0.009
$\mathrm{female\_male}_{ijt}$	0.045	0.018**	0.045	0.018**	0.042	0.017**	0.042	0.017**	0.041	0.018**	0.029	0.026	0.038	0.020**	0.046	0.018**	0.046	0.018**
RDD_{ijt}	–0.367	0.211*	–0.359	0.213*	–0.347	0.196*	–0.335	0.180*							–0.316	0.162**	–0.299	0.147**
RDS_{ijt}									0.055	0.284	0.103	0.292	0.102	0.291				
$skill\_total_{ijt}$	–0.130	0.078*	–0.116	0.075	–0.125	0.078	–0.124	0.078	–0.131	0.081*	–0.133	0.081*	–0.132	0.081*	–0.136	0.078*	–0.137	0.078*
BOI_{ijt}	–0.175	0.11	–0.177	0.109*	–0.187	0.110*	–0.189	0.110*	–0.223	0.119*	–0.278	0.164*	–0.243	0.136*	–0.197	0.112*	–0.198	0.111*
HHI_{jt}	–0.054	0.074	–0.051	0.073	–0.074	0.075	–0.075	0.076	–0.077	0.078	–0.102	0.102	–0.062	0.075	–0.061	0.074	–0.060	0.074
$Network_{jt}$	–0.715	0.704	–0.658	0.701	–0.826	0.716	–0.812	0.722	–0.700	0.754	–1.123	0.861	–1.032	0.794	–1.152	0.732	–1.201	0.739
$inputtariff_{jt}$	0.796	0.993	1.696	1.086														
$outputtariff_{jt}$	2.477	2.171	2.280	2.182														
$input\_rim_{ijt}$			7.939	4.468*														
$output\_exp_{ijt}$			–0.626	1.430														
ERP_1_{jt}					0.349	0.221												
ERP_2_{jt}							0.568	0.392	0.655	0.476	3.976	5.447	1.895	2.805				
ERP_3_{jt}															0.599	0.4748		
ERP_4_{jt}																	0.883	0.643
$Subsidy_{jt}$													0.365	0.502				
time dummy	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
No. of observations	9,304		9,304		9,304		9,304		9,304		9,304		9,282		9,304		9,304	
No.of groups	3,283		3,283		3,283		3,283		3,283		3,283		3,272		3,283		3,283	
Wlad chi² (prob>chi²)	232.53 (0.000)		234.32 (0.000)		241.05 (0.000)		232.88 (0.000)		229.08 (0.000)		231.6 (0.000)		231.8 (0.000)		235.03 (0.000)		235.1 (0.000)	
Log-likelihood	–13074.192		–13053.484		–13055.232		–13040.342		–13118.15		–13090.473		–13087.746		–13029.303		–13006.9	

Note: # The control function approach for panel data with PPML is applied to redress endogeneity problems of tariffs. All variables, except $female\_male_{ijt}$; RDD_{ijt}; BOI_{ijt}, $Network_{ijt}$, $inputtariff_{jt}$, $outputtariff_{jt}$, ERP_{jt} and $Subsidy_{jt}$ are in the logarithm formula. ***, **, and * = 1, 5, and 10 percent significance, respectively.

Source: Author's estimations.

design manufacturers (ODM) or original brand manufacturers (OBM). Note that trade liberalization, regardless of how tariffs are proxied, and participation in the global production network could not significantly influence the ratio of skilled workers in terms of the total workforce. Interestingly, when non-tariff barriers, like subsidies, are included in the model, the coefficients associated with effective rates of protection (ERP) show a mild and positive significance (Table 7.1, Column F).[11] The very weak significance, to a certain extent, may imply that trade liberalization, especially when input and output tariffs are simultaneously reduced, would not widen income inequality as unskilled workers could be promoted from such liberalization.

However, as mentioned earlier, due to the low variation in the dependent variables, the results, when the ratio of skilled to total workers is employed as an independent variable, may not provide a clear picture. To clearly examine the impact of trade liberalization, participation in the global production network and the effects of investment policy on employment, the determinants of skilled and unskilled workers are examined separately in Equations (7.4) and (7.5). Table 7.2 presents the empirical results. Note that when the number of workers is employed as an independent variable, overdispersion is encountered, so the control function approach with a negative binomial (NB) model is our preferred choice of methodology.

The results show that firm-specific factors are crucial in determining the proportion of skilled and unskilled workers, regardless of how tariffs and *RD* are measured. Consistent with the results, when the ratio of skilled to total workers is considered, foreign ownership (own_{ijt}) is statistically significant. The significance is found when unskilled workers are set as the dependent variable, reflecting that foreign firms tend to hire less unskilled workers than indigenous, but this variable is insignificant when skilled workers are set as the dependent variable.

In contrast with using the share of skilled to total workers, firm market orientation variables, both exports and imports, are crucial in determining the amount of employment, in terms of both skilled and unskilled workers in all scenarios. Interestingly, a non-linear relationship is revealed in the case of the export variable. Firms which have a high proportion of exports (exp_{ijt}) are likely to need more skilled workers (see Table 7.2). This confirms what we hypothesized, as shown in the previous section; that is, exporting firms must surpass productivity thresholds to survive within global competition so they are likely to hire more skilled workers to enhance their productivity, as opposed to the case with domestic-oriented firms. However, in all scenarios, a negative and significant coefficient associated with (exp_{ijt}^2) is revealed. This implies that when the share of exports to total output exceeds a certain threshold, which from our estimation is around 1.3, a firm's demand for skilled workers starts declining, and they are likely to hire more non-skilled workers instead.[12]

As shown in Table 7.2, the coefficient associated with (exp_{ijt}^2) is positive and significant when non-skilled workers are employed as the dependent variable. To a certain extent, it seems that in Thai manufacturing, skilled and non-skilled workers are still substitutable to serve a large scale of exports and, as mentioned earlier, several Thai firms are OEMs, and the volume of exports matters for such firms in expanding in global markets. With the relatively thin market, unskilled workers are likely to be employed in producing those products. Original design manufacturers (ODM) or origianl brand manufacturers (OBM) tend to demand more skilled workers, but those firms still remain limited within Thai manufacturing.

An increase in the imports of raw materials (rim_{ijt}) tends to promote the demand for skilled workers. The coefficient associated with rim_{ijt} is positive and significant when skilled workers are used as the independent variable, but it is insignificant when unskilled workers are employed. This confirms the effects of the complicated procedures involving imports, as mentioned earlier. Firm-specific factors in terms of capital–labor ratios ($klratio_{ijt}$) and firm size ($size_{ijt}$) matter in determining demand for skilled workers, with a non-linear relationship revealed. Regarding the former, an increase in capital–labor ratios tends to promote the need for more skilled workers, as shown by the positive and significant coefficient associated with this variable (see Table 7.2). This suggests that skilled workers are likely to be complementary with physical capital. However, probably due to the law of diminishing returns, surpassing a certain threshold, which is relatively low (at least ten times lower than the average value of capital–labor ratio in our sample),[13] capital deepening starts to reduce the demand for skilled workers. The negative coefficient associated with $klratio_{ijt}$^2 and the low value of the threshold may raise concerns about whether introducing more and more capital may replace (skilled) workers, pushing them out of the job market. With limited information in the industrial censuses, we cannot address this issue clearly.

Interestingly, however, Jongwanich, Kopaiboon, and Obashi (2020), using labor force surveys during 2012–2017, examined whether introducing advanced technology, including robots and ICT, would generate adverse impacts on labor market outcomes, especially employment and wages, in Thailand. The results showed that the impact of advanced technology on pushing workers out of the job market is limited. Instead, the technologies introduced in Thailand tended to affect the reallocation of workers between skilled and unskilled positions. Skill upgrading is possible and likely to occur more when workers stay or move within manufacturing sectors, and ICT usage tends to generate more favorable outcomes than robot adoption, probably due to its longer engagement with workers. Workers in comparatively capital-intensive industries, including the automotive and plastics and rubber sectors, tend to receive greater benefits from technological growth than those in labor-intensive industries. All in all, this result probably suggests that capital deepening, especially that involved with advanced technology, would still have limited power in pushing labor out of the job market in Thai manufacturing, but without any adjustments, such deepening could force a noticeable proportion of workers to be employed in relatively unskilled positions.

Regarding firm size ($size_{ijt}$), the negative coefficient associated with $size_{ijt}$ and the positive coefficient associated with $size_{ijt}$^2 imply that the relationship between size and the number of skilled workers is negative at the beginning and then becomes positive afterward (Table 7.2). This reflects the nature of hiring skilled workers incurring fixed costs to the establishment. Fixed costs include the other non-salary benefits that these types of workers often expect from the establishment. Such a relationship, to a certain extent, also reflects the preference of these skilled workers to work in larger establishments with brighter career pathways. The improvement of labor productivity ($VAPW_{ijt}$) tends to promote both unskilled and skilled workers, but the coefficients associated with skilled workers are higher than those associated with unskilled. Interestingly, R&D tends to promote both skilled and unskilled workers when R&D is measured by binary dummy variables, but it becomes statistically insignificant when R&D expenses are employed to reflect the participation of firms in R&D activities. This may reflect the relatively small amount of R&D expenditure observed, which in our sample was only around 2 percent of sales on average during 2006–2016, in affecting the absolute number of workers, both skilled and unskilled. However, the coefficient associated with the rd_sale_{ijt} of skilled workers is greater than that associated with unskilled (see Table 7.2, columns E1 and E3, for example), so this variable could potentially affect the ratio of skilled to total workers shown in Table 7.1, as discussed earlier.

Regarding trade policy, all scenarios tend to show that trade liberalization in terms of tariff reductions was not harmful to unskilled workers. When tariffs are disaggregated into input and output, interestingly only the input tariff is positive and statistically significant when skilled workers are employed as the dependent variable. This result, which is in line with Amiti and Cameron (2012), indicates that a reduction in input tariffs leads to a decline in the demand for skilled workers. Imported inputs become cheaper relative to those domestically produced, so firms substitute home-based production for imports. While raw materials/intermediate inputs tend to involve skill-intensive technology, liberalization causes a decline in the demand for skilled workers. The reduction in output tariffs in our case is positive but statistically insignificant. Amiti and Cameron (2012) argue that the insignificance of output tariffs is surprising but could occur due to the multi-plant/products nature of firms. Reducing output tariffs may induce firms to produce other products with different factor intensities, so that such liberalization would not affect the relative demand for skilled/unskilled workers. However, as shown in the previous chapter, where the output tariff reduction *per se* could not influence firm productivity, we argue that the insignificance of output tariffs may arise because firms in Thailand consider both input and output tariffs simultaneously concerning their business activities. Jongwanich and Kohpaiboon (2007) showed that protection bargains in Thai manufacturing tend to be struck on ERP, instead of nominal tariff rates (see Chapter 2). Meanwhile, exporting firms are unlikely to receive any benefits from cutting output tariffs as their prices tend to follow world rates, thereby reducing the explanatory power of output tariffs in influencing overall productivity improvements. To consider these possible reasons, effective rates of protection (ERPs) are employed, instead of separately including input and output tariffs.

Effective rates of protection, regardless of whether water in tariff is considered, including both ERP_1_{jt} and ERP_2_{jt}, show a positive and significant relationship with skilled workers (Table 7.2: Columns B1, C2–C5). The positive coefficients associated with these variables indicate that trade liberalization (decline in ERP, either through output or input or both) reduces the demand for skilled workers. Although final goods are produced with lower-skilled intensive technology than intermediate inputs, in Thailand high tariff rates tend to be imposed on relatively capital-intensive sectors, including motor vehicles, where the demand for skilled workers is involved. Thus, trade liberalization, or lower effective rates of protection, lowers the demand for skilled workers in response to the cheaper imports of finished products. However, as shown in Chapter 2, tariff rates in Thailand have declined substantially over the past three decades, but the escalating tariff structure remains in place, reflected by the higher tariff rate of finished products than is the case with capital and intermediate goods, and effective rates of protection remained relatively stable during 2006–2019. In addition, although around 32 percent of tariff lines were tariff-free while tariff lines with rates of between 10 and 20 percent noticeably declined to around 12 percent in 2016–19 from close to 20 percent in 2006–2010, more than a quarter of tariff lines are still operating out of the three-rate structure, comprising the 0–1, 5, and 10 percent bands. This reflects unfinished business in tariff restructuring in Thailand. Further liberalization would probably help reduce income inequality by encouraging more unskilled workers and reducing their wage gap with skilled employees.

However, when we consider the impact of trade liberalization on wage skill premiums in Thailand, the results show an unexpected outcome; that is, such liberalization could not significantly influence wage skill premiums (see Table 7.3). Only the interaction term between input tariffs and the share of raw material imports is positive and statistically significant. Two possible explanations emerge from this finding. First, the insignificance of trade liberalization on wage skill premiums may result from the limited number of observations included in the 3-yearly censuses in the formulating panel data. Second, it may occur due to the structure of the labor market in Thailand, where there exists friction, as well as a shortage of skilled workers, especially those involved with operational activities, while foreign workers, including those from Myanmar, Cambodia, and Laos, increase the supply of unskilled workers. The former tends to cause the wages of skilled workers to remain at a relatively high level, though tariff reductions lower the demand for skilled workers, while the latter reduces the probability of unskilled workers' wages rising. Another point argued by Jongwanich, Kohpaibbon, and Obashi (2020), as mentioned earlier in Section 7.2, concerns the largely weak unionization within the Thai labor market. The relatively low level of human capital in Thailand could somewhat explain the lack of strong labor unions and, to a certain extent, the lower ability of workers, especially unskilled, to negotiate their wages with employers. All in all, this possibly suggests that labor market conditions tend to decouple the employment-wage outcomes induced by trade liberalization.[14] Our finding is in line with some studies, including Pavcnik et al. (2004) for Brazil and Feliciano (2001) for Mexico, which show no relationship between trade policy and wage skill premiums. Note that when ERP concerning partial trade liberalization through FTAs (ERP_3_{jt} and ERP_4_{jt}) is considered, results resemble those derived without considering the role of FTAs; that is, tariff reductions through FTAs had no impact on wage skill premiums. However, they are in fact likely to encourage more unskilled workers. In addition, non-tariff measures like subsidies do not have any significant impact on either employment or wages.

Interestingly, participation in a global production network ($Network_{jt}$) tends to encourage more skilled workers. The results are robust, regardless of how trade liberalization is measured (see Table 7.2). This supports the argument that firms operating in developing and developed countries face different cones of production (Feenstra, 2004; Leamer and Schott, 2005; and Kiyota, 2012). A given activity involved in the network, mostly in the context of the electronics, electrical appliances, and machinery sectors, can be regarded as unskilled in the northern hemisphere, but skilled labor intensive in the southern. In other words, unskilled-labor-intensive activities outsourced by firms in developed countries tend to require relatively skilled workers in developing countries to perform. However, the participation has no significant impact on wage skill premiums. As mentioned earlier, labor market conditions in Thailand probably constrain the impact of participating in the global production network on wages.

It seems that firm-specific factors[15] are crucial in affecting wage skill premiums (Table 7.3). Consistent with the results for employment, a firm's ownership and a firm's market orientation, especially in terms of exports, have an effect on wage skill premiums. For exports, a non-linear relationship is revealed as the wage skill premium tends to increase at the beginning when the share of exports to the output of firms (exp_{ijt}) increases, but after a certain threshold, close to that we mentioned earlier, the wage skill premium declines. This confirms the fact that when the volume of exports expands significantly, non-skilled workers are required, thereby narrowing wage skill premiums. Imports tend to increase wage premiums, but the effect is not vigorous as its positive impact is shown only when input and output tariffs are separately included in the analysis. The capital–labor ratio ($klratio_{ijt}$) is another important firm-specific factor, and the revealed result is consistent with employment, that is to say, it widens the wage skill premium to a certain level in response to the greater demand for skilled workers, but when it passes a certain point, wage premiums become lower, which to a certain extent reflects the substitution between capital and skilled workers, as mentioned earlier. The effect of R&D on wage premiums also reflects the phenomena shown in its impacts on employment; that is, R&D tends to promote both skilled and unskilled workers when R&D is measured by binary dummy variables, with higher impacts shown in the case of the latter, but it becomes statistically insignificant when R&D expenses are employed. Wage skill premiums are either unresponsive or shrink in response to R&D investment (Table 7.3). As mentioned in Chapter

5, the statistical insignificance of R&Ds in promoting skilled workers could be partly due to the dominance of technology transmission over technology generation. In particular, it seems that most MNE affiliates still import technology from their parent companies, instead of setting up R&D activities in Thailand. In line with the results concerning employment, BOI privileges are likely to reduce the wage gap between skilled and unskilled workers, partly due to the fact that most exporters receiving BOI support are involved in original equipment manufacturing activities.

7.5 Conclusions

This chapter aims to examine the impact of globalization on workers' skills and wage premiums using firm-level data of Thai Manufacturing to construct the case study. As in the previous chapter, trade and investment policies, as well as proxies of global production sharing, are included to analyze their impact on labor market outcomes. The tariff protection applied here is in terms of both nominal and effective tariffs. With effective rates of protection (ERP), a traditional measure, a measure incorporating possible water in tariffs, and that concerning the effects of partial trade liberalization, are applied. For the nominal tariffs, the effects on finished (output) and raw material (input) products are separately examined. The results show that firm-specific factors, especially demand-side, truly matter in determining firms' decisions to hire skilled/unskilled workers. Firms' market orientation, both the export and import of raw materials, firm size, firm ownership, and the level of capital–labor ratios are all crucial in affecting the relative demand for skilled/unskilled workers. While foreign firms and firms with a high proportion of raw material imports are likely to hire more skilled workers, those with a high proportion of exports, capital deepening, and larger size tend to be inconclusive. Non-linear relationships with skilled employment are established in the case of the latter three variables.

With respect to trade policy, trade liberalization in terms of tariff reductions was not harmful to unskilled workers in all scenarios. With trade protection, high tariff rates tend to be imposed on relatively capital-intensive sectors, which need skilled workers to be involved. Trade liberalization or lower effective rates of protection tend to lower the demand for skilled workers in response to cheaper imported products. Non-tariff barriers, comprising subsidies in this study, do not have any robust impact on the demand for skilled workers in the Thai manufacturing context. Investment policy, in terms of providing investment incentives, tends to have a more favorable impact on unskilled workers than skilled. Participation in the global production network ($Network_{jt}$) tends to encourage demand for more skilled workers, regardless of how trade liberalization is measured. This confirms that participation in the global production network of Thai firms has expanded beyond simple assembly functions.

Interestingly, when wage skill premiums are considered, wage–employment skills dissociation emerges in some variables within our scope of interest, including trade liberalization through tariff reductions and participation in global production networks, as well as receiving investment promotion through the BOI. Wage skill premiums were not influenced by these factors, though they could affect the number of skilled/unskilled workers, as mentioned earlier. In addition to the rather short and small panel-data set, labor market conditions, especially friction in the labor market; a shortage of skilled workers, especially those involved in operational activities; and the somewhat excess supply of unskilled workers induced by migrant workers has caused wage–employment skills dissociation. In addition, the largely weak unionization within the Thai labor market, partly caused by the relatively low level of human capital, is able to somewhat explain the lower ability of workers, especially unskilled, to negotiate their wages with employers.

Appendix 7.1

Table Appendix 7.1 Data used in the empirical model

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
$(Ls/Ltotal)_{ijt}$	14,586	0.71	0.35	0.00	1.00
$(Ls)_{ijt}$	14,616	123.66	340.70	0.00	14023.00
$(Lu)_{ijt}$	14,616	59.48	208.70	0.00	4579.00
$(Ws/Wu)_{ijt}$	14,566	2.01	6.30	0.00	218.53
own_{ijt}	14,616	0.05	0.16	0.00	0.69
exp_{ijt}	14,616	0.09	0.20	0.00	0.69
rim_{ijt}	14,616	0.08	0.17	0.00	0.69
$klratio_{ijt}$	14,616	12.42	1.57	4.40	21.54
$size_{ijt}$	14,616	17.51	2.12	10.07	25.61
$female\_male_{ijt}$	14,313	1.44	2.68	0.00	76.50
RDD_{ijt}	14,616	0.12	0.32	0.00	1.00
RDS_{ijt}	14,616	0.01	0.10	0.00	3.35
BOI_{ijt}	14,616	0.16	0.37	0.00	1.00
$vapw_{ijt}$	14,356	12.46	1.32	4.57	18.55
$skill\_total_{ijt}$	14,568	0.67	0.38	0.00	1.00
HHI_{jt}	14,600	−3.38	0.98	−5.52	−0.01
$network_{jt}$	13,965	0.08	0.17	0.00	0.69
$inputtariff_{jt}$	14,153	0.06	0.04	0.00	0.21
$outputtariff_{jt}$	14,153	0.11	0.09	0.00	0.60
ERP_1_{jt}	14,596	−0.01	0.27	−0.82	0.99
ERP_2_{jt}	14,596	0.00	0.20	−0.67	0.81
ERP_3_{jt}	14,596	0.01	0.14	−0.28	1.14
ERP_4_{jt}	14,596	0.01	0.11	−0.16	0.86
$Subsidy_{jt}$	13,965	0.06	0.23	0.00	1.00

Note: All variables, except $female\_male_{ijt}$; RDD_{ijt}; BOI_{ijt}, $Network_{ijt}$, $inputtariff_{jt}$, $outputtariff_{jt}$, ERP_{jt} and $Subsidy_{jt}$ are in logarithm formula.
Source: Author's calculations.

Appendix 7.2

Table Appendix 7.2 Correlation coefficient matrix of all relevant variables

$(Ls/Ltotal)_{ijt}$	1																						
$(Ls)_{ijt}$	0.16	1																					
$(Lu)_{ijt}$	−0.34	0.20	1																				
$(Ws/Wu)_{ijt}$	−0.01	0.04	0.05	1																			
own_{ijt}	0.02	0.22	0.12	0.06	1																		
exp_{ijt}	−0.01	0.23	0.19	0.07	0.40	1																	
rim_{ijt}	0.01	0.17	0.10	0.07	0.37	0.41	1																
$klratio_{ijt}$	0.00	0.03	0.01	0.01	0.13	0.05	0.09	1															
$size_{ijt}$	−0.05	0.42	0.36	0.10	0.32	0.35	0.29	0.37	1														
$female\_male_{ijt}$	0.05	0.06	0.03	0.03	0.08	0.16	0.09	−0.15	−0.03	1													
RDD_{ijt}	−0.03	0.11	0.08	0.02	0.07	0.12	0.11	0.09	0.23	−0.01	1												
RDS_{ijt}	0.01	0.03	0.02	0.01	0.02	0.06	0.05	0.02	0.05	0.00	0.39	1											
BOI_{ijt}	0.00	0.25	0.19	0.06	0.42	0.55	0.34	0.12	0.39	0.08	0.14	0.12	1										
$vapw_{ijt}$	−0.02	0.07	0.07	0.04	0.19	0.13	0.17	0.51	0.69	−0.14	0.14	0.04	0.20	1									
$skill\_total_{ijt}$	0.98	0.15	−0.33	−0.01	0.02	0.00	0.00	−0.01	−0.07	0.06	−0.04	0.01	0.00	−0.04	1								
HHI_{jt}	0.01	0.05	0.04	0.02	0.07	0.04	0.10	0.02	0.04	−0.05	0.04	0.02	0.06	0.03	0.01	1							
$network_{jt}$	0.01	0.08	0.06	0.03	0.19	0.08	0.14	0.02	0.14	−0.03	0.01	0.00	0.14	0.08	0.01	0.13	1						
$inputtariff_{jt}$	−0.04	0.05	0.06	0.01	−0.02	0.01	−0.03	−0.01	−0.02	0.09	0.03	0.00	−0.03	−0.03	−0.03	0.16	0.05	1					
$outputtariff_{jt}$	0.00	0.06	0.03	0.00	−0.01	0.10	−0.04	−0.08	−0.02	0.22	0.01	0.00	0.03	−0.09	0.01	0.07	0.06	0.49	1				
ERP_1_{jt}	0.07	0.02	−0.05	0.02	0.01	0.06	0.03	−0.07	−0.02	0.05	0.01	0.13	0.15	−0.03	0.07	0.01	0.02	−0.36	0.12	1			
ERP_2_{jt}	0.06	0.03	−0.03	0.02	0.01	0.08	0.03	−0.06	−0.01	0.07	0.01	0.13	0.17	−0.02	0.06	−0.01	0.02	−0.33	0.12	0.97	1		
ERP_3_{jt}	0.01	0.02	−0.01	0.02	−0.01	0.01	0.00	−0.01	−0.02	−0.01	0.00	0.06	0.07	−0.02	0.01	0.14	0.01	−0.11	0.18	0.42	0.43	1	
ERP_4_{jt}	0.01	0.02	−0.01	0.02	−0.01	0.02	0.00	−0.02	−0.02	−0.01	0.01	0.07	0.07	−0.03	0.01	0.14	0.00	−0.09	0.19	0.42	0.46	0.984	1
$Subsidy_{jt}$	0.02	−0.01	−0.02	0.00	0.02	0.00	0.02	−0.02	0.01	−0.04	−0.01	0.04	0.07	0.01	0.01	−0.17	−0.01	−0.16	−0.15	0.17	0.14	0.060	0.044 1

Note: All variables, except $female\_male_{ijt}$; RDD_{ijt}; BOI_{ijt}, $Network_{ijt}$, $inputtariff_{jt}$, $outputtariff_{jt}$, ERP_{jt} and $Subsidy_{jt}$ are in logarithm formula.
Source: Author' s calculations

Notes

1 See for example, Revenga (1997), Hanson and Harrison (1999), Feliciano (2001), Attanasio et al. (2004), Currie and Harrison (1997), Topalova (2004), Robertson (2000; 2004) and Wacziarg and Wallack (2004). Noticeably, the results are largely based on the Latin American experience.
2 They argue that input and output tariffs could have different effects on the wage premiums with the postulation that the former is expected to play a more significant role. The latter would occur only in special circumstances.
3 Note that in the labor force survey, about 50 percent of samples at time t-1 are matched exactly with those at time t for each year so that 2-year panel data can be constructed from the survey. The reallocation of workers can also be determined.
4 Note that *income* refers to wages and other benefits for workers, including overtime payments and bonuses. On average, wages accounts for the highest proportion at around 85 percent of total income.
5 These include the manufacture of prepared animal feeds (ISIC1533); the manufacture of pumps, compressors, taps, and valves (ISIC2912); and the manufacture of knitted and crocheted fabrics and articles (ISIC1730).
6 See *Thailand Economic Monitor: Inequality, Opportunity, and Human Capital (Vol. 2) (English)*. Thailand Economic Monitor Washington, D.C.: World Bank Group. http://documents.worldbank.org/curated/en/154541547736805518/Thailand-Economic-Monitor-Inequality-Opportunity-and-Human-Capital
7 The amendment was intended to make the effort of skill formation more effective. For example, incentives granted to firms committing to in-house training are revised and increased as found in Article 33 (1). Another example is additional members from professional associations, representatives of employers, and employees in the committee of skills development (Article 38).
8 See information from Department of Skill Development website: http://www.dsd.go.th/DSD/Stat
9 Note that in Amiti and Casson (2012), the model also includes government ownership, perhaps due to the fact that state-owned firms seem to be relevant within Indonesia. By contrast, state-owned firms in the manufacturing sector in Thailand were rare, so were excluded in our model.
10 Two instrumental variables, i.e., the export–output ratio of industry and industrial growth, are employed, respectively, due to their significant impact on possible endogenous variables as mentioned, while they do not show any significant impact on employment variables. For the export–output ratio of industry, as mentioned in Chapter 2, industries involved more with exports are likely to receive less benefits from protection, so the demand for protection becomes less. For the industrial growth variable, arguably, it can influence value added per worker, since in industries which experience rapid output expansion, firms are likely to expand production. With slower adjustment in inputs, this could have an implication to labor productivity.
11 Note that all types of ERP (ERP_1_{jt}, ERP_2_{jt}, ERP_3_{jt} and *ERP*_4jt) show a mildly significant positive sign when subsidy is included in the model. In Table 7.1, we show only ERP_4jt.
12 Note that on average, the share of exports to total output in our samples during 2006–2016 was around 1.12 (see Appendix 7.1 in which this value is shows in logarithm formula)
13 Note that on average, the capital–labor ratio in our samples during 2006–2016 was around 1.1 million Baht (see Appendix 7.1 in which this value is shown in logarithm formula)
14 Note that Jongwanich, Kohpaibbon, and Obashi (2020), using a labor force survey during 2012–2017, showed that income adjustments in some cases, induced

by the introduction of advanced technologies, are not in line with employment status. For example, the introduction of ICT was likely to generate favorable outcomes in generating skills upgrading, but no income adjustment was indicated from the study.

15 Note that the negative and statistical significance of $Skillshare_{ijt}$ is in line with our hypothesis. Due to the way data was collected, wage compensation for operation workers partly covers that of skilled workers, so that the denominator in the wage premium is inflated.

8 Conclusions and policy inferences

This book explores the impact of globalization, especially in the context of trade and investment policies, on the key economic outcomes, including innovation, productivity, employment, and wages, using Thai manufacturing as a case study. Chapters 2 and 3 review trade and investment policies in Thailand, especially after the late 1980s, and Chapter 4 looks at trends and patterns concerning these two variables, both in terms of sectors and markets. The impacts of the US–China trade war and COVID-19 on trade and investment in Thailand, compared to other Asian countries, are also briefly discussed in this chapter. These three chapters aim to lay a groundwork for analyzing impacts of globalization on the key economic outcomes in Thailand as mentioned earlier in Chapters 5, 6, and 7.

As discussed in Chapter 2, historically Thailand had a greater reliance on tariff rather than non-tariff barriers as trade policy instruments in the manufacturing sector. Between the 1960s and the mid-1980s, Thailand implemented an import-substitution strategy, with relatively high tariff levels, together with a cascading structure which tended to alter relative prices in favor of producing goods for the domestic market, instead of targeting export opportunities. In the 1980s, there was a clear shift in emphasis from import-substituting activities to export promotion, and various exemption schemes aiming to promote Thailand as an export platform for multinationals were introduced. Tariff restructuring in Thailand could not be implemented until the late 1980s mainly due to the poor fiscal situation. A comprehensive plan of tariff reduction and rationalization in Thailand was proposed in 1990 and implemented in 1995 and 1997 as part of the World Trade Organization (WTO) commitments. Tariffs at all stages of production substantially declined. The reform process was disrupted due to the financial crisis in 1997, and tariffs in many categories, especially luxury products, were temporarily increased. Tariff restructuring received renewed emphasis again in the early 2000s, and the Thai government introduced tariff cuts, commencing in June 2003 (implemented in October 2003), followed by a 4-year period of tariff reductions from 2004 to 2008. The tariff rates continued to decline after 2008, except in 2011–2013, when the global financial crisis and severe flooding in Thailand caused slight increases in tariff rates. The US–China trade war and COVID-19 have not so far reversed the trends of tariff reductions in Thailand.

DOI: 10.4324/9781003144076-8

Despite a series of tariff reductions, the escalating tariff structure still exists. Industries producing intermediate goods tend to have relatively lower rates of tariffs than final goods-producing sectors. Effective rate of protection (ERP), measuring input and output tariffs simultaneously, shows that the tariff structural reform, especially after the 2000s, brought no significant progress in reducing ERP in various sectors, such as agro-processing, textile products, apparel, leather and footwear products, and electrical appliances. This is an obvious example where tariff reduction tended to put greater emphasis on intermediates, thereby widening their ERP estimates instead of reducing protection. Interestingly, when export-oriented activities and possible water in tariffs are considered, the less unfavorable impact of an escalating tariff structure on industrial protection was revealed.

Although non-tariff barriers have diminished noticeably in Thai manufacturing over the past decades, non-tariff measures (NTMs),[1] especially sanitary and phytosanitary (SPS) and technical barriers to trade (TBT), have become more crucial since the early 2000s in the country (see Chapter 2). SPS measures are mostly imposed on agriculture and food products, while TBT measures are required more for manufacturing products. Although a number of SPS and TBT measures, which Thailand imposed on other countries' imports, were close, the incidence of measures, especially the coverage ratio, suggests the far lesser importance of SPS compared to TBT measures. The greater value of trade (as well as the number of tariff lines) associated with manufacturing products – mostly subject to TBT measure – than with agriculture and food – mostly linked to SPS – explains such a finding. From a country analysis, countries in Asia, especially ASEAN+6, tend to be less affected by the Thai NTMs. The implementation of mutual recognition agreements (MRAs) and harmonization agreements, implemented since 2002 and covering about 40 percent of total intra-ASEAN imports, would probably help lower the incidence of ASEAN countries.

On the flip side, Thai exports have also been subject to NTMs, especially SPS and TBT, from both developed and developing countries, including ASEAN nations. For ASEAN countries, the NTMs introduced for Thai products tended to be comparable to those introduced for Vietnamese and Indonesian products, while being noticeably higher than those for products from Singapore and Malaysia, particularly when coverage ratios are considered. When developed country markets, especially the US, are considered, although the incidence of detentions and the coverage ratio of Thai exports were lower than with some other Asian countries, the causes of detentions raise some concerns. While export products of other Asian countries were mostly detained due to misbranding, more than 60 percent of Thai exports were detained due to adulteration, including contamination, unsafe additives, insanitariness, and acidification. Resolving the problems related to the former tends to be easier than those related to the latter, where improvements in entire production processes are required, including hygiene and contamination testing. This is an area where Thailand still needs to urgently develop, especially considering national efforts to move the country toward becoming a food innovation hub in the region.

Liberalization through the proliferation of so-called free trade agreements (FTAs) is one of the most notable phenomena to have emerged in the world economy since the onset of the new millennium (see Chapter 3). The Thai government has been actively involved in signing FTAs, and as of the end of 2020, 14 FTAs have been in effect and another 5 are under negotiation. The FTA partners include ASEAN members, Japan, the Republic of Korea, China, Australia, New Zealand, India, Chile, Peru, and Hong Kong, many of which have more than one FTA in effect. The preferential tariffs offered in these agreements to Thailand vary across FTAs, so the tariff margins, that is comparing MFN tariffs with preferential tariffs, have varied considerably among FTAs. As expected, the tariff margins for developed countries are smaller than the corresponding range for developing countries. FTA preferential schemes tend to be highly concentrated within certain product lines whose tariff margins are less substantial. This is especially true for developing countries, whose tariffs, on average, are generally high compared to developed countries. The substantial tariff margins were observed within four FTAs, namely AFTA, Thailand–Australia, Thailand–New Zealand, and ASEAN–Korea, and the least was for ASEAN–Japan and the JTEPA. When all partners are combined, the utilization rate for Thai exports was increasing during 2006–2019, but was still relatively low, averaging around 50 percent in 2016–2019. The utilization rates vary across FTA partners and tend to be higher for non-ASEAN partners, especially Australia. Regarding FTA utilization for imports, it increased gradually during 2006–2019, but the rate was much lower than on the export side. The relative importance of raw materials/intermediates, to which various tariff exemption schemes can be applied, in preferential imports explains their lower FTA utilization rates than those on the export side. Tariff margins, the ability to comply with RoOs, the economic fundamentals driving trade, and trade under the production networks of multinationals explain the use of FTAs in Thailand.

Concerning the investment policies governing foreign investment, Thailand has pursued a 'market-friendly' approach toward foreign investors in manufacturing (Chapter 3). The Board of Investment (BOI), established in 1966 as an independent office, is responsible for providing investment incentives. The direction of investment promotion has been altered several times, in line with implemented industry policies. The promoted zones were established and reclassified in 1989 to strengthen and promote manufacturing activities in remote areas. The Eastern Seaboard (ESB) was also built as the 'new economic zone', which is an export-oriented light-industry base for industries such as automobiles and electronics. Infrastructure, including deep seaports, highways, and industrial estates, was constructed. In 2013, the BOI announced the new 5-year strategy plan (2013–2017) for promoting investment in Thailand. Ten promoting sectors were prioritized instead of a broad-based approach, and instead of using geographic zones as a criterion in providing privileges, new incentives comprising a combination of two sub-incentive schemes – one involving activity-based incentives and the other merit-based – were introduced. Activities which were useful to the country's competitiveness, especially research and development (R&D)

and environmental-related industries, received higher privileges through activity-based incentives as well as additional concessions through the merit-based ones. Interestingly, even though the new planned promotion tended to be more selective instead of a broad-based initiative, the industry coverage (ten major sectors) was still very wide. This casts doubt on its effectiveness as a targeted industry strategy during this period.

A major change took place once again in 2017 for the BOI investment promotion plan (2015–2021). Generally, the main purpose of the amendment was to promote activities enhancing national competitiveness through research and development (R&D) and innovation. Additional incentives were granted to support the new policy package known as Thailand 4.0, and ten newly targeted industries were selected to hopefully serve as new and more sustainable growth engines.[2] The incentives provided by the BOI for the newly targeted industries also comprise a combination of two sub-incentive schemes as during 2013–2017, but the activities in each category are different. To support an industrial transformation, the Eastern Economic Corridor (EEC), connecting the three eastern provinces of Chonburi, Rayong, and Chachoengsao, was established in 2017. The Thai government again announced additional privileges in 2019 to draw windfalls from the US–China trade tension. Other Southeast Asian countries also competed to draw windfalls by offering additional privileges during this period.

Chapter 4 looks at trends and patterns concerning trade, both by sector and market, in Thailand. Regarding the trade patterns, labor-intensive manufacturing products, such as clothing, footwear, leather, and electronic products have dominated the exports of Thailand since the late 1980s, when there was a clear shift in emphasis from import-substituting activities to an export-promotion strategy. The degree of openness, measured by total trade of goods (and services) over GDP, rose noticeably from the late 1980s until the 1997 Asian economic crisis, partly due to the comprehensive plan of tariff reduction and rationalization in Thailand, as mentioned earlier. However, the share of manufacturing in the world market showed a declining trend during 1992–1998, attributable to a significant decline in the share of apparel. A growing supply from other Asian countries, especially China, caused a dramatic drop in apparel exports from Thailand. Thailand went into crisis in 1997–1999. The export sector became an engine for economic recovery, partly due to the dramatic currency depreciation during this period, though some manufacturing exporters were restrained by the credit crunch in the financial sector.

After the Asian financial crisis, Thailand experienced a slight growth slowdown between 2000 and 2005. However, exports performed relatively well, and the degree of trade openness continued to rise during this period. After 2008, however, export performance, especially that of goods, became relatively poorer due to both internal and external factors interplaying, including political unrest starting in 2005, the severe flooding in Thailand in 2001, and the global financial crisis in 2008. The share of exports of goods over GDP declined, but thanks to the exports of services, especially the tourism sector, total exports over

GDP remained relatively stable. Weak domestic demand, especially investment, caused a noticeable stall in the import of goods, thereby significantly lowering the degree of trade openness in Thailand since 2011. Export destinations changed considerably after the recent global financial crisis in 2008. ASEAN and China have become more crucial export destinations for Thailand. From detailed trade information for 2002–2016, it can be seen that exports in Thailand were mostly explained by intensive margins (exports of traditional [existing] products), while the impact of extensive margins (exports of new products or exports to a new market) was still limited, with a slight increase after 2014.

Export growth improved in 2017 owing to an expansion in foreign investment, which was probably influenced by the Thailand 4.0 policy announcements. However, the external environment, in particular the US–China trade war and COVID-19, caused a significant decline in exports in 2018–2020. The US–China trade war created both positive and negative consequences for the Thai economy, but the latter tended to dominate the former. Windfalls from the US–China trade war, especially in terms of possible trade diversion and investment relocation, were limited in Thailand compared to other Southeast Asian countries. Particularly, in 2018, Thai exports slowed down in the US market, especially electronics and machinery, while other Asian countries gained access into this market during this period. The limited windfalls in Thailand may reflect some fundamental problem in the country, especially the relatively low investment over the preceding period and the unattractiveness of new BOI incentives for existing firms, especially those locating outside the EEC. Thai exports continued to stall in 2019–2020 due to COVID-19. Interestingly, although exports in Thailand dropped significantly during this period, the world market share of all products in Thailand went up, and some export products, especially those in electronics and electrical appliances, resumed their growth in 2020 and served as the key engines for economic recovery in Thailand.

The parts and components (P&C) share in the total manufacturing trade in Thailand has been substantial, though a noticeable decline in electronic and electrical appliance prices recently reduced their proportion within the manufacturing trade. The US–China trade war and COVID-19 have disrupted the P&C trade in Thailand. However, so far, their importance in the manufacturing trade during the pandemic has tended to illustrate the continuity of global supply chains in the country. So far sources of P&C suppliers in key manufacturing products have not yet significantly altered in response to the virus crisis.

In terms of foreign investment, coinciding with the Thai industrialization process, FDI inflows dramatically increased and became increasingly important to the country's capital accumulation process from the late 1980s. The financial crisis in 1997 even increased FDI inflows into Thailand due to the 'fire-sale' phenomenon. The dot.com bubble in 2001 caused a (mild) decline in FDI inflows into Thailand, but the level of the flows was still higher than those during 1990–1996. FDI inflows expanded significantly again in 2003–2013, except in 2009 and 2011 due to the global financial crisis and the flooding disaster in Thailand. Chinese and ASEAN investors gained importance in Thailand after the

2008 global financial crisis, along with major investors like Japan, the US, and the EU.

However, despite the BOI announcing their new 5-year strategy plan (2013–2017) with new classified privileges intended to promote investment in Thailand in 2013, FDI dropped dramatically during 2014–2016, after a military coup took place in May 2014. In 2017, a major change was announced in the wake of an amendment included in the BOI investment promotion plan (2015–2021), along with the establishment of the Eastern Economic Corridor (EEC). Net FDI inflows increased in 2017–2018, with predominance in the service sector, especially financial and insurance activities. The trade war between the US and China is likely to have stimulated foreign investors to relocate their investment into Thailand, but its impact tended to be insignificant. In 2019, only Thailand among Southeast Asian countries encountered a significant drop in net FDI inflows. The COVID-19 pandemic starting in early 2019 had a further unfavorable impact on Thailand, and FDI inflows were interrupted. In 2020, it seems that only Thailand was faced with a reversal of foreign capital flows, while other neighboring countries encountered only a deceleration in foreign investment. This evidence, to a certain extent, casts doubt upon the effectiveness of the new investment incentives and the business environment in the country in attracting foreign investors.

In Chapters 2–4, we discussed how globalization, through trade (including the P&C trade) and investment, continues in Thailand amid the anti-globalization sentiment since the onset of the new millennium, especially the US–China trade war and the COVID-19 pandemic. The country tends to rely on and welcome these two as key engines in promoting innovative and sustainable economic growth. However, whether such globalization helps spur innovation, especially R&D investment, productivity, skilled workers, and wages, all crucial elements in leading to innovative and sustainable economic growth in Thailand, remains an unsettled question and receives less systemic analysis in empirical studies.

Chapter 5 investigates the relationship in Thailand between multinational enterprises (MNEs) investing through FDI mode, exporting, and three types of R&D activities, namely R&D leading to improved production technology, R&D concerning product development, and R&D involving process innovation. The result shows that most MNE affiliates are unlikely to invest in R&D in Thailand, but instead they tend to import technology (technology transmission) from their parent company. The high fixed costs involved in setting up R&D in the host countries, cheap transportation costs, complex communication, and co-operation within a firm explain preferable choices of MNEs toward employing technology transmission. However, the automotive and hard disk drive industries are two exceptional cases wherein MNE affiliates have a significant and positive impact on R&D activities in Thailand. In particular, in the case of the automotive industry, the entering of MNEs into the market generates all three types of R&D activity in Thailand, while in the hard disk drive industry, the role of MNEs is found more in product development and production technology. These results confirm the world-class production base status of the country in these two industries. Interestingly, though most MNEs are unable to generate a positive and direct impact on R&D activity in the host country, they are able to generate a spillover effect by stimulating indigenous firms to invest in R&D activity, especially for product development and process innovation.

Government promotion policy, expedited through the Board of Investment (BOI), such as tax exemption, could spur R&D activity, especially in terms of improved production technology. However, its effectiveness is likely to be limited to only domestically owned firms, not MNEs, as most of them are at a disadvantage in terms of proprietary assets and need additional support from the government. Exporting tends to promote R&D leading to product development. Entering an export market tends to help firms learn more about competing products and customer preferences, but the ability to access the information related to improving production technology and process innovation is limited from the exporting channel. Although the relationship of exports and the other two R&D activities is not uncovered statistically, the positive sign of this variable revealed in this study, to some extent, reflects the intense global competition that is beginning to stimulate firms in Thailand to invest in R&D leading to improved production technology and process innovation.

Firm-specific factors, including age, size, productivity, and capital–labor ratios, are all crucial in determining R&D activity. Regarding firms' productivity, once firms have already decided to invest in R&D, firms with higher productivity tend to invest more in R&D, especially in product development. Infrastructure is another crucial factor positively influencing both a firm's decision to invest in R&D and R&D intensity for all three types of R&D. Meanwhile, the dynamism of industries involved in a production network is likely to require more R&D investment to keep the industry upbeat and competitive in international markets.

In addition to R&Ds, Chapter 6 examines the role of trade and investment on firms' productivity in the Thai manufacturing sector. The range of industrial policy tools was widely defined, including tariff measures, subsidies, and investment incentives, all of which represent the main tools used in Thailand. Firm-specific variables are of marked significance and tend to be more crucial than industrial policies. The results show that firms which are more exposed to the world market, either via exporting output abroad or sourcing imported raw materials or both, exhibit higher productivity. Foreign firms also have higher productivity than indigenous firms. Firms committing to a concerted R&D effort in addition to hiring white-collar workers see greater productivity gains than those which do not. Participating in global production networks potentially results in higher productivity improvements.

Regarding trade policy in terms of tariff measures, it seems that simultaneous and, perhaps, substantial reductions in both input and output tariffs (measured through effective rate of protection, ERP) for imports appear to have a pronounced impact on enhancing firm productivity. Among trade protection measures, the ERP, which concerns water in tariffs encountered by exporting firms, has the greatest effects on firm productivity, whereas the FTA-led trade liberalization effect fails to add substantial competitive pressure compelling firms to improve productivity. Such statistical insignificance reflects the nature of the

FTA commitments that Thailand has made so far. This remains a challenge to any Thai governments going forward which have yet to materialize the potential benefits represented by signed FTAs. Preferential schemes offered by Thailand's FTA partner countries could represent another potential channel in encouraging firm productivity in Thailand through firms' export stimulation. However, as shown in Chapter 3, the FTA utilization rate of Thai exporters was only around 50 percent; that is, only half of Thai exports used the preferential tariffs offered by Thai FTA partners. The relatively low FTA utilization by Thai exporters could probably limit the role of FTAs in stimulating firm productivity through the export channel.

Subsidies like the assistance programs granted to exporting firms were not effective in enhancing firm productivity and, in some cases, firms in the subsidized sectors tend to perform significantly poorer in terms of productivity improvement than other firms. Non-tariff measures (NTMs), such as sanitary and phytosanitary and technical barriers to trade, could also have implications for firms' productivity. While technical NTMs tend to generate negative impacts on exports, either volume or prices or both, it is likely to have adverse impacts on firms' productivity. However, as pointed out in Chapter 2, complying with technical NTM measures could yield some positive impacts on complainant firms, including upgrading product quality, improving product design, and building consumer trust. Thus, the task of complying with technical NTMs should not be viewed just as a barrier to trade, but also as an opportunity for firms to upgrade quality standards and market sophistication.

Investment incentives offering through the board of investment (BOI) help improve firm productivity. Their impacts tend to be evident beyond the three provinces – Chon Buri, Rayong and Chachoengsao – in the Eastern Economic Corridor (EEC) area, for example, Pathum Thani, Phra Nakhon Si Ayutthaya, and Samut Prakan, where most electronic sectors are located; Samut Prakan, Prachinburi, Phra Nakhon Si Ayutthaya, and Chachoengsao for automotive sectors (and automotive parts); and Samut Sakhon, Samut Songkhram, and Nakhon Pathom for food. Thus, providing special BOI incentives to a particular area, such as the Eastern Economic Corridor (EEC), initiated in 2017, while ignoring various original manufacturing areas may result in unsustainably moving toward Thailand 4.0. Providing investment incentives via the BOI should be undertaken with caution since ensuring the positive impact of BOI initiatives incurs significant costs, especially in terms of foregone government revenue. Lastly, establishing a conducive environment, entailing domestic competition, matters directly in helping generate higher firm productivity and indirectly in enhancing the role of BOI. This highlights the necessary and important role of an enabling environment, which must be in place to foster such productivity.

Regarding issues of workers' skills and wage premiums (Chapter 7), firm-specific factors, especially demand-side factors, truly matter in determining whether firms hire skilled/unskilled workers and tend to be more crucial than trade and investment policies. Firms' market orientation, both exports and imports of raw materials, firms' size, firms' ownership, and the level of capital–labor ratio are all crucial in affecting skilled/unskilled workers. While foreign firms and firms with a high proportion of raw material imports are likely to hire more skilled workers, those with a high proportion of exports, capital deepening, and larger size tend to be inconclusive. For exports, a non-linear relationship is revealed. Firms which have a high proportion of exports are likely to need more skilled workers to enhance their productivity and survive in the global competition. But when the share of exports to total output exceeds a certain threshold, a firms' demand for skilled workers starts declining, and they are likely to hire more non-skilled workers instead. To a certain extent, it seems that in Thai manufacturing skilled and non-skilled workers are substitutable to serve a large scale of exports, which are mostly in original equipment manufacturing (OEMs) products.

Capital deepening starts to reduce demand for skilled workers when it surpasses a certain threshold, reflecting that the installed physical capital is labor-saving technology in Thai manufacturing, so that demand for workers, especially skilled ones, becomes less. This raises concerns about whether introducing more and more capital would replace (skilled) workers and push them out of the job market. Interestingly, Jongwanich, Kopaiboon, and Obashi (2020), using labor force surveys during 2012–2017, show that capital deepening, especially that involved with advanced technology, would still have limited power in pushing labor out of the job market. Instead, such deepening tended to affect the reallocation of workers between skilled and unskilled positions. The non-linear relationship between firm size and the number of skilled workers reflects the nature of hiring skilled workers, which incurs fixed costs to the establishment and, to a certain extent, also suggests the preference of skilled workers who want to work in the larger establishments with brighter career paths.

For trade policy, trade liberalization in terms of tariff reductions was not harmful to unskilled workers in all scenarios. According to the nature of trade protection, high tariff rates tend to be imposed on relatively capital-intensive sectors, which need skilled workers to be involved. Trade liberalization, or a lower effective rate of protection, tends to lower the demand for skilled workers in response to cheaper imported products. Non-tariff barriers, i.e., subsidies in this study, by contrast, do not have any robust impacts on skilled workers in Thai manufacturing. Participation in the global production network ($Network_{jt}$) tends to encourage more skilled workers, regardless of how trade liberalization is measured. This supports arguments that firms operating in developing and developed countries are facing different cones of production.

Investment policy, in terms of providing investment incentives through BOI, tends to have more favorable impacts on unskilled workers than on skilled ones. This is in contrast to what we expect, since it is foreign firms and indigenous export firms who apply for those privileges. However, since a number of Thai exporting firms who obtain BOI privileges are still involved with original equipment manufacturing (OEMs) exports, the demand for unskilled workers is likely to go up in response to the large export volume. R&D also tends to have a limited role in encouraging firms to hire skilled workers, partly due to a relatively small amount of R&D expenditure in Thai manufacturing and more involvement of foreign firms in technology transmission than in technology generation.

When wage skill premium is considered, a wage–employment skills disconnection emerges in some variables of our interests, including trade liberalization through tariff reductions and participation in global production networks, as well as receiving investment promotion through BOI. The wage skill premium was not influenced by these factors, though they could affect a number of skilled/unskilled workers. Labor market conditions, especially friction in the labor market; a shortage of skilled workers, especially ones involved with operational activities; and a somewhat excess supply of unskilled workers induced by migrant workers from Thailand's neighboring countries could cause wage–employment skills dissociation. In addition, the largely weakly unionized Thai labor market, partly caused by the relatively low level of human capital, could somewhat explain the lower ability of workers, especially unskilled ones, to negotiate their wages with employers to match with their skill adjustments driven by trade and investment liberalization.

All in all, Thailand has gained considerable benefit from trade and investment liberalization in various forms, including innovation, firm productivity improvements, and worker skills enhancement. Although the country has prospered in these areas, several further enhancements are needed in order to effectively harness the benefits available from globalization. First, trade liberalization should continue to be implemented. From our evidence, it could be achieved with less concern for its effects in widening wage skill premiums. Although tariff rates in Thailand have declined substantially over the past three decades, the escalating tariff structure has remained in place, and effective rates of protection were relatively stable during 2006–2019. In addition, more than a quarter of tariff lines are yet to be incorporated into the three-rate structure, 0–1, 5, and 10 percent. This reflects unfinished business in terms of tariff restructuring in Thailand. Further liberalization would help promote firm productivity and innovation as discussed earlier. Where tariff reforms are concerned, pursuing reform by placing too much focus on input tariffs while leaving output tariffs untouched might not yield favorable outcomes. Lowering input tariffs potentially enhances firm productivity through, for example, accessing previously unavailable and higher quality varieties of imported inputs, but it could possibly discourage firms' efforts to improve productivity due to the increased level of effective protection. To spur productivity, both input and output tariffs must be jointly taken into consideration in ensuring trade is liberalized.

As FTA negotiations are expected to drive further trade liberalization initiatives, a policy emphasis designed to harness the trade-induced effects of signed FTAs should be placed on reducing the costs incurred from the presence of RoOs. Lowering such costs requires the co-operation of both exporting and importing countries. There is room for inter-governmental co-operation to mitigate any obstacles preventing firms from making use of available FTAs. Tariff cuts for import products under the FTA must also be implemented in a comprehensive manner with minimum exceptions to ensure that the negotiation efforts undertaken so far are ultimately worthwhile.

Regarding non-tariff technical measures, which have become increasingly predominant in NTMs since the early 2000s, co-operation regarding mutual recognition and harmonization agreements should be strengthened and go beyond ASEAN, while the scope of products included in such agreements should be expanded to ensure technical NTMs are implemented effectively to address legitimate objectives, such as health and safety, instead of being used as trade barriers or protectionist tools. The country should also strengthen its supply-side capacity, upgrade quality standards, and provide knowledge to domestic firms, especially small and medium enterprises, to increase the probability that Thai organizations can successfully meet foreign standards. Hopefully, complying with technical NTMs could yield a positive impact on complainant firms, including upgrading product quality, improving product design, and building consumer trust, which will eventually help improve firm productivity and innovation levels in the country.

Second, although the government desires and encourages firms to produce and export innovative and high-value-added products under the Thailand 4.0 plan, to a certain extent, the volume of exports still matters for several Thai firms in their efforts to expand in global markets, especially organizations involved with original equipment manufacturing (OEM) products. These products tend to demand less-skilled workers than those under original design manufacturers (ODMs) or original brand manufacturers (OBMs). However, such products still dominate Thai exports and could enhance firms' productivity, as mentioned earlier. Jongwanich (2020) also shows that Thailand's traditional export products, including OEMs, are still the key to stimulating economic growth, while new products, including those under ODM and OBM (or the so-called extensive margins), are found to have a limited impact on economic growth. To smoothen the transition toward Thailand 4.0 and promote the availability of more skilled workers, promoting new products, including ODM and OBM, should be simultaneously boosted along with improving the efficiency of producing traditional products. Excess profit as a result of enhancing the competitiveness of traditional products could form the core internal financial resource of firms seeking to sustainably drive ventures into new product areas, especially innovative exports and high-value-added goods. Government promotion policy, through the Board of Investment, could be expedited to spur R&D activity. From this study, its effectiveness is likely to be greatest with operations involved in process innovation and domestically owned firms. However, providing investment incentives via the BOI should be undertaken with caution, since ensuring the positive impact of BOI initiatives incurs significant costs, especially in terms of foregone government revenue.

Third, too much emphasis was placed on BOI incentives to particular locations, including the Eastern Economic Corridor (EEC) initiated in 2017, while ignoring original development clusters involved in producing key existing export products – for example, the electronic sectors in Pathum Thani, Phra Nakhon Si Ayutthaya, and Samut Prakan; the automotive sectors in Samut Prakan, Prachinburi, Phra Nakhon Si Ayutthaya, and Chachoengsao; food in Samut

Sakhon, Samut Songkhram, and Nakhon Pathom, and so on – could potentially worsen productivity improvements and income inequality and eventually result in unsustainable progress toward achieving Thailand 4.0. BOI investment promotion certificates have demonstrated more geographical concentration in the three provinces of the EEC since 2017, which has led to concerns over industrial decentralization, which represents a crucial pathway toward ensuring sustainable development. The unattractiveness of new BOI incentives for existing firms, especially those in electronics/electrical appliances and machinery and equipment, to expand production at their established locations outside of the EEC could limit the potential windfalls available as a side effect of the US–China trade war compared to other Asian countries, as pointed out in Chapter 4. In addition, industry concentration within only three out of the ten targeted industries shown by the BOI investment promotion certificates raises additional concerns over whether the selected industries under the new investment policy strategy could be able to effectively serve as new and sustainable growth engines for Thailand 4.0. In some countries, for example Korea, a bottom-up rather than a top-down decision-making approach has been applied in choosing and developing industry clusters. Such industry clusters are located in various areas of the country and linked through efficient logistical systems.[3]

Nevertheless, although investment incentives have been able to promote firm productivity and some types of R&D investment, Chapters 4–7 show that a conducive business environment is far more crucial than investment incentives in attracting foreign investors and harnessing the benefits to be accrued from such investments. Ensuring the presence of a competitive environment, reducing cumbersome red tape, and maintaining policy stability, as well as establishing the infrastructure/efficient logistics required for domestic and global connections, are all examples of factors constituting a conducive environment, which should be prioritized. Such a favorable environment would also help attract MNEs to invest in activities involved in the global supply chain, which our study has shown to help spur R&D, productivity, and the availability of skilled workers. Although some evidence of supply-chain disruption has emerged as a result of the COVID-19 pandemic, so far its importance in terms of manufacturing trade performance during the pandemic has tended to illustrate the continuity and relative stability of global supply chains in Thailand. However, the COVID-19 pandemic remains, along with ongoing tensions between the US and China. Developments regarding GVCs should continue to be monitored to clearly reveal the impact of the pandemic on global production sharing and the behavior of MNE firms participating in supply chains.

From our study, foreign investment tends to widen wage skill premiums, raising concerns about enlarged income inequality in the countries involved. To redress such adverse impacts, improving indigenous firms' ability to tap into knowledge/technology spillovers from foreign operations – especially through ensuring a competitive environment and developing employees' human capital, as well as encouraging foreign investors to generate useful programs for the communities supplying workers, particularly through corporate social responsibility initiatives – should be prioritized. In particular, the entering of foreign firms, together with their ensuing improved technological spillovers, as well as the creation of the conducive environment mentioned earlier, will eventually help improve the investment situation in Thailand. This represents an especially desirable outcome, as its ratio over GDP has declined continuously since the severe flooding experienced in 2011.

Lastly, hiring skilled workers incurs fixed costs for firms; solely enlarging skilled workforces while ignoring demand factors would be unable to mitigate against labor shortages effectively, and would rather worsen quality mismatching. Establishing a conducive environment for firms as mentioned earlier must go hand in hand with government efforts to enlarge the pool of skilled workers in the country to effectively stimulate demand for labor. In addition to supporting skills improvement beyond formal education, governments should act as facilitators to vigorously reduce friction in the labor market and smoothen the transition of workers from one place to another, either within or across industries. Co-operation with private firms is necessary to effectively manage information, especially that related to job creation and redundancies across firms and industries, and to minimize friction in the labor market. All these supply improvements would, to a certain extent,help prevent workers from being pushed out of the job market or relocated to unskilled positions due to capital deepening, especially that involved with advanced technology, most of which, our study has shown, is labor-saving technology in Thai manufacturing operations.

Wages should also be properly readjusted commensurate to skills improvements/changes. From our study, in some cases, wages/income fail to be adjusted to reflect the skills development involved. Proper payment schemes, beyond relying on merely providing the minimum wage, should be developed to treat workers fairly, along with encouraging them to improve their skills and be flexible in response to changing operational requirements.

Notes

1 The definition of NTMs is broader than that of non-tariff barriers (NTBs) since the former includes all measures, other than ordinary customs tariffs, which can be applied with protectionist intent or to address legitimate objectives such as health and safety. NTBs, by contrast, are likely to be implemented solely with protectionist intentions, such as quotas and voluntary export restrictions, so that NTBs are a subset of NTMs. See the detailed definition of NTMs in Section 2.3.

2 As mentioned in Chapter 3, the COVID-19 tends to cause Thai government to rethink about the targeted industries. The government has started to emphasize the Bio-Circular-Green Economy (BCG) Model, instead of all ten targeted industries. Thailand's four strategic areas for the BCG model are (1) food and agriculture; (2) medical and wellness; (3) energy, material, and biochemicals; and (4) tourism and creative economy.

3 For example, in capital area, digital content, information and communications, and green IT are in Seoul; intelligence fusion parts are in Namdong; electronic components are in Banwol/Sihwa; and semi-conductors and displays are in Gyeonggi. In the south-west, Jeollanom-do, i.e., Gwangiu and Iksan, optical

communication, LEDs, and electronic parts are mainly produced. In the northern region, Gangwon-do, activities related to medical devices are carried out. In the eastern part, including Gyeongsangbuk-do, electrical and electronic items are produced; for example in Gumi, electronic parts, mobiles, IT devices, and display components are produced; in Daegu (Seongseo); mobiles and IT electricals/electronics are produced. Well established infrastructure (both in terms of utilities and transportation) and labor and living conditions are crucial factors in attracting investors. A technology-based approach, instead of an area-based approach, is applied in providing government support.

Taylor & Francis
Taylor & Francis Group
http://taylorandfrancis.com

References

Acs, Z.J., & Audretsch, D.B. (1987). Innovation, market structure, and firm size. *The Review of Economics and Statistics*, *69*(4), 567–574.

Aghion, P., Cai, J., Dewatripont, M., Du, L., Harrison, A., & Legros, P. (2015). Industrial policy and competition. *American Economic Journal: Macroeconomics*, *7*(4), 1–32.

Agosin, M.R. (2006). Trade and growth: Why Asia grows faster than Latin America. In *Economic and Sector Study Series RE2-06-2002*. Washington, DC: Inter-American Development Bank.

Akira, S. (1989). *Capital Accumulation in Thailand 1855–1985*. Bangkok: Silkworn Books.

Akira, S. (1996). *Capital Accumulation in Thailand 1855–1985*. Bangkok: Silkworn Books.

Akrasanee, N., & Ajanant, J. (1986). Thailand: Manufacturing industry protection issues and empirical studies. In C. Findlay & R. Garnaut (Eds.), *The Political Economy of Manufacturing Protection: Experiences of ASEAN and Australia*. Sydney: Allen and Unwin.

Altenburg, T. (2011). *Industrial Policy in Developing Countries: Overview and Lessons from Seven Country Cases*. d.i.e. Discussion Paper, No.4/2011. Bonn: German Development Institute.

Alvarez, R., & Lopez, R.A. (2005). Exporting and performance: Evidence from Chilean plants. *Canadian Journal of Economics*, *38*(4), 1384–1400.

Amiti, M., & Cameron, L. (2012). Trade liberalization and the wage skill premium: Evidence from Indonesia. *Journal of International Economics*, *87*(2), 277–287.

Amiti, M., & Davis, D. (2011). Trade, firms, and wages: Theory and evidence. *Review of Economic Studies*, *79*, 1–36.

Amiti, M., & Konings, J. (2007). Trade liberalization, intermediate inputs, and productivity: Evidence from Indonesia. *American Economic Review*, *97*(5), 1611–1638.

Arnold, J.M., & Hussinger, K. (2005). Export behavior and firm productivity in German manufacturing: A firm-level analysis. *Review of World Economics*, *141*(2), 219–243.

Artuc, E., Chaudhuri, S., & McLaren, J. (2010). Trade shocks and labor adjustment: A structural empirical approach. *American Economic Review*, *3*(100), 1008–1045.

Athukorala, P. (2003). *FDI in Crisis and Recovery: Lessons from the 1997–98 Asian Crisis*. Working Paper in Trade and Development 2003/04. Canberra, Australia: Research School of Pacific and Asian Studies, Australian National University.

Athukorala, P., & Hill, H. (2010). Asian trade and investment: Patterns and trends. In P. Athukorala (Ed.), *The Rise of Asia: Trade and Investment in Global Prospective* (pp. 11–59). London: Routledge.

Athukorala, P., & Kohpaiboon, A. (2010). Globalization of R&D by US-based multinational enterprises. *Research Policy*, *39*(10), 1335–1372.

Athukorala, P., & Kohpaiboon, A. (2012). Australian-Thai trade: Has the FTA made a difference? *Australian Economic Review*, *44*(4), 457–467.

Athukorala, P., & Kohpaiboon, A. (2014). Trade and investment patterns in Asia: Implications for the debate on multilateralizing regionalism. In R. Baldwin & M. Kawai (Eds.), *Multilateralizing Asian Regionalism*. New York: Oxford University Press-ADB Institute.

Athukorala, P., & Nasir, S. (2012). Global production sharing and South-South trade. *Indian Growth and Development Review*, *5*(2), 173–202.

Attanasio, O., Goldberg, P., & Pavcnik, N. (2004). Trade reforms and wage inequality in Colombia. *Journal of Development Economics*, *74*(2), 331–366.

Autor, D., Dorn, D., & Hanson, G.H. (2013). The China syndrome: Local labor market effects of import competition in the United States. *American Economic Review*, *103*(6), 2121–2168.

Autor, D., Dorn, D., & Hanson, G.H.. (2015). Untangling trade and technology: Evidence from local labour market. *The Economic Journal*, *125*(May), 621–646.

Aw, B.Y., & Batra, G. (1998). Technological capability and firm efficiency in Taiwan (China). *World Bank Economic Review*, *12*(1), 59–79.

Aw, B.Y., Roberts, M.J., & Xu, D.Y. (2008). R&D investments, exporting, and the evolution of firm productivity. *American Economic Review*, *98*(2), 451–456.

Aw, B.Y., Roberts, M.J., & Xu, D.Y. (2009). *R&D Investment, Exporting and Productivity Dynamics*. NBER Working Paper No. 14670. Washington, DC: The National Bureau of Economic Research.

Aw, B.Y, Roberts, M.J., & Xu, D.Y. (2011). R&D investment, exporting and productivity dynamics. *American Economic Review*, *101*(4), 1312–1344.

Balassa, B. (1965). Tariff protection in industrial Countries: An evaluation. *Journal of Political Economy*, *73*(6), 573–594.

Baldwin, J., & Gu, W. (2004). Trade liberalization: Export market-participation, productivity growth, and innovation. *Oxford Review of Economic Policy*, *20*(3), 372–392.

Baldwin, R, & Jaimovich, D. (2012). Are free trade agreements contagious?. *Journal of International Economics*, *88*(1), 1–16.

Baldwin, R., & Okubo, T. (2019). GVC Journeys: Industrialisation and deindustrialisation in the age of the second unbundling. *Journal of the Japanese and International Economies*, *55*(C), 53–67.

Baldwin, R.E. (1969). The case against infant industry protection. *Journal of Political Economy*, *77*(3), 295–305.

Barrios, B., Brulhart, M., Elliot, R., & Sensier, M. (2003). A tale of two cycles: Co-fluctuations between UK regions and the Euro Zone. *The Manchester School*, *71*, 265–292.

Baylis, K., Martens, A., & Nogueira, L.. (2009). What drives import refusals?. *American Journal of Agricultural Economics*, *91*(5), 1477–1483.

Becker, S.O., & Egger, P.H. (2013). Endogenous product versus process innovation and a firm's propensity to export. *Empirical Economics*, *44*(1), 329–354.

Belderbos, R. (2003). Entry mode, organizational learning, and R&D in foreign affiliates: Evidence from Japanese firms. *Strategic Management Journal*, *24*(3), 235–59.

Bernard, A.B., & Jensen, J.B. (1999). Exceptional exporter performance: Cause, effect, or both?. *Journal of International Economics*, *47*(1), 1–25.

Bernard, A.B., Redding, S.J., & Schott, P.K. (2011). Multiproduct firms and trade liberalization. *Quarterly Journal of Economics*, *126*(3), 1271–1318.

Bhagwati, J. (1978). *Anatomy and Consequences of Exchange Control Regimes*. Cambridge, MA: Ballinger for National Bureau of Economic Research.

Bhagwati, J. (2000). *The Wind of the Hundred Days: How Washington Mismanaged Globalization*. Oxford: Oxford University Press.

Bhagwati, J., Krisna, P., and Panagariya, A. (1999). *Trading Blocs: Alternative Approaches to Analyzing Preferential Trade Agreements*. Cambridge: MIT Press.

Bigsten, A., & Durevall, D. (2006). Openness and wage inequality in Kenya: 1964–2000. *World Development*, *34*(3), 465–480.

Blalock, G. & Gertler, P.J. (2008). Welfare gains from foreign direct investment through technology transfer to local suppliers. *Journal of International Economics*,*74*(2), 402–421.

Blatter, M., Muehlemann, S., & Schenker, S. (2012). The costs of hiring skilled workers. *European Economic Review*, *56*(1), 20–35.

Blomström, M., & Kokko, A. (1998). Multinational corporations and spillovers. *Journal of Economic Surveys*. *12*(2), 147–177.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, *87*(1), 115–143.

Boffa, M., Jansen, M., & Solleder, O. (2019). Do we need deeper trade agreements for GVCs or just a BIT?. *The World Economy*, *42*(6), 1713–1739.

Borensztein, E., Gregorio, J.D., & Lee, J.W. (1998). How does foreign direct investment affect economic growth?. *Journal of International Economics*, *45*(1), 115–135.

Borghans, L., & de Grip, A. (2000). The debate in economics about skill utilization. In Borghans, L. & Grip, A. de (Eds.), *The Overeducated Worker? The Economics of Skill Utilization* (pp. 3–26). Cheltenham, UK.

Bratt, M. (2017). Estimating the bilateral impact of nontariff measures on trade. *Review of International Economics*, *25*(5), 1105–1129.

Brooks, D. & Hill H. (2004). *Managing FDI in a Globalizing Economy: Asian Experiences*. London: Palgrave Macmillan.

Brooks, D.H., Fan, E.X., & Sumulong, L.R. (2004). Foreign direct investment: Recent trends and the policy context. In D.H. Brooks & H. Hill (Eds.), *Managing FDI in a Globalizing Economy: Asian Experiences*. New York: Palgrave Macmillan.

Brown, J.R., Martinssonb, G., Petersen, B.C. (2017). What promotes R&D? *Comparative Evidence from Around the World*, *46*(2), 447–462.

Büchel, F., and M. Pollmann-Schult. (2001): Overeducation and skill endowments: The role of school achievement and vocational training quality. *IZA Discussion Paper Series No. 337*, 1–28.

Burger, M., Van Oort, F., & Linders, G.J. (2009). On the specification of the gravity model of trade: Zeros, excess zeros and zero-inflated estimation. *Spatial Economic Analysis*, *4*(2), 167–190.

Cadot, O., & Gourdon, J. (2015). NTMs, preferential trade agreements, and prices: New evidence (CEPR Discussion Paper No. DP10798). Retrieved from: www.cepii.fr/PDF_PUB/wp/2015/wp2015-01.pdf

Cadot, O., Carrère, C., & Strauss-Kahn, V. (2011). Export diversification: What's behind the hump? *The Review of Economics and Statistics*, *93*(2), 590–590.

Cadot, O., Gourdon, J. & van Tongeren, F. (2018). *Estimating Ad Valorem Equivalents of NonTariff Measures: Combining Price-Based and Quantity-Based Approaches*. OECD Trade Policy Papers No. 215. Paris: OECD Publishing. doi:10.1787/f3cd5bdc-en

Cadot, O., Munadi, E., & Ing, L.Y. (2015). Streamlining non-tariff measures in ASEAN: The way forward. *Asian Economic Papers*, *14*(1), 35–70.

Calderon, C., & Schmidt-Hebbel, K. (2008). *Openness and Growth Volatility*. Central Bank of Chile Working Papers No. 483. Santiago, Chile: Central Bank of Chile.

Cassiman, B., Golovko, E., & Martinez-Ros, E. (2010). Innovation, exports and productivity. *International Journal of Industrial Organization*, *28*(4), 372–376.

Caves, R. (2007). *Multinational Enterprise and Economic Analysis*. Cambridge: Cambridge University Press.

Chang, H.-J., & Andreoni, A. (2016). Industrial policy in a changing world: Basic principles, neglected issues and new challenges. In Cambridge Journal of Economics 40 Years Conference, 12–13 July, Cambridge.

Chongvilaivan, A., & Thangavelu, S.M. (2012). Does outsourcing provision lead to wage inequality? New evidence from Thailand's establishment-level data. *Review of International Economics*, *20*(2), 364–376.

Cimoli, M., Dosi, G., & Stiglitz, J. (Eds.) (2009). *Industrial Policy and Development: The Political Economy of Capabilities Accumulation*. Oxford: Oxford University Press.

Clerides, S.K., Lach, S., & Tybout, J.R. (1998). Is learning by exporting important? Microdynamic evidence from Colombia, Mexico, and Morocco. *Quarterly Journal of Economics*, *113*(2), 903–947.

Cohen, W.M., & Levin, R.C. (1989). Empirical studies of innovation and market structure. In R. Schmalanse & R.D. Willing (Eds.), *Handbook of Industrial Organization* (pp. 1059–1107). Amsterdam: Elsevier Publishers.

Corden, M. (1997). *Trade Policy and Economic Welfare* (2nd ed.). New York: Oxford University Press.

Corden, W.M. (1966). The structure of a tariff system and the effective protective rate. *Journal of Political Economy*, *74*(3), 221–237.

Currie, J., & Harrison, A.E. (1997). Sharing the costs: The impact of trade reform on capital and labor in Morocco. *Journal of Labor Economics*, *15*(3), S44–S71.

Daft, R.L., Lengel, R.H., & Trevino, L.K. (1987). Message equivocality, media selection and manager performance: Implications for information systems. *MIS Quarterly*, *11*(3), 355–366.

Damijan, J., C. Kostevc, & S. Polanec (2010). From innovation to exporting and vice versa? *The World Economy*, *33*(3), 374–398.

Davis, D.R., & P. Mishra (2007). Stopler-Samuelson is dead: And other crimes of both theory and data. In A. Harrison (Ed.), *Globalization and Poverty*. Chicago, IL: University of Chicago Press.

Deardorff, A.V. (2011). Fragmentation in simple trade models. Comparative advantage, growth, and the gains from trade and globalization: A festschrift in honor of Alan V Deardorff. In R.M. Stern (Ed.), *World Scientific Books* (pp. 165–181). World Scientific Publishing Co. Pte. Ltd., No. 8077, September.

Di Maio, M. (2009). *Industrial policies in developing countries: History and perspectives, in Industrial Policy and Development: The Political Economy of Capabilities Accumulations, Chapter 5*, Cimoli, C., G. Dosi and J.E. Stiglitz eds., United Kingdom: Oxford University Press.

Diao, X., Rattso, J., & Stokke, H. (2006). Learning by exporting and structural change: A Ramsey growth model of Thailand. *Journal of Policy Modeling*, *28*(3), 293–306.

Dollar, D. (1992). Outward-oriented developing economies really do grow more rapidly: Evidence from 95 LDCs, 1976–85. *Economic Development and Cultural Change*, *40*(3), 523–544.

Dollar, D., Hallward-Driemeir, M., & Mengistae, T. (2004). *Investment Climate and International Integration*. World Bank Policy Research Working Paper, No.3323, Washington, DC: World Bank.

Dorfman, N.S. (1987). *Innovation and Market Structure: Lessons from the Computer and Semiconductor Industries*. Cambridge, MA: Ballinger.

Dustmann, C., Ludsteck, J., & Schönberg, U. (2009). Revisiting the German wage structure. *Quarterly Journal of Economics*, *124*(2), 843–881.

Easson, A. (2001). Tax incentives for foreign direct investment part 1: Recent trends and countertrends. *Bulletin for International Fiscal Documentation*, *55*, 266–274.

Ebenstein, A., Harrison, A., McMillan, M., & Phillips, S. (2014). Estimating the impact of trade and offshoring on American workers using the current population surveys. *Review of Economics and Statistics*, *96*(4), 581–595.

Eckel, C., & Neary, P. (2010). Multi-product firms and flexible manufacturing in the global economy. *Review of Economic Studies*, *77*(1), 188–217.

Edwards, S. (1998). Openness, productivity, and growth: What do we really know?', *Economic Journal*, *108*(447), 383–398.

Ejarque, J. & Nilsen, O. (2008). *Identifying Adjustment Costs of Net and Gross Employment Changes*. IZA Discussion paper No. 3703. Boon, Germany: Institute of the Study of Labor (IZA).

Esser, K., Hillebrand, W., Messmer, D., & Meyer-Stamer, J. (1996). *Systemic Competitiveness: New Governance Patterns for Industrial Development*. London: Routledge (GDI Book Series 5).

Estevadeordal, A., & Suominen, K. (2004). Rules of origin: A world map and trade effects. In A. Estevadeordal, O. Cadot, A. Suwa-Eisenmann, & D.C.T. Verdier (Eds.), *The Origin of Goods: Rules of Origin in Preferential Trade Agreements*. Oxford: Oxford University Press.

Falvey, R., & Reed, G. (2002). Rules of origin as commercial policy instruments. GLM Research Paper 2000/18. Centre for Research on Globalization and Labour, University of Nottingham, Markets.

Feenstra, R., & Kee, H.L. (2008). Export variety and country productivity: Estimating the monopolistic competition model with endogenous productivity. *Journal of International Economics*, *74*(2), 500–518.

Feenstra, R.C. (2004). *Advanced International Trade: Theory and Evidence*. Princeton, NJ: Princeton University Press.

Feenstra, R.C., & Hanson, G.H. (2001). *Global Production Sharing and Rising Inequality: A Survey of Trade and Wages*. NBER Working Paper 8372. Cambridge, MA: National Bureau of Economic Research..

Feliciano, Z. (2001). Workers and trade liberalization: The impact of trade reforms in Mexico on wages and employment. *Industrial and Labor Relations Review*, *55*(1), 95–115.

Ferraris, A., Santoro, G., & Dezi, L. (2017). How MNC's subsidiaries may improve their innovative performance? The role of external sources and knowledge management capabilities. *Journal of Knowledge Management*, *21*(3), 540–552.

Financial Times. (2021). *Asia Benefits from Sharp Shift in Cross-Border Investment Flows*, 2 February. https://www.ft.com/content/ea7e36b8-210d-4198-a048-120e32f2df3939 (accessed 12 February 2021).

Freeman, C. (2008). *Systems of Innovation: Selected Essays in Evolutionary Economics.* Cheltenham, UK and Northampton, MA: Edward Elgar.

Frost, T.S., & Zhou, C. (2005). R&D co-practice and 'Reverse' knowledge integration in multinational firms. *Journal of International Business Studies*, *36*(6), 676–87.

Galiani, S., & P. Sanguinetti (2003). The impact of trade liberalization on wage inequality: Evidence from Argentina. *Journal of Development Economics*, *72*(2), 497–513.

Gallagher, K.P., & Worrell, J.L. (2007). Organizing IT to promote agility. *Information Technology Management*, *9*(1), 71–88.

Gaulier, G., Sztulman, A., & Ünal, D. (2020). Are global value chains receding? The jury is still out. Key findings from the analysis of deflated world trade in parts and components. *International Economics*, *161*(1), 219–236.

Goldberg, P. & Pavcnik, N. (2007). Distributional effects of trade liberalization in developing countries. *Journal of Economic Literature*, *45*(1), 39–82.

Goldberg, P.K., Khandelwal, A.K., Pavcnik, N., Topalova, P. (2010). Multiproduct firms and product turnover in the developing world: Evidence from India. *Review of Economics and Statistics*, *92* (4), 1042–49.

Goos, M., Manning, A., & Salomons, A. (2014). Explaining job polarization: Routine-biased technological change and offshoring. *American Economic Review*, *104*(8), 2509–2526.

Greenaway, D., Hine, R.C., & Wright, P. (1999). An empirical assessment of the impact of trade on employment in the United Kingdom. *European Journal of Political Economy*, *15*(3), 485–500.

Greenwald, B. & Stiglitz, J. (2006). Helping infant economies grow: Foundations of trade policies for developing countries. *American Economic Review*, *96*(2), 141–46.

Griliches, Z. (1969). Capital-skill complementarity. *Review of Economics and Statistics*, *51*(4), 465–68.

Groot, W., & Maassen van den Brink, H. (2000). Overeducation in the labor market: A meta-analysis. *Economics of Education Review*, *19*(2), 149–158.

Grossman, G., & Helpman, E. (1991). *Innovation and Growth in the Global Economy.* Cambridge, MA: MIT Press.

Grunwald, J., & Flamm, K. (1985). *The Global Factory: Foreign Assembly in International Trade*. Washington, DC: Brookings Institution Press.

Hahn, C.H. (2004). *Exporting and Performance of Plants: Evidence from Korean Manufacturing*. NBER Working Paper 10208.

Haile, G., Srour, I., & Vivarelli, M. (2017). Imported technology and manufacturing employment in Ethiopia. *Eurasian Business Review*, *7*(1), 1–23.

Hall, P., & Soskice, D.. (2001). *Varieties of Capitalism: The Institutional Foundations of Comparative Advantage*. Oxford: Oxford University Press.

Hanson, G.H., & A. Harrison (1999). Trade liberalization and wage inequality in Mexico. *ILR Review*, *52*(2), 271–288.

Harrison, A., & Hanson, G. (1999). Who gains from trade reform? some remaining puzzles. *Journal of Development Economics*, *59*(1), 125–154.

Harrison, A. & Rodríguez-Clare, A. (2010). Trade, foreign investment, and industrial policy for developing countries. *Handbook of Development* Economics, *5*, 4039–4214.

Hausmann, R., & Rodrik, D. (2003). Economic development as self-discovery. *Journal of Development Economics*, *72*(2), 603–633.

Hausmann, R., Hwang, J., & D. Rodrik (2007). What you export matters. *Journal of Economic Growth*, *12*(1), 1–25.

Hayakawa, K. (2012). Impacts of FTA Utilization on Firm Performance. IDE Discussion Paper No. 366. Tokyo: Institute of Developing Economies (IDE).

Hayakawa, K., Laksanapanyakul, N., Matsuura, T. (2020). *Do Regional Trade Agreements Really Help Global Value Chains Develop? Evidence from Thailand*. ERIA Discussion Paper Series No.325. Jakarta, Indonesia: Economic Research Institute for ASEAN and East Asia.

Hill, H., & Kohpaiboon, A. (2017). 'Policies for Industrial Progress', not 'Industry Policy': Lessons from Southeast Asia. In L.Y. Ing & F. Kimura (Eds.), *Production Networks in Southeast Asia, Routledge–ERIA Studies in Development Economics* (pp. 202–224). Singapore: Routledge.

Hine, R.C., & Wright, P. (1997). Trade and manufacturing employment in the United Kingdom. In J. Borkakoti & C. Milner (Eds.) *International Trade and Labor Markets*. Basingstoke: Palgrave Macmillan.

Hirsch, S., & Bijaoui, I. (1985). R&D intensity and export performance: A micro view. *Weltwirtschaftliches Archiv*, *121*(H2), 238–251.

Hobday, M. (1995). East Asian latecomer firms: Learning the technology of electronics. *World Development*, *23*(7), 1171–1193.

Iacovone, L., & Javorcik, B. (2012). Getting ready: Preparation for exporting. CEPR Discussion paper 8926.

Ing, L.Y., & Cadot, O. (2017). *Ad Valorem Equivalents of Non-tariff Measures in ASEAN*. ERIA Discussion Paper No. ERIA-DP-2017-09. Retrieved from: http://www.eria.org/ERIADP-2017-09.pdf

Isgut, A.E. (2001). What's different about exporters? Evidence from Colombian manufacturing. *Journal of Development Studies*, *37*(5), 57–82.

James, W. (2005). Rules of origin and rules of preference and the World Trade Organization: The challenge to global trade liberalization. In P. Macrory, A. Applegate and M. Plummer (Eds.), *The World Trade Organization: Legal, Economics and Political Perspectives* (Vol. 2). New York: Springer.

Javorcik, B.S. (2004). Does foreign direct investment increase the productivity of domestic firms? In search of spillovers through backward linkage. *American Economic Review*, *94*(3), 605–627.

Jitsuchon, S. (2012). Thailand in a middle-income trap. *TDRI Quarterly Review*, *27*(2), 13–20.

Jones, R.W., & Kierzkowski, H. (1990). The role of services in production and international trade: A theoretical framework. In Ronald, Jones, Krueger, Ann (Eds.), *The Political Economy of International Trade*. Oxford: BasilBlackwell.

Jones, R.W., & Kierzkowski, H. (2001). A framework for fragmentation. In S.W. Arndt & H. Kierzkowski (Eds.), *Fragmentation: New Production Patterns in the World Economy* (17–34). New York: Oxford University Press.

Jongwanich, J. (2009). The impact of food safety standards on processed food exports from developing countries. *Food Policy*, *34*(5), 447–457.

Jongwanich, J. (2011). Foreign direct investment in emerging Asia: Implications of the international production network. In Elaine Hutson, Rudolf R. Sinkovics, & Jenny Berrill (Eds.), *Firm-level Internationalisation, Regionalism and Globalisation*. London: Palgrave Macmillan.

Jongwanich, J. (2016). Determinants of food safety compilation in developing countries. In *Challenges to Industrial Development in Thailand Phase 2*. Thailand: Thailand Research Fund.

Jongwanich, J. (2017). *Capital Mobility: Causes and Consequences*. Singapore: ISEAS Publishing.

Jongwanich, J. (2020). Export diversification, margins and economic growth at industrial level: Evidence from Thailand. *The World Economy*, *43*(10), 2674–2722.

Jongwanich, J. (2021). *Drivers of US Import Refusals in the Food Sector*. Discussion Paper No. 63. Bangkok, Thailand: Faculty of Economics, Thammasat University.

Jongwanich, J., & Kohpaiboon, A. (2007). Determinants of protection in Thai manufacturing. *Economic Papers*, *26*(3), 276–294.

Jongwanich, J., & Kohpaiboon, A. (2008). *Export Performance, Foreign Ownership and Trade Policy Regime: Evidence from Thai Manufacturing*. ERD Working Paper No. 140. Economics and Research Department, Asian Development Bank.

Jongwanich, J., & Kohpaibbon, A. (2017a). Exporter responses to FTA tariff preferences: Evidence from Thailand. *Asian-Pacific Economic Literature*, *31*(1), 21–38.

Jongwanich, J., & Kohpaibbon, A. (2017b). Trade protection and firm productivity: Evidence from Thai manufacturing. *The Developing Economies*, *55*(2), 130–157.

Jongwanich, J., & Kohpaibbon, A., & Obashi, A. (2020). *Technological Advancement, Import Penetration and Labour Markets: Evidence from Thai Manufacturing*. ERIA Discussion Paper Series No. 336. Jakarta, Indonesia: Economic Research Institute for ASEAN and East Asia, forthcoming in *World Development*.

Jouanjean, M-A., Maur, J.-C., Shepherd, B. (2015). Reputation matters: Spillover effects for developing countries in the enforcement of US food safety measures. *Food Policy*, *55*(6), 81–91.

Kee, L.H., Nicita, A., & Olarreaga, M. (2009). Estimating trade restrictiveness indices. *The Economic Journal*, *119*(534), 172–199.

Keesing, D.B. (1983). Linking up to distant markets: South to North exports of manufactured consumer goods. *American Economic Review*, *73*(2), 338–342.

Keesing, D.B., & Lall, S.. (1992). Marketing manufactured exports from developing countries: Learning sequences and public support. In Gerald K. Helleiner (Ed.), *Trade Policy, Industrialization, and Development: New Perspectives*. Oxford: Clarendon Press.

Kiyota, K. (2012). A many-cone world?. *Journal of International Economics*, *86* (2), 345–354.

Klinger, B., & Lederman, D. (2006). *Innovation and Export Portfolios*. World Bank Policy Research, Working Paper 3983. World Bank, Washington, DC.

Kohpaiboon, A. (2003). Foreign trade regime and FDI-growth nexus: A case study of Thailand. *Journal of Development Studies*, *40*(2), 55–69.

Kohpaiboon, A. (2006). *Multinational Enterprises and Industrial Transformation: Evidence from Thailand*. Northampton, MA: Edward Elgar Publisher.

Kohpaiboon, A. (2010). *Product Fragmentation Phenomenon, Production Networks of Multinationals and Implication on Thai Manufacturing*.Bangkok, Thailand: Misterkopy.

Kohpaiboon, A (2019). Hiring skilled workers in global production sharing: Evidence of Thai manufacturing plants. paper prepared for UNU-WIDER Conference, 12–14 September 2019, Bangkok.

Kohpaiboon, A., & Jongwanich, J. (2015). *Use of FTAs from Thai Experience*. ERAI Discussion Paper Series ERIA-DP-2015-02. Jakarta, Indonesia: Economic Research Institute for ASEAN and East Asia.

Kohpaiboon, A., & Jongwanich, J. (2019). The use of FTAs: The Thai experience. In L.Y. Ing, M. Richardson and S. Urata (Eds.), *East Asian Integration: Gppds, Services and Investment* (pp. 114–142). London: Routledge.

Kohpaiboon, A., & Jongwanich, J. (2021). *Global Value Chain and Clusters: Implication for ASEAN Integration*. Discussion Paper No.62. Bangkok, Thailand: Faculty of Economics, Thammasat University.

Kokko, A., Zejan, M., & Tansini, R. (2001). Trade regimes and spillover effects of FDI: Evidence from Uruguay. *Weltwirtschaftliches Archiv*, *137*(1), 124–149.

Kraay, A. (1999). Exportations et performances economiques: etude d'un panel d'entreprises chinoises. *Reveu d'Economie Du De´veloppement*, *1–2*, 183–207.

Krishna, K. (2005). *Understanding Rules of Origin*. NBER Working Paper No.11150. Cambridge, MA: National Bureau of Economic Research.

Krueger, A. (1978). *Foreign Trade Regimes and Economic Development: Liberalization Attempts and Consequences*. Cambridge, MA: Ballinger for National Bureau of Economic Research.

Krueger, A. (1999). Are preferential trading agreements trade-liberalizing or protectionist? *Journal of Economics Perspectives*, *13*(4), 105–124.

Krueger, A.O. (1992). *Economic Policy Reforms in Developing Countries*. Oxford: Basil Blackwell.

Krugman, P. (1995). Growing world trade: Causes and consequences. In *Brookings Papers on Economic Activity, 25th Anniversary* (pp. 327–377).

Krusell, P., Ohanian, L.E., Ríos-Rull, J.-V., & Violante, G.L. (2000). Capital-skill complementarity and inequality: A macroeconomic analysis. *Econometrica*, *68*(5), 1029–1053.

Lall, S. (1979). The international allocation of research activity by US multinationals. *Oxford Bulletin of Economics and Statistics*, *41*(4), 313–331.

Lall, S. (2004). Selective industrial and trade policies in developing countries: Theoretical and empirical issues. In C. Soludo, O. Ogbu, & H.-J. Chang (Eds.), *The Politics of Trade and Industrial Policy in Africa: Forced Consensus?* (pp. 4–14). Lawrenceville, NJ: Africa World Press & IDRC.

Lazonick, W. (2006). The innovative Firm. In J. Fagerberg, D.C. Mowery, & R.R. Nelson (Eds.), *The Oxford Handbook of Innovation*. New York: Oxford University Press.

Leamer, E., & Levinsohn, J. (1995). International trade theory: The evidence. In Grossman, G. & K. Rogoff (Eds.), *Handbook of International Economics* (vol. 3, pp. 1339–1394). Amsterdam: Elsevier.

Leamer, E., Schott, P., & Peter, K. (2005). The rich (and poor) keep getting richer. *Harvard Business Review*, *83*(4), 20.

Lee, K. (2000). *From Third World to First: The Singapore Story 1965–2000 (Memoris of Lee Kuan Yew)* (Vol. 2). Singapore: Singapore Press Holding.

Lee, M.H., & Hwang, I.J. (2003). Determinants of corporate R&D investment: An empirical study comparing Korea's IT industry with its non-IT industry. *ETRI Journal*, *25*(4), 258–265.

Levin, R.C., Klevorick, A.K., Nelson, R.R., & Winter, S.G. (1987). Appropriating the returns from industrial research and development. *Brookings Papers on Economic Activity*, *3*, 783–820.

Levinsohn, J., & Petrin, A. (2003). Estimating production functions using inputs to control for unobservables. *Review of Economic Studies*, *70*(2), 317–341.

Lilleva, A. (2008). Trade liberalization and productivity dynamics: Evidence from Canada. *Canadian Journal of Economics*, *41*(2), 360–390.

Lin, W., & Wooldridge, J.M.. (2019). Testing and correcting for endogeneity in nonlinear unobserved effects models. In Mike Tsionas (Ed.), *Panel Data Econometrics: Theory* (pp. 21–43). Cambridge, MA: Academic Press.

Lipsey, R.E. (2001). *Foreign Direct Investment and the Operations of Multinational Firms: Concepts, History, and Data*. NBER Working Papers 8665. Cambridge, MA: National Bureau of Economic Research.

List, F. (1856). *The National System of Political Economy*. Philadelphia, PA: JB Lippincott and Co.

López, R.A. (2005). Trade and growth: Reconciling the macroeconomic and microeconomic evidence. *Journal of Economic Surveys*, *19* (4), 623–648.

Manning, A. (2006). A generalized model of monopsony. *Economic Journal*, *116*(558), 84–100.

Manning, C., & Purnagunawan, R.M. (2011). Survey of recent developments. *Bulletin of Indonesian Economic Studies*, *47*(3), 303–332.

Manova, K., & Zhang, Z. (2012). Export prices across firms and destinations. *Quartely Journal of Economics*, *127*(1), 379–436.

Melitz, M.J. (2005). When and how should infant industries be protected? *Journal of International Economics*, *66*(1), 177–96.

Melitz, M.J. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica*, *71*(6), 1695–1725.

Melitz, M.J., & Ottaviano, G.I.P. (2008). Market size, trade, and productivity. *Review of Economic Studies*, *75*(1), 295–316.

Merz, M., & Yashiv, E. (2007). Labor and the market value of the firm. *American Economic Review*, *97*(4), 1419–1431.

Meschi, E., Taymaz, E., & Vivarelli, M. (2016). Globalization, technological change and labour demand: A firm-level analysis for Turkey. *Review of World Economics*, *152*(940), 655–80.

Meyer, J. (2009). Workforce age and technology adoption in small and medium-sized service firms. *Small Business Economics*, *37*(3), 12–32.

Milner, C., & Wright, P. (1998). Modelling labour market adjustment to trade liberalisation in an industrialising economy. *Economic Journal*, *108*(447), 509–528.

Mishra, P., & Kumar, U. (2005). *Trade Liberalization and Wage Inequality: Evidence from India*, IMF Working Paper No.05/20. Washington, DC: International Monetary Fund.

Mishra, V. (2007). The determinants of R&D expenditure of firms: Evidence from a cross-section of Indian firms. *Economic Papers*, *26*(3), 237–248.

Nelson, R.R., & Pack, H. (1999). The asian miracle and modern growth theory. *Economic Journal*, *109*(457), 416–436.

Newark, P.D.L. (1983). Further evidence of the determinants of industrial research and development using single and simultaneous equation model. *Empirical Economics*, *8*, 203–214.

Nikkei Asia (2019). *Southeast Asian Nations Compete to Redraw Supply-chain Map.* Retrieve from https://asia.nikkei.com/Economy/Southeast-Asian-nations-compete-to-redraw-supply-chain-map

Obashi, A., & Kimura, F. (2017). Deepening and widening of production networks in ASEAN. *Asian Economic Paper*, *16*(1), 1–27.

Olley, G.S., & Pakes, A. (1996). *The Dynamics of Productivity in the Telecommunications Equipment Industry* (No. w3977). Cambridge, MA: National Bureau of Economic Research.

Organisation for Economic Co-operation and Development (OECD). (2020). *COVID-19 and Global Value Chains: Policy Options to Build More Resilient Production Networks.* Paris. https://read.oecd-ilibrary.org/view/?ref=134_134302-ocsbti4mh1&title=COVID-19-and-Global-Value-Chains-Chains-Policy-Options-to-Build-More-Resilient-Production-Networks

Osnago, A., Rocha, N., & Ruta, M. (2017). Do deep trade agreements boost vertical FDI?. *World Bank Economic Review*, *30*(S1), S119–25.

Pack, H., & Saggi, K. (1997). Inflows of foreign technology and indigenous technological development. *Review of Development Economics*, *1*(1), 81–98.

Pack, H., & Saggi, K. (2006). Is there a case for industrial policy? A critical survey. *World Bank Research Observer*, *21*(2), 267–97.

Papageorgion, D., Choksi, A., Michaely, M. (1990). *Liberalizing Foreign Trade in Developing Countries: The Lessons of Experiencing.* Washington, DC: The World Bank.

Pavcnik, N., Blom, A., Goldberg, P., Schady, N. (2004). Trade policy and industry wage structure: Evidence from Brazil. *World Bank Economic Review*, *18*(3), 319–344.

Pavitt, K. (1987). The objectives of technology policy. *Science and Public Policy*, *14*(4), 182–188.

Pavitt, K., Robson, M., & Townsend, J. (1987). The size distribution of innovation in the UK: 1945–83. *Journal of Industrial Economics*, *35*(3), 297–316.

Pietrobelli, C. (1998). *Industry Competitiveness and Technological Capabilities in Chile. A New Tiger from Latin America?* New York: St. Martin's Press.

Plummer, M.G., Cheong, D., & Hamanaka, S. (2010). *Methodology for Impact Assessment of Free Trade Agreements.* Metro Manila, Philippines: Asian Development Bank.

Revenga, A. (1997). Employment and wage effects of trade liberalization: The case of Mexican manufacturing. *Journal of Labor Economics*, *15*(3), 20–43.

Roberts, M., & Skoufias, E. (2007). The long-run demand for skilled and unskilled labor in colombian manufacturing plants. *Review of Economics and Statistics*, *79*(2), 330–334.

Robertson, R. (2000). Trade liberalization and wage inequality: Lessons from the Mexican experience. *The World Economy*, *23*(6), 827–849.

Robertson, R. (2004). Relative prices and wage inequality: Evidence from Mexico. *Journal of International Economics*, *64* (3), 387–409.

Robinson, J.A. (2009). Industrial policy and development: A political economy perspective. Paper presented at the 2009 World Bank ABCDE Conference, 22–24 June, Seoul.

Rodriguez, F., & Rodrik, D.. (2001). Trade policy and economic growth: A skeptic's guide to the cross-national evidence. In Bernanke, B. & Rogoff, K.S. (Eds.), *NBER Macroeconomics Annual 2000* (Vol. 15, pp. 261–338). Cambridge, MA: MIT Press.

Ruta, M. (2017). *Preferential Trade Agreements and Global Value Chains: Theory, Evidence, and Open Questions.* Policy Research Working Paper, No. WPS 8190. Washington, DC: World Bank.

Sachs, J., & Warner, A. (1995). Economic reform and the process of global integration. *Brookings Papers on Economic Activity*, *1*, 1–118.

Sally, R. (2007). Thai trade policy: From non-discriminatory liberalisation to FTAs. *The World Economy*, *30*(10), 1594–1620.

Salomon, R., & Shaver, J.M. (2005). Learning by exporting: New insights from examining firm innovation. *Journal of Economics and Management Strategy*, *14*(2), 431–460.

Schumpeter, J. (1942). *Capitalism, Socialism and Democracy.* London: Harper & Brothers.

Serapio, M., & Dalton, D. (1999). Globalization and industrial R&D: An examination of foreign direct investment in R&D in the United States. *Research Policy*, 28 (2–3), 303–316.

Sivadasan, J. (2009). Barriers to competition and productivity: Evidence from India. *Journal of Economic Analysis and Policy*, *9*(1), 1–66.

Sjöholm, F. (1999). Technology gap, competition and spillovers from direct foreign investment: Evidence from establishment data. *Journal of Development Studies*, *36*(1), 53–73.

Szczygielski, K., Grabowski, W., Pamukcu, M.T., & Tandogan, V.S. (2017). Does government support for private innovation matter? Firm-level evidence from two catching-up Countries. *Research Policy*, *46*(1), 219–237.

Tangkitvanich, S., & Bisonyabut, N. (2015). Toward high-quality growth: Thailand's challenges and opportunities in the next three decades. *TDRI Quarterly Review*, *30*(1, March), 3–15.

Tantratananuwat, P. (2015). *Vertical and horizontal FDI technology spillovers in Thai manufacturing: Does measurement matter?* [MA thesis, Thammasat University, Bangkok].

Taylor, A.M. (1998). On the costs of inward-looking development: Price distortions, growth, and divergence in Latin America. *The Journal of Economic History*, *58*(1), 1–28.

Taylor, C.T. (2000). The impact of host country government policy on US multinational investment decisions. *World Economy*, *23*(5), 635–648.

Thee, K.W., & Pangestu, M. (1998). Technological capabilities and Indonesia's manufactured exports. In D. Ernst, T. Ganiatsos, & L. Mytelka (Eds.), *Technological Capabilities and Export Success in Asia* (pp. 211–265).

Thurow, L.C. (1975). *Generating Inequality. Mechanisms of Distribution in the U.S. Economy.* New York.

Thurow, L.C. (1979). A job-competition model. In Piore, Michael J. (Ed.), *Unemployment and Inflation: Institutionalist and Structuralist Views* (pp. 17–32). New York.

Thuyen, T., Jongawanich, J., & Ramstetter, E. (2015). Productivity spillovers from foreign multinationals and trade protection: Firm-level analysis of Vietnamese manufacturing. *Asian-Pacific Economic Literature*, *29*(2), 30–46.

Topalova, P. (2004). Factor immobility and regional impacts of trade liberalization: Evidence on poverty and inequality from India. *Yale Mimeo.*

Topalova, P., & Khandelwal, A. (2011). Trade liberalization and firm productivity: The case of India. *Review of Economics and Statistics*, *93*(3), 995–1009.

UNCTAD. (2013). Non-tariff measures to trade: Economic and policy issues for developing countries. In United Nations Conference on Trade and Development, United Nations.

UNCTAD. (2019). *Guidelines To Collect Data On Official Non-Tariff Measures 2019 Version*. In United Nations Conference on Trade and Development, United Nations.

Urata, S., & Yokota, K. (1994). Trade liberalization and productivity growth in Thailand. *Developing Economies*, *32*(4), 444–59.

Van Beveren, I., & Vandenbussche, H. (2010). Product and process innovation and firms' decision to export. *Journal of Economic Policy Reform*, *13*(1), 3–24.

Vaona, A., & Pianta, M. (2008). Firm size and innovation in European manufacturing. *Small Business Economics*, *30*(3), 283–299.

Verhoogen, E.A. (2008). *Trade, quality upgrading and wage inequality in the Mexican manufacturing sector. Quarterly Journal of Economics*, *123*(2), 489–530.

Vermulst, E., & Waer, P. (1990). European community rules of origin as commercial policy instruments. *Journal of World Trade*, *24*(3), 55–100.

Vernon, R. (1979). The product cycle in the new international environment. *The Oxford Bulletin of Economics and Statistics*, *41*(4), 255–267.

Vernon, R. (2000). *In The Hurricane's Eye: The Troubled Prospects of Multinational Enterprises.* Cambridge, MA: MIT Press.

Wacziarg, R., & Wallack, J.S. (2004). Trade Liberalization and Intersectoral Labor Movement. *Journal of International Economics*, *64*(3), 411–435.

Wakelin, K. (1998). Innovation and export behaviour at the firm level. *Research Policy*, *26*(7–8), 829–841.

Warr, P. (2011). A nation caught in the middle-income trap. *East Asia Forum Quarterly*, October-December, 4–6.

Warr, P., & Kohpaiboon, A. (2018). Explaining Thailand's automotive manufacturing success. *Journal of Southeast Asian Economies*, *35*(3), 425–448.

Warr, P.G., & Nidhiprabha, B. (1996). *Thailand's Macroeconomic Miracle: Stable Adjustment and Sustained Growth.* Kuala Lumpur: Oxford University Press.

Wells, L.T. Jr. (1986). Investment incentives: An unnecessary debate. *TNC Reporter*, *22*(Autumn), 12–16.

Westphal, L.E., Rhee, Y.W., & Pursell, G. (1979). Foreign influences on Korean industrial development. *Oxford Bulletin of Economics and Statistics*, *41*(4), 359–88.

Wongseree, S. (2012). *Foreign direct investmeent and local firm productivity: Evidence from Thailand* [Doctoral Dissertation, University of Tennessee, Knoxville].

World Bank. (1980). This report was prepared by an industrial policy mission that visited Thailand in July/August 1979. The mission consisted of: Bela Balassa, chief of mission John D. Shilling, deputy chief of mission Benjamin Cu Kok, economist David Loevner, economist Demetrios Papageorgiou, economis.

World Bank. (1988). *Thailand: Country Economic Memorandum Building on the Recent Success: A Policy Framework.* Washington, DC: World Bank.

World Bank. (2016). *Thailand: Getting Back on Track: Reviving Growth and Securing Prosperity for All (A Systematic Country Diagnostic)*, November 10. Washington, DC: World Bank.

Wortzel, L.H., & Wortzel, H.V.. (1981). Export marketing strategies for NIC and LDC-based firms. *Columbia Journal of World Business*, *16*(1), 51–60.
WTO. (1990). *Thailand: Trade Policy Review*. Geneva: World Trade Organization.
WTO. (2020). *Trade Policy Review: Report by the Secretariates (Thailand)*. Geneva: World Trade Organization.
Yoon, C.H., Kwon, N.H., & Sim, H.M. (2000). An analysis of spill-over effects of R&d activities on national economy: Focused on IT industry. *KISDI*, *2*, 2000.
Yu, M. (2015). Processing trade, tariff reductions and firm productivity: Evidence from Chinese firms. *The Economic Journal*, *125*(585), 943–988.

Index

Note: Page numbers in *italics* indicate figures, **bold** indicate tables in the text, and references following "n" refer endnotes.