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The Nexus between Financial Development and Energy Consumption: Estimating the Role of Foreign Direct Investment, Economic Growth and Urbanization

by

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I want to dedicate this achievement my parents, teachers and friends who always encourage and support me in every crucial time

CERTIFICATE OF APPROVAL

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Abstract

This study examines the nexus between financial development and energy consumption estimating the role of foreign direct investment, economic growth, and urbanization from worldwide perspective. The study employed a panel data regression analysis of 136 countries from the period of 1960 to 2019 by using System GMM estimation technique. Energy consumption is dependent variable and financial development, economic growth, urbanization and foreign direct investment are independent variables. There are three different financial development indicators are used in this study to check the impact of financial development on energy consumption. By dividing the sample into overall and different groups of continent Asian, European, African, North/Latin American and Caribbean countries. The overall findings related to financial development are significant and negative impact on energy consumption. The different group of continents shows that mixed results related with the nexus between financial development and energy consumption. The policymakers in these different groups of countries must balance the relationship between energy supply and demand to achieving the sustainable economic development.

Keywords: Energy Consumption, Financial Development, Economic Growth, System-GMM.

Contents

List of Tables

Abbreviations

EC	Energy Consumption
EIA	International Energy Agency
FD	Financial Development
FDB	Financial Development of Banks
FDFS	Financial Development of Financial Sector
FDI	Foreign Direct Investment
FDPS	Financial Development of Private Sector
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
IEO	International Energy Outlook
N=136	Next- 136 Countries
OCED	Organization Corporation Economic Development
Sys-GMM	System- Generalized Method of Moments
URBN	Urbanization
WDI	World Development Indicator

Chapter 1

Introduction

In twenty-first century, the economic activities expand with the passage of time. This expansion will require more energy in almost all countries whether they are developing or developed. The importance of energy in the production of goods and services hence equally important for economic development of a country (Gomez & Rodríguez, 2019; Lu, 2017). But too much pressure on energy development resulted in the shape of environmental hazards. Energy is vital source for production of almost all goods and services so with the passage of time developing countries need more energy to cope up with their needs (Sadorsky, 2010).

Firstly, energy is an important element that enables economic development because the production of goods and services in any country depends on the provision and usage of energy services (Islam, Shahbaz, Ahmed, & Alam, 2013). According to Energy Information Administration (EIA), energy will grow worldwide by (28%) among the 2015 through 2040 and in Asia mostly China and India which is not parts of (OCED) countries they more than 60% increasing in the energy consumption the world during period from 2015 over 2040 also IEO-2019 in the reference case (EIA) projects that world energy consumption will grow almost (50%) among 2018 and 2050. The maximum growth related this concern come from those countries that there are not parts of (OCED). According to the (EIA) the consumption of energy globally will increase to 56 percent during the period of 2010-2040. Simultaneously, to much increase utilization of energy could deliberate economic development. Like in countries like Pakistan, and Bangladesh people are

facing energy crisis which will slower the pace of economic development(Islam et al., 2013; Sadorsky, 2011). For making it sure that everything goes smooth with nature we will have to create a balance between the demand and supply of energy. According to the EIA, from 2005 to 2030, global energy consumption is expected to expand at the annual growth rate of 1.8% and the topmost Ten consumers of primary energy in the world are the US, Canada, Russia, Germany, China, India, Japan, South Korea, Brazil, and France meanwhile in countries like India and china the demand of energy will increase at the rate of 3% annually which will result in 40% increase at global level (Sadorsky, 2011).

Secondly development of a country financially brings many changes within a country. For example, the cost of borrowing is quite low in countries with strong and progressed developed structure and, it provides better access to financial capital and raises transparency among borrowers and also creditors. All these factors result in flow of investment between countries which helps in getting access to better technology. So, that these doings increase the demand of energy through business fixed investment and utilization of energy. Financial development outcome also increases in confidence of investors and helps both local and foreign investors to invest more like investing more on their plants, hiring more workers, and buying more machinery and different equipment also making new technologies. It gives rise to growth of industry and results in development of new infrastructure and results in usage of more energy (Zhang, 2011).

Also the development of financial sectors increases the diversification of asset-allocation, which generates a wealth-effect that in opportunity boosts business and consumer confidence. So, we can say that financial development is a major factor is accessing a development of a country. Even in some countries which have very less financial resources usage with great management results in more productivity with lesser resources. The financial development inspires industrial growth and it's also helps make newly infrastructure facilities on the behind of this situation positively influence with the consumption of energy. Therefore a well develop and managed financial-sector and also provide a balance between energy demand and supply (Farhani & Solarin, 2017). To maintaining a decent balance among supply

of energy and consumption then developed a well-managed financial sectors and its allows assigning appropriate financial resources to the energy sector. Many researchers conducted empirical studies to find out the finance-energy nexus by using various samples and methods but they find out entirely different results that could not result in a consensus.

1.1 Theoretical Background

Theoretically, many scholars (Ozturk & Acaravci, 2013; Sadorsky, 2010) have considered that financial development increases energy consumption because a well-developed financial system could provide funds for enterprises with much lower costs, which facilitates the expansion of their production scale and thus raises the energy consumption. Sadorsky (2010) study in twenty-two developing countries during the period last 26 year from 1990-2006 using GMM technique to figured out the relationship financial development and energy consumption. The results concluded that financial development has strong positive relationship among energy consumption while it's measured three different stock market variables. Sadorsky (2011) to check the banking and stock market effect on consumption of energy based on the panel data of nine countries. They conclude that positive also the significant association among financial development with the energy consumption by using the three different banking variables, while on the base of different M. A. Destek (2018) stock-market variables just one variable like stock market-turnover positive direction also significant connection with the utilization of energy. Almulali and Lee (2013) study in GCC countries based on co-integration technique and covering the form 1980 to 2009. The findings show that financial development is vital factor together shorter and longer term period that increase consumption related energy.

Secondly, financial development has also been found to reduce energy consumption. Farhani and Solarin (2017) studied in US during the period of 1973-2014 based Quarterly data using the unit root LM test and to scrutinize the finance-energy linkage. The finding indicates that in the longer term utilization of energy decrease

but in the shorter term financial development increase consumption of energy. M. A. Destek (2018) studied over the period of 1991-2015 based on annual data using (CCE) estimation approach and they conclude that development of banking and bound market negative direction with statistical significant with the consumption of energy. Al-mulali and Lee (2013) studied GCC countries to figure out the finance-energy linkage. These outcomes tell us about in GCC nations the financial-development decline the energy-consumption. Now Kahouli (2017) concludes FD is supportive to decline EC. Gomez and Rodríguez (2019) studies in (NAFTA) nations to the influence finance-energy association by using a panel data during the period of 1971 to 2015 and his finding indicates that finance-energy negative connection among each other.

Thirdly, some of researchers identified no connection among energy consumption and financial development. The finance-energy nexus in EU27 based on Sys-GMM estimation approaches and taking data panel over the period 1990-2011. The finding indicates that when sample dividing into old member of EU27 financial development (FD) had a positive influence with energy consumption (EC) but no significant relationship among EC and FD in the EU27 (Coban & Topcu, 2013). Keskingoz and Inancli (2016) study in turkey, form the period of 1960 to 2011 based on VAR Granger causality and Johansen co-integration test and his finding indicates that in the short term, positively association with EC but in the long term, no obvious correlation occurs among FD and EC. Topcu and Payne (2017) study in 32 high-income countries from the period of 1990 to 2014 to scrutinized the finance-energy relationship with two heterogeneous estimation methods, common correlated effect mean group and mean group. They made different comprehensive index to measure the financial development like overall index, then stock, bond and banking sectors and his findings show that the overall-index no significant with consumption of energy and also increase the stock market index decline utilization of energy.

Lastly, in another group of studies, found a non-linear connection among the financial development and also energy consumption. Baloch and Meng (2019) study in OECD countries data collect out of 9 year form 2006-2015 based on the pane

data to figure out the association among financial development on energy consumption and the finding tells us about the upturned U-shape connection occurs among the utilization of energy and financial development. Yue, Lu, Shen, and Chen (2019) study in twenty-one transitional countries for covering the period of 2006-2015 based on panel data to investigate the impact of FD on EC by using the PSTR models. These finding conclude that no strong linear connection occurs among FD and EC, where the nonlinear parameters are significant. Sare (2019) studied in forty-five African nations during the period of 1973-2017 to observe the finance-energy links using a threshold and sample splitting estimation approach based on the panel data. The empirical findings show that threshold effect between financial developments also the energy consumption. So there are two conflicting impact related financial development and also the energy consumption.

The financial development has two opposite impact related the energy consumption according to the theoretical analysis, and its might be tough to identified the collective impact of financial-development and energy-consumption. However, the empirical studies powerfully support the point of view of theoretical studies, such as empirical studies with different method used, samples period, countries selection and they deliver broadly different conclusions, which show that the result varies across countries related the effect of financial development and also the energy consumption. Therefore, this study analysed the finance-energy nexus from worldwide perspective.

1.2 GAP Analysis

In the last few years, numerous studies have covered the role of financial development in energy consumption. Most of researchers say about that financial development increases the energy consumption (Coban & Topcu, 2013; Mahalik, Babu, Loganathan, & Shahbaz, 2017; Sadorsky, 2010; Muhammad Shahbaz, Van Hoang, Mahalik, & Roubaud, 2017). Similarly, Furuoka (2015) revealed that financial development is one of the key element that growing energy consumption. Sadorsky (2011) concludes the development of financial sectors significant with

also positive direction on the energy consumption. Alam et al. (2015) their finding tells us about strong positive connection among finance-energy. But in Some of studies revealed that financial development is a factor to decrease the consumption of energy (Kahouli, 2017). Another study found that FD decline demand of energy for US Farhani and Solarin (2017). Destek (2018) they conclude that banking and bond market statistically significant also negative association with energy consumption. Gomez and Rodríguez (2019) studies in (NAFTA) countries his finding indicates that a negative connection among these variables.

For the help of above studies it is underlined that the uncertain connection among energy consumption and financial development. The unclear connection related these variables rises numerous some questions. First, many important factors that can affect the relationship between these two variables in both direct and indirect ways

Earlier researchers have employed different econometric techniques which avoid the problem of heterogeneity, endogenity and cross sectional dependency. To ignore these issues related endogenity indications to produce uncertain and bias estimates. Along these lines, the connection between energy consumption and financial development needs further studies. To fill these gaps, this study aims to investigate the finance-energy nexus for worldwide perspective with controlling the model of FDI, GDP and by using panel estimation methods robust to heterogeneity and endogenity problem. So, this empirical research work focuses to examine the nexus between financial development and energy consumption for worldwide perspective.

1.3 Problem Statement

In literature, numerous studies are conducted about the connection among financial development, economic growth and the energy consumption. Most of empirical study concentrated on specific countries or region with different income level, some researchers focus related this study from global point of view, few one focused on developed and developing countries but different methodology and sample size.

While the relevant literature cannot reach a unique conclusion, they have provided us a comprehensive view of the influence of financial development on energy consumption across different countries which could facilitate energy policy making. Conversely, although the research from worldwide perspective neglects the characteristics of different countries, it could provide us an "aggregate" view on this topic, which could assist with relevant energy and environmental policy making. Therefore, this study contributes in the body of knowledge is that the nexus between financial development and energy consumption from worldwide prospective across 136 countries and also dividing sample into four major groups of continents (Asian, European, African, North/Latin American and Caribbean countries). To fill the gap in the empirical literature this study covers the following research question.

1.4 Research Questions

There are following research Questions.

RQ1: What is the impact of financial development on energy consumption across countries?

RQ2: Does economic growth impact on energy consumption of overall countries and across different group of countries?

RQ3: Does the financial development indicators have different impact on energy consumption?

The main objective of this study's is to examine the finance-energy nexus in 136 countries covering the period of 1990 to 2019.

1.5 Research Objectives

There are following research objective of this study.

1. To describe the impact between energy consumption, economic growth, financial development, foreign direct investment and urbanization.

2. To investigate the impact of different financial development indicator on energy consumption.

3. To examine the finance-energy nexus through sample dividing into four different continents (Asian, European, African, North/Latin American and Caribbean countries).

1.6 Significance of the Study

This study will be helpful to design a better environmental policy to move towards sustainable economic development and considerably add to better long-run environmental performance. This study also helps the government and policymaker in overall countries to encourage foreign investment, efficient projects, and trade to produce clean energy. This study will help the policymakers and monetary authorizers while making the decisions about policies regulation and efficient technologies. This study also helpful for the governments in Asian countries need to restrict the import of outdates technology and imposes dumping duties on high consuming equipment transfer through global.

1.7 Scheme of the Study

The rest of the study is structured as follows; Chapter 2 includes the literature reviews of the previous studies and hypotheses for the study. Chapter 3 covers the data description and methodology of the current research study. In the chapter 4 covered the results and discussion. Finally, conclusion, recommendation and limitation of the current research study also future direction cover the section 5.

Chapter 2

Literature Review

During the past few decades because of the increasing consumption of energy for both developed nations with also developing countries related finance-energy nexus, the researchers have paid much attention to this area. Different researchers have inspected the together longer also shorter run the connection among utilization of energy with the financial development of various countries. Subsequently, during the different time period some of studies focused to check the different comprehensive index related on energy consumption with growth of economic and CO2. The literature review for this study is categorized into four sections. In the first part, the relationship between finance-energy, the second part of literature explains that growth-energy relationship, third section deliberate the connection among FDI and utilization of energy and in the last part, associated this section to review the relationship among urbanization with energy consumption.

2.1 Financial Development and Energy Consumption

The First line of researches has examined the relationship between financial development and energy consumption. The development of a country financially brings many changes within a country. For example, the cost of borrowing is quite low in countries with strong and progressed developed structure and, it delivers more

entrance to financial capital and rises transparency among borrowers and creditors. All these factors result in flow of investment between countries which helps in getting access to better technology. Additional option can be that the development of financial sector cannot inspire financial, banking and private sectors to deliver greater energy efficient projects also more credit for investment.

Mielnik and Goldemberg (2002) study in twenty developing countries period selected 1987 to 1998 by using regression analysis and the findings indicate that negative connection among the financial development and the energy consumption also, significant. Sadorsky (2010) study in twenty-two developing countries taking annual panel data set from the period of 1990 to 2006 by using bound test and dynamic panel estimation technique to check the finance-energy linkages. They used variable in there study financial development, GDP, energy-price and energy consumption. The finding indicates that connection among finance-energy nexus positive and also significant.

Sadorsky (2011) continued to apply similar techniques in nine Eastern and Central European countries taking annual panel data set from the period of 1996 to 2006 by using bond test and dynamic panel method. The findings indicate that finance-energy-growth are integrated I (0) and also, positive-significant association among the utilization of energy and financial development. Most of the researchers have (Omri & Kahouli, 2014; Sadorsky, 2010; Sadorsky, 2011) indicates strong link like positive also statistically significantly related financial development and energy-consumption while, others found a significant and negative link (Mielnik & Goldemberg, 2002).

The financial sectors offers cheapest loan for different producer also purchases innovative technology and tools these all related concern increases the energy demand (Shahbaz, Khan, & Tahir, 2013). Moreover, some causal association among finance-energy nexus. For example, the positive also longer run two-way connection among the financial development with consumption related energy Boutabba (2014). Similar Furuoka (2015) indicates that utilization of energy granger causality with the development of finance. Also, while numerous studies stated that there was a bi-directional causal relations among finance-energy nexus (Al mulali

& Sab, 2012) for nineteen selected countries, (Islam et al., 2013) for Malaysia; and some of studies investigated that no causal relationship between these variables this topic (Al mulali & Sab, 2012; Shahbaz, Hye, Tiwari, & Leitao, 2013b; Shahbaz et al., 2013).

Shahbaz and Lean (2012) study in Tunisia by using data time series over the period of 1971-2008 to investigated the link among financial development and energy demand. There is different variable are used in these study energy consumption, urbanization, industrialization, GDP and financial development. Different estimation technique used is used ARDL test, Johansen co-integration test, Granger causality and NP technique and his results explain that the longer term co-integrated connection concerning the financial-development and energy consumption also bidirectional relationship among these variables. However, Al mulali, Sab, and Fereidouni (2012) study in thirty SSA countries and the data collection period between 1980-2008 based on dated panel to observe the finance-energy linkage. The findings indicate that the bi-directional causal connection among finance energy variables. In a similar way, Al mulali and Sab (2012) study in nineteen countries from the period if 1980 to 2008 by applied panel data method and they conclude that statistical no causal connection among these variables.

Islam et al. (2013), study in Malaysia using time series from the ear among 1971 to 2009 that finance-energy nexus. Their findings indicate that GDP and in the short term, financial development effectively with energy use but in long term, and also the bi-directional causality among these variables. Tang and Tan (2014) study in Malaysia his findings indicate that finance-energy in longer term both are correlated. Shahbaz et al. (2013) study in China by using annualized data from the period of 1971 to 2011 and his finding indicates no causality link amongst the consumption for energy and financial development.

In a similar technique, Shahbaz et al. (2013b) study in Indonesia by taking quarterly data time series over the year of 1975 to 2011 they found did not identify several causality among finance-energy linkages. Khan, Khan, Zaman, Irfan, and Khatab (2015) study in South Asia to analyse the relationship among finance-energy nexus by using time varies annualized data from the period among 1975 to

2011 and they conclude that financial development and also the energy consumption bidirectional causal linkage to each other.

Chtioui (2012) study in Tunisia his finding indicates that in together short term with also longer term causality goes unidirectional from financial development and it's also energy consumption. Xu (2012) study in China from the period of 1999 to 2009 to investigates the finance-energy nexus using (Sys-GMM) estimation techniques. The findings show that a statistical significantly and positively connection among variables like that the energy consumption also the financial development with utilization of energy. Another study in China, Jalil and Feridun (2011), the outcomes show that no causality running among from finance to energy. Ozturk and Acaravci (2013) study in Turkey and they conclude that in short-term EC to FD while, in long-term does causal change in energy consumption. (Mehrara & Musai, 2012) study in Iran and his finding indicate that co-integration finance-energy associations.

According to the causality runs from financial development to energy consumption there are two basically two probable channels the negative and positive. According to the first channels, its encourages a larger demand of energy when financial development raise energy consumption and also it supports GDP (Aslan, Apergis, & Topcu, 2014; Rashid & Yousaf, 2015; Sadorsky, 2010; Sadorsky, 2011; Zhang, 2011). There are three different effects (Sadorsky, 2011) described the positive causality like business ,wealth and also direct effects. Firstly, the business, lot of opportunity regarding businesses higher energy demand; secondly, the wealth, greater confidence related economic persuades higher energy demand and thirdly, the direct effect, people purchase additional energy consuming goods. Also, in the negative case related these concerns ideas to more modern and less energy uses tools, advance (R&D) technology and results leads to a decline in energy consumption. Technological effect is also denotes related these channels e.g., (Jalil & Feridun, 2011; Mahalik & Mallick, 2014; Tamazian, Chousa, & Vadlamannati, 2009).

Coban and Topcu (2013); Ozturk and Acaravci (2013) they found that the financial development has no influence with energy consumption. Furthermore, these

studies outcomes fluctuate on the methods used different countries. For example Pakistan, Kakar, Khilji, and Khan (2011) result shows that in short-term there was a no effect of finance-energy but in long-term existing its affects. Chtioui (2012) his finding tells us the negatively and also two-way causality goes from finance to consumed energy but in long-term one-way causal connection among the utilization of energy with GDP. Islam et al. (2013) research in Malaysia and their finding conclude that positively and significantly influence energy consumption for both long, shot-term with GDP and financial development.

Coban and Topcu (2013) study in European union and his findings indicate that financial development also energy consumption statistical insignificant relationship in (EU27) it mean that there was no connection in EU27 among these variables. Once, sample is dividing into two categories old member and new member so that there was statistical significant with the direction among these variables positively in old member countries regardless, whether it is measured using the stock market or the banking sector.

Altay and Topcu (2015) study in Turkey his finding indicates that there was no significant connection amongst finance-energy association. Chang (2015) study in fifty-three nations and these finding indicates that while together domestic also private credit are used as proxies of financial development and its financial development increased with energy consumption, But, the results differ when stock market variables measure as a proxies of financial development its mean that energy demand decline when these variable rise. Komal and Abbas (2015) study in Pakistan from the period of 1972 to 2012 using (Sys-GMM) estimation approach to capture the linkage among energy consumption, financial development and GDP. They conclude that positively significantly financial development influence on the GDP and energy consumption.

Muhammad Shahbaz (2015) study in Pakistan also his finding indicates that both side relations like bidirectional also causality among financial development and electricity consumes its show that feedback hypothesis effect. Saud, Baloch, and Lodhi (2018) to examine the finance-energy nexus in eleven countries from the period of 1990 to 2014 by using dynamic seemingly unrelated correlation regression

analysis (DRUS). Their finding indicates that positive direction also significant connection between energy-finance.

Frankel and Romer (1999) study in china and his finding indicates the development of finance greater attraction related FDI, economic and also its increase utilization of energy. King and Levine (1993) study in eighty countries from the period of 1960 to 1989 by using Correlation, OLS regression method his finding indicates that financial development stimulates energy growth via promoting efficient capital use and boosting rate of capital accumulation. Dasgupta, Laplante, and Mamingi (2001) his conclusion explain that stock market variable show as the financial development, its helps firms to lesser financing costs and rise channels related financing, in adding to dissolving operational risk and the arrangement of assets and liabilities optimization, thus they interested to investing the new projects and can also purchase different installations, which all the activities higher energy consumption. Also, Boulila and Trabelsi (2004) support Dasgupta et al. (2001), they conclude the results in more energy consumption.

Jalil and Feridun (2011) study in China over the period between 1953 through 2006, to scrutinized the influence of energy use, also real-income per capita and finance on environmental pollution by using bounding ARDL estimation technique and his finding deliberate that negative symbol of the co-efficient association related financial development, guiding that in China, financial development has not taken place at the expense of environmental pollution but, on the conflicting, it has run to reduce in environment pollution. Le (2016) study in the low-income countries (SSA) over the period of 1983-2010 by using co-integration analysis and (MG) estimation his finding indicates that no relationship exist when (DCFS) per capita used as proxies among financial development and energy consumption. So, in SSA countries finance little bit influence to decline in utilization related energy.

The scholar's perceived development related finance and consumption related energy has positive connection. Additional recently stud in Pakistan Komal and Abbas (2015) from the period of 1972 to 2012 by using Sys-GMM estimation method. The findings indicate that according to the channel related economic-growth positively effect of finance-energy association. Another Furuoka (2015) research during

the period between 1980-2012 in Asian-nations to observe the connection among finance-energy linkage by using Panel co-integration also causality panel technique. These study outcomes explain that the cointegration technique show longer term linkages between finance-energy also, causality test show unidirectional association among these variables.

Different literature highlights the finance- energy nexus in which certain way and its influence on the consumption related energy. On the base of industrial level, entrepreneurs gain easily entrance to financial capital in order to start new one business, existing one, so making a business effect. One the base of household level, consumers gain easily entrance to borrowed low-cost resources to buying these goods that is direct touch demand of energy. The stock market as consider proxy as economic-growth. The higher risk gets higher return and lesser risk gets lower return so that stock market increase risky also diversify for businesses and consumers that consequence more found for investment opportunity or projects availability so it's a making a wealth affect. These builds up businesses and consumer confidence that results indicate increase economy activates or expansion in economic activities generates demand of products related energy Sadorsky (2010) and Coban and Topcu (2013). So Coban and Topcu (2013) also emphasize that financial-development if made easier availability to advancement in technology that lead efficiency in energy and also decline energy consumption.

Dan and Lijun (2009), study in China and his findings indicates financial development failed to increase energy consumption. Bekhet, Matar, and Yasmin (2017) study in Gulf Cooperation Council (GCC) counties from the period of 1980 to 2011 to examined the link among FD, EC, CO2 and GDP using ARDL model. The finding shows the occurrence of a long-term link among finance-energy in all (GCC) countries. For instance, Riti, Shu, Song, and Kamah (2017), study in ninety countries based on the low high and middle level of the selected country groups to investigate the links among finance-energy and his results determine that financial development is helpful to decline CO2 in high level of the income countries but certain low level and middle level income countries its show that insignificant influence on these variables. There are some previous studies related

finance-energy nexus based some measure of financial development like DC domestic credit to private sector using the different countries. Shahbaz and Lean (2012) study in Tunisia during the period between 1971 through 2008 using the ARDL and UECM technique and they conclude that FD increases EC.

Islam et al. (2013) study in Malaysia data collects for 1971 to 2009 based on ARDL technique. The DC used as the measure of financial-development and he found that FD also rises EC. Muhammad Shahbaz, Tiwari, and Nasir (2013) study in South Africa from the period of 1965 to 2008 based ARDL and UECM models and his finding indicates that FD decreases EC. Tamazian and Rao (2010) study twenty-four economies using GMM model and they conclude that also, FD decreases EC. Omri, Daly, Rault, and Chaibi (2015) study in 12-MENA countries during the period among 1990 to 2011 using GMM approach and DC measure of FD and uncertainty association among EC and FD. Another, Ozturk and Acaravci (2013) study in Turkey they result also uncertainty related these variables.

Dogan and Seker (2016) Study in US using the ARDL and VECM model form the duration among 1960 to 2010 these result Uncertainty among these variables. (Javid & Sharif, 2016) study in Pakistan, DC as measure of FD also using VECM and ARDL model period among 1972 through 2013 and his finding explain that FD increases EC. Mahalik et al. (2017) study in Saudi Arabia their finding also shows the FD rise EC. Bekhet et al. (2017) used DC as measure of FD indicators in GCC countries form the period 1980–2011 they conclude that FD increases EC. Most of studies used an comprehensive-index as the proxies of FD for example, Shahbaz, Shahzad, Ahmad, and Alam (2016b) study in Pakistan based on NARDL technique he found FD also rise EC and Ouyang and Li (2018) study in China using GMM and VAR model his finding deliberate that FD increase EC.

2.2 Economic Growth and Energy Consumption

The second parts of literature the researches has studied the association among economic growth and energy consumption. In the last 4 decades the world economy has practiced significant economic growth. According to Kraft and Kraft (1978)

it was the first study in US from the period of 1947 to 1974 to scrutinize the link among energy consumption, carbon emission and GDP. The finding shows that causality one-way move since GNP growth to energy use and in this research explained that growth in economy achieved through extensive consumption related energy that inspires CO2. In the previous years, the causal association among growth-energy and in latest literature the energy consumption has raising attention for example the (Islam et al., 2013) for Malaysia; (Khan et al., 2015) for South Asia; (Mahalik et al., 2017) and (Bekhet et al., 2017) for GCC countries. There are not unclear results one of the basic reason is that in these existing energy-growth literature they can used different econometric tool and techniques for instance simple regression approach, then test for panel unit root, correlation approach, bivariate causal and multivariate co-integration, VECM and (ARDL).

Dagher and Yacoubian (2012), study in Lebanon and they found that in together the short term and long term a two way connection among it GDP and the energy-consumption also finding indicates that the feedback hypothesis accept and in Lebanon energy has limiting part GDP. Ozturk and Acaravci (2010) also explain the detailed study between energy-growth relationships. Some of the researchers have also highlighted the connection among energy consumption with economic growth. Such as, Tang (2008) deliberated this nexus in Malaysia; (Eggoh, Bangaké, & Rault, 2011) explained this relationship for African countries; (Dergiades, Martinopoulos, & Tsoulfidis, 2013) for Greece; (Araç & Hasanov, 2014) for Turkey; (Al-mulali & Lee, 2013) investigated lager-income, (upper and lower middle level income) and also the higher level of income countries.

Another, Fuinhas and Marques (2012) studied the interaction among growth and energy consumption in Spain, Greece, Portugal, Turkey and Italy; (Ocal & Aslan, 2013) regarded at Turkey. Menegaki (2014) deliberated a fifty-one researches in the last twenty years published using data for all over the world from the time when 1949, on the association among GDP and the energy consumption. Omri and Kahouli (2014) study sixty-five countries from the period of 1990 to 2001 by using GMM estimator and his finding indicates that the significant and positive relationship among energy-growth nexus. They also emphasize that causality

among growth and energy may be equally determined, as well-organized energy consumption needs greater level of economic growth, as know that if the higher level of economic growth will also need greater the level of energy consume hence, causality direction may not be judged earlier.

Most of studies concerning the growth-energy nexus, the (Costantini & Martini, 2010) study in 26 countries from the period of 1960 to 2005 by using Panel causality, co-integration and his finding indicates that possible occurrence of common causal interactions among growth-energy. Belke, Dobnik, and Dreger (2011) study in twenty-five OECD countries from the period of 1981 to 2007 by using dynamic panel causality test and his outcome displays the existence of connection among GDP and energy consumption bidirectional causality. Fuinhas and Marques (2012) study in the Countries as (PIGST) from the period of 1965 to 2009 by using ARDL Test and his finding indicates that the feedback hypothesis also supporting among these relationship and together shorter also longer term bidirectional causal association between growth-energy.

Kahsai, Nondo, Schaeffer, and Gebremedhin (2012) study in forty (SSA) countries from the period of 1980 to 20007 by using Granger causality test, co-integration test and they conclude that the economic growth also energy demand direct connection with each other. Bella, Massidda, and Mattana (2014) study in OECD countries from the period of 1965 to 2006 based on the (VECM) approach and his finding indicates that electric power consumption and income show u-shaped and long team relationship for each other. As an alternative, (Smiech & Papież, 2014) study in European Union countries from the period of 1993 to 2011 and results explain energy policy influence links among economic growth and the energy demand.

Saidi and Hammami (2015) study in fifty-eight countries from the period of 1990 to 2012 by using GMM estimator and his finding indicates that significantly and positively influence of GDP with energy consumption in panel four only. Salahuddin, Gow, and Ozturk (2015) study in GCC countries from the period of 1980 to 2012 by using FMOLS, DOLS and DFE and his results show that the positive connection in the long term among the growth-energy linkage. Ozturk and Al-Mulali

(2015) study in GCC countries from the period of 1980 to 2012 by using different estimation tools (DOLS) and (FMOLS). The result indicates that in longer term growth in economic positive and also the energy natural gas its affects in GCC countries.

Akarca and Long (1980) using same data but from the period of 1947 to 1972 his finding indicate that no link between growth-energy nexus. They asked one possible reason is that presence of 1973 to 1974 data can infect the series due to the effect of oil restriction. Erol and Yu (1987) study in 6 countries namely Germany, Canada, Japan Italy, England and France (GCJIEF) from the period of 1952 to 1982 his finding indicates that for China the causality connection run from two-way energy-growth, from growth-energy for Italy & Germany, causality for Japan bidirectional and none for England and France. Masih and Masih (1996) study in six countries using integration and error correction modelling techniques his finding indicate that in India energy to growth causality but in the Pakistan and Indonesia causality run from energy to growth but none for Philippines, Singapore and Malaysia.

Soytas and Sari (2003) study in G-7 countries he found that in Korea and Italy growth to energy causality run but the unidirectional energy to growth causality run in Turkey, France, Japan also Germany. Some of studies show reverse causality by (Chien-Chiang Lee, 2006) for Switzerland, Canada, Sweden, Germany and UK; (Bowden & Payne, 2009) for the US; (Narayan & Smyth, 2008) for G-7 countries. According to lack of consensus in these researches due to use different methodologies, tools and techniques, sample selection and countries, different climate and phase of energy-growth patterns.

Salahuddin, Alam, Ozturk, and Sohag (2018) Study in Kuwait based on ADRL technique using data between 1980-2013 over the period of 1980 to 2013 using the ARDL model his finding validates that both LR and SR the economic-growth stimulate energy utilization.

Bartleet and Gounder (2010) study in New Zealand form the period of 1960 to 2004 using both multivariate and bivariate techniques to scrutinize causal affiliation among GDP with also the energy consumption. The finding designates that

the employment and GDP also the energy consumption have an integration relationship. The result strong proof that in New Zealand energy consumption is basically determined by economic activities and together the longer and shorter term outcomes show that GDP granger causes energy consumption. However, Kumar and Kumar (2013) study in South Africa and Kenya from the period of 1971 to 2009 and 1978 to 2009 by using (ARDL) bounds techniques they support conservation hypothesis and his finding indicates that causal connection runs one-way for energy per capita and capital per worker to output related per worker for together nations. Several studies regarding in the China the link among energy-growth nexus debated in the literature (L. Liu, Huang, & Yu, 2016; Wang, Wang, Zhou, Zhu, & Lu, 2011; Yuan, Kang, Zhao, & Hu, 2008).

Yuan et al. (2008) study from the period of 1963 to 2005 in which variables like used energy, labour, and capital and integration procedure their finding indicate that causality run for bidirectional relationship between GDP and also the energy consumption. The X. Zhang and Cheng (2009) employing the (Toda and Yamamoto) method from the period of 1960 to 2007 his finding indicates that the unidirectional causal connection run from the GDP to the energy consumption. Wang et al. (2011) also using capital and labour variables into model and found that the uni-directional causal connection among these energy use to GDP from the period of 1972 to 2006.

Apergis and Payne (2009) study in eleven States from the era of 1991 to 2005 to examine energy-growth association with different estimation techniques like co-integration, error correction models and also the unit root. They conclude that bidirectional in the long term causality run among the GDP and energy-consumption but unidirectional run in the short term interconnection among these variables. Therefor the feedback hypotheses are supported related with the relationships among these variables.

In addition, Chen, Kuo, and Chen (2007) study in ten Asian countries from the period of 1971 to 2001 his finding indicates that causality move for bidirectional long term concerning GDP and electricity. Mahadevan and Asafu Adjaye (2007) to reinvestigate the growth energy nexus in twenty net energy exporters and importers

from the period of 1971 to 2002 by using error correction model and his finding indicates that together the long and short term causality run in develop nations the bi-directional among growth-energy but according to developing nations only shot run only the energy consumption stimulate energy consumption. Akkemik and Göksal (2012) study in seventy nine countries form the period of 1980-2007 also, by taking panel-heterogeneity to detect the causality linkages among GDP with consumption related energy. Some of studies confirmed conservation hypotheses its mean that economic growth effects to the energy demand (Kasman & Duman, 2015; Narayan, Narayan, & Popp, 2010).

2.3 Foreign Direct Investment and Energy Consumption

The third part of researches has studied the relationship between FDI and energy consumption. Mielnik and Goldemberg (2002), study in twenty developing countries his finding indicates that significantly and positively link among the FDI and energy intensity. Sadorsky (2010) study in twenty two developing countries and his finding indicates that that the positive effect among the FDI and energy consumption also significantly.

Tang (2009) they conclude that the FDI also encouraging utilization of energy over the expansion of transportation procedure, manufacturing and industrialization sector development while the energy required associate manufacturing method. FDI allows cheaper businesses and easily available financial capital, expansion in previous operations, build new and different factories and plants all these activities increase energy use. Bekhet and bt Othman (2011) study in Malaysia from the period of 1971 to 2009 his finding indicates the causality link among the FDI and the consumption related energy in presence of long run. Bento (2011) study in Portugal from the period of 1980 to 2007 and he found that they not strong connection and negatively influence the FDI and energy consumption. Lee (2013) study in nineteen nations of G-20 countries from the period of 1991 to 2009 based

on the panel data and different variable used GDP FDI and the energy use. The empirical finding indicates that no gripping proof of FDI connection with clean energy use and FDI has played key character in economic growth for the G-20 countries. Tang and Tan (2014) Study in Malaysia from the period of 1972 to 2009 by using bounding testing approach and Johansen Juselius cointegration test. The Finding indicates that the together finance led growth and also FDI led growth, the feedback hypothesis exists among these variables.

Anwar and Nguyen (2010) study in sixty-one provinces of Vietnam from the period of 1996 to 2005 using panel data to observe the association among FDI and GDP. The result show that in overall relations an equally strengthening two-way connection among economic growth and FDI exists in Vietnam. In energy consumption and FDI some countries specific studied including in their analysis. Dube (2009) study in Malaysia and South Africa to find a cointergration relationship among FDI and electricity consumption respectively. He, Gao, and Wang (2012) study in Shanghai and his finding indicate that FDI inducing energy saving and bidirectional effect among FDI and energy consumption.

Mudakkar et al. (2013) their finding indicates that for Sri Lanka and Bangladesh the causal connection move energy to FDI and result also indicates in India causality run since FDI to energy consumption. Now adding, Azam, Khan, Zaman, and Ahmad (2015) their finding indicates that together GDP and also FDI have significantly link to the energy consumption in Indonesia, Malaysia and Thailand. Most of studies have found that FDI (inflow) encourage energy consumption over the expansion of manufacturing and transportation, industrialization sector the energy play vital role to supports manufacturing procedure (Bekhet & bt Othman, 2011; Doytch & Narayan, 2016; Mielnik & Goldemberg, 2002; Omri & Kahouli, 2014; Sadorsky, 2010; Tang, 2009).

2.4 Urbanization and Energy Consumption

The fourth parts of researches have studied the relationship among urbanization and energy consumption. In the early stage of urbanization, the people consume

more electronic goods that enhance demand for energy (Baloch, 2018; Baloch & Suad, 2018; B. Zhang, Wang, & Wang, 2018). Urbanization is a natural process in which mass relocation move from rural areas to urban parts. The purpose for this situation that peoples travels after rural parts to urban parts for according to observing the improved life style of living, the better job opportunities, and daily life activities easily convenience of other resources. Altogether these doings reason to rise demand for energy. Concerning the link among energy demand and urbanization the outcome explain the increase in urbanization stimulate energy consumption (Kahouli, 2017; Liu, Zhou, Huang, & Hao, 2018; Mahalik & Mallick, 2014; Shahbaz, Loganathan, Muzaffar, Ahmed, & Jabran, 2016).

In the world, urbanization is key demographic trend especially China, through severe consequences for the environment and development. It influences the complex connection through energy demand. There are two likely details regarding greater urbanization lead larger energy use. Firstly, economic structure changes when population movements into cities and the creation of different urban structures, promoting also the expansion in many industries, like usage of energy for example cement and steel industries. Secondly, households that now right to entry to energy in rustic parts probably to increase their in urban zones consumption because purchase of new ones and increase use of existing appliances (Huang, Du, & Tao, 2017). Mishra, Smyth, and Sharma (2009) found that energy consumption granger causality urbanization.

Most of researchers indicates that can the urbanization increase energy demand (Guan, Zhou, & Zhang, 2015; Lin & Ouyang, 2014; L. Liu et al., 2016; Shahbaz & Lean, 2012; Song & Zheng, 2012; Yan, 2015). Mishra et al. (2009) study in Pacific Island countries from the period of 1980 to 2005 by using Granger causality test and co-integration analysis his finding indicate that mutual causality among energy consumption per capita and urbanization in short run. Sadorsky (2013) study in seventy-six from the period of 1980 to 2010 by using (OLS) methods and check the influence of industrialization, urbanization with energy consumption and his finding indicates that urbanization statistically positive effect with energy consumption.

Sadorsky (2014) study in eighteen countries over the period of 1971-2008 and his finding indicate that industrialization raise energy consumption in the longer term and also urbanization decrease energy consumption. Shahbaz and Lean (2012) study in Tunisia from the period of 1971 to 2008 using VECM models and ARDL bound technique and the both short term and also long term urbanization granger causes energy consumption. The results also confirmed that the urbanization raises the energy consumption. Al mulali and Sab (2012) study in seven regions in world including Central Asia, LAC, East Europe, Asia and Pacific, Western Europe, SSA, and Middle East, NAC from the period of 1980 to 2008 by using FMOS estimation method His results show that the existences of a bidirectional link among urbanization, CO2 and energy consumption energy consumption.

Poumanyvong and Kaneko (2010) study in ninety-nine countries using balanced panel dataset from the period of 1975 to 2005 and his finding indicates that Urbn influence EC the various crosswise the phases of development. According to these different countries economic scenarios to determine the behaviour of the urbanization. The higher-income level also middle-income level groups, its increase energy usage, but lower-income level groups decline the energy use. Y. Liu (2009) study in China from the period of 1978 to 2008 using factor decomposition model and ARDL testing model and the finding indicates that both long and short run existence of causal relationship runs urbanization to utilization of energy. Guan et al. (2015) study in Jiangsu Province (JP) taking data from the period of 1989 to 2012 using an ECM and ARDL bound approach their finding indicates that speedy urbanization in (JP) is one of the key providers to its greater energy demand.

In both empirical and theoretical literature broadly discussed the linkage among urbanization and it also energy consumption. The linkage between energy intensity and urbanization depends on various factors, for example the phase of development and industrialization, the mass of population in urban areas, the income level, renewable or non-renewable energies which is also kind of energy pattern (Liddle & Lung, 2010; Newman & Kenworthy, 1989; Poumanyvong & Kaneko, 2010; Sadorsky, 2013). Hemmati (2006) found that by fixing a country's technological advancement and industrial level, effect of the industrialization and

urbn on consumption of energy vary across the regions. Furthermore, in China, different researcher deals with the connection among the urbanization also with the energy consumption. Halicioglu (2007) study in Turkey from the period of 1998 to 2005 by using ARDL testing technique. The finding indicates that in long term causality run as of GDP, energy prices urbanization to the energy consumption. They also inconclusive causality outcome indicates in short-term. Lenzen et al. (2006), study in Brazil, India, Denmark, Japan and Australia countries. The finding indicates that effect of urbanization on energy consumption were different the countries across in the period.

Most of the studies show that more urbanization rate might be indicates that lead to higher energy consumption (Jones, 1989, 1991). Some of the studies negative correlate urbanization with energy use exists in many cities by (Ewing & Rong, 2008; Kenworthy & Laube, 1996; Newman & Kenworthy, 1989). Lariviere and Lafrance (1999) study in Canada and his results show that higher urbanized area lesser energy consumption per capita. Ghosh and Kanjilal (2014) study in India from the period of 1971 to 2008 by using ARDL techniques to influence the relationship among the GDP, URBN, with also energy consumption. The results strongly proof that urbanization and economic growth increase energy consumption.

Shahbaz, Loganathan, Sbia, and Afza (2015) study in Malaysia from the period of 1970 to 2011 using ARDL techniques. The results show that existence of unidirectional link among urbanization and energy consumption. (Li & Lin, 2015) study in seventy-three countries from the period of 1971 to 2020 by using (SERPAT) methodology to examined the nexus among urbanization, CO2, industrialization and energy consumption and the finding indicates that urbanization has no impact on energy consumption.

Beck and Levine (2004) study in forty countries from the period of 1976 to1998 using ordinary least square and GMM technique used. His finding shows that stock market and banks independently incentive economic growth. Chien-Chiang Lee (2005) study in eighteen countries and the data collect over the period between 1975-2001 The result indicates the energy to growth causality run in the together

long and short-term but that there is no short and longer run connections from growth to energy. Pradhan (2009) study in five ASEAN countries from the period of 1970 to 2007 by using Co-integration and causality test his finding shows that bidirectional causality relationship between FDI and GDP. Anwar and Nguyen (2010) study in Vietnam by using GMM estimation technique his finding shows that bidirectional causality between FDI and GDP. Brunnschweiler (2010), study in one ninety-nine countries from the period of 1980 to 2006 by using GMM and FE model and his finding indicates that linear positively outcome of financing development on the consumption related renewable energy.

Wu, Hou, and Cheng (2010) study in thirteen (EU) countries over the period of 1976 to 2005 by using Unit root test and PMG method his finding shows that Long run connection occurs between banking economic development, stock market and banking sector. For the financial development influence longer term and then on output may be negatively but may be improving information services of banks and risk diversification in stable economic. Noor and Siddiqi (2010) study in five South Asian countries from the period of 1971 to 2006. In short run his finding shows that unidirectional causality relationship among GDP to energy consumption but not vice versa and his finding also shows in the long run that (1%) energy consumption increased that result tends to decrease GDP by 0.13%.

Anwar and Sun (2011) study in Malaysia country from the period of 1970 to 2007 using (GMM) technique and finding indicates that based on the DCS (domestic credit stock) is influence by level of financial development that lead to energy consumption. A. D. Ahmed (2013) studies in twenty one (SSA) Countries form the period of 1981 to 2009 with (GMM) technique used. The finding shows that due to financial liberalization there is negative association among these variables. The countries involvement positively effects of liberalization that are human capital, steady inflationary environment and having solid legal institutions. Nasir and Hassan (2011) study in (South-Asian) nations form the era of 1995-2008. The empirically study investigate the role of market size, economic freedom and exchange rates in attracting foreign direct investment. The results show that significantly and positively relationship among FDI inflow and economic freedom South Asian

countries. Yousefi-Sahzabi, Sasaki, Yousefi, and Sugai (2011) study in Iran to examined the connection among the energy consumption with also CO2 their finding indicate that a strong positive correlation.

Pao, Yu, and Yang (2011), study on BRICS countries, suggested handling both FDI and energy demand and energy efficiency to reduce CO2 emission and investment in energy supply. Moudatsou and Kyrkilis (2011), study in twenty six countries from the period of 1970 to 2003 by using Causality based on an ECM method his finding shows that bidirectional causality between FDI and GDP. Akkemik and Göksal (2012) study in seventy nine countries from the period of 1980 to 2007 by taking into panel heterogeneity his results indicate that seventeenths of the countries approximately show bidirectional causality, one 10th show unidirectional and two tenths explain that no causality. Sahoo and Trade (2012) study the factors of FDI for South Asian countries with importance on trade openness, reforms and infrastructure development. The results tell that major factors of FDI in South Asia are labour force, market size, trade openness, economic reforms and infrastructure stock. Additional, using the panel data based on the causality test and found that strong connection among FDI inflow and infrastructure development.

Mehrara and Musai (2012) study in Iran from the period of 1970 to 2009 by using ARDL his finding shows that longer term connection occurs among the capital stock, energy growth, financial development, oil revenues and the energy consumption in long run. Al mulali et al. (2012) study in seven regions over the period of 1980 to 2018 these regions including South and Central Asian, East Europe, Middle East and Western European, North America, LAC, SSA, East Asia and Pacific. Their findings indicate that CO2, urbanization and the energy consumption sixteen per cent of countries have mixed results and eighty-four per cent of countries long run and positively influence but few countries have negative connection and also some low-income level countries have no linkage among these variables.

Mudakkar et al. (2013) investigate study in (SAARC) countries from the period of 1975 to 2011 by using (TYDL) Granger causality test their findings conclude that in short-run two way causal association among finance-energy in Pakistan.

Barros, Chen, and Damásio (2013) study in twenty seven Asian countries a balance panel data from the period of 2003 to 2011, to examine the attractions for the investment. The outcome is robust between the separate regressions and FDI attraction the policy implication indicate those larger countries is different from that small countries.

Saboori and Sulaiman (2013) study in South East Asian nations the empirical connection among energy consumption, economic growth, and CO2. they found that positive direction also significantly relationship with CO2 and also energy consumption in together shorter and longer term. Mallick and Tandi (2015) using FMOLS, GMM model from the period of 1972 to 2010 with 5 (SAARC) countries and the finding indicates that the (EKC) hypotheses are disallowed for these countries. Komal and Abbas (2015) study in Pakistan during the period of 1972 to 2012 based on the Sys-GMM estimation technique to describe the finance, growth and energy nexus for Pakistan. The result concludes that positive and significantly influence of urbanization and GDP on EC. While the effect of FD significant and positively on EC through growth channels.

Malik and Masih (2017) study in Malaysia during the period among 1971-2014 to examine the shorter also longer term association among EG, FD and EC using the VECM,VDC and ARDL bounding testing approaches. The finding show that in together shorter also longer run EC is influenced EG and FD. Bhattacharya, Churchill, and Paramati (2017) study in eighty Five developed and developing economies using GMM and FMOL technique his finding indicate that economic productivity and CO2 emission negatively and positively influenced by renewable energy consumption. Abdouli and Hammami (2017) study in seventeen MENA countries from the period of 1990 to 2012 by using Fixed effects model and system GMM model his finding indicate that unidirectional causality among FDI and GDP.

Koengkan (2017) Study in twenty-one Latin American & Caribbean (LAC) countries covering the period of 1980 to 2104 based on Panel data using the (PVAR) to analyse the nexus among GDP, EC and urbanization among these (LAC) nations. The result shows that two-way nexus among the GDP and EC in LAC countries.

Sarkodie and Strezov (2019) study in five developing countries namely, Iran, Indonesia, China, South Africa and India from the period of 1982-2016 based on panel data regression technique and the finding indicates that strongly positive effect of energy-consumption on greenhouse-gas emissions.

Yang, Hui, Yasmeen, Ullah, and Hafeez (2020a) studies in thirty-two Asia countries covering the period of 1990-2017 to investigate the finance-energy nexus based on the different financial development indicators using various estimation techniques such as the (HC) and (DSUR) and the finding indicates that on the base of HC show two-way causal connection among proxies of FD to EC also the urban and FDI accumulate EC. These results also explain that in Asian nations these indicators of FD are declining the consumption related energy. Abbasi, Parveen, Khan, and Kamal (2020) study in eight Asian countries during the period of 1982-2017 and panel data used. To figure out the urbanization and utilization of energy on CO2 using the various estimation techniques like that panel-co-integration and granger causality test their finding deliberates the longer term association among the urban, CO2 and EC. They also conclude two-way causality connection among the urbn and EC but one-way causal connection presence among EC and CO2.

Nkalu, Ugwu, Asogwa, Kuma, and Onyeke (2020) study in SSA countries covering the period among 1975 through 2017 based on different methodologies such as VECM granger causality and cointegration their results tell us about that in the longer term significant and positive relationship among FD and EC exist but no effect statistically significant related these variable in the shorter term period. They also show that one-way causality runs for FD to EC. Anton and Nucu (2020) study in twenty-eight EU countries covering the period among 1990 to 2015 based on the panel fixed effect model the outcome explain that the various indicators financial-development like that capital, bound and banking market respectively positive also significant effect consumption related renewable energy but the capital market not influence with utilization of renewable energy. Fan and Hao (2020) Studied in thirty-one Chinese-provision during the period of 2000-2015 based on VECM, unit root test, causality and also co-integration test employed. The finding concludes that in longer term stable connection among the FDI, GDP and

REC.

Mukhtarov, Humbatova, Seyfullayev, and Kalbiyev (2020) study in Kazakhstan from the period of 1994-2014 to investigate the relationship between FD, GDP,EC and Energy price (CPI) base on VECM technique and they found that positive and significant effect of FD and GDP on EC also in the longer runs CPI has negative effect with EC.

Ma and Fu (2020) study in 120 countries based on panel data the financial-development influence on energy-consumption. Furthermore, national-difference the sample dividing into developed also developing countries by GMM technique used. The finding show that world-wide FD significant and positive influence with EC and also based on national deference the outcome explains that in developing nations FD positive influence on EC but in developed countries no effect with energy consumption.

Kassi and Francois (2020) Study in 123 countries over the period of 1990 to 2017 that investigated the dynamics among FD, RCE, and EG. On the based on composite analysis they deliberate four different groups of income-level such as the lower and lower middle income, upper also higher middle income countries LIC, LMC, UMC, HMC respectively, but they also different sample into regional vice like that five key regions including that AMA, MENA, SSA, ESA and NLAC, while they employed the both Diff-GMM and Sys-GMM estimation technique, panel VAR, and granger causality techniques used and his finding concludes that there is nonlinear effect of FD on REC also growth of economic taking various indicators of financial development. They conclude that in all regions two-way causality connection among FD and GDP. However, the two-way causality association among FD and REC the hypothesis is supported only SSA, American and AMA regions and results also conclude that one-way causality runs from FD to REC IN MENA and ECA. The finding also explains that bidirectional or two-way causal connection among REC and EG only for SSA and Asian-pacific.

Naseem and Ji (2020) Study in SAARC countries covering the period of 2000-2017 based on cross-sectional using the FEM also Two-step Sys-GMM technique to investigate the association among the REC, AR, EG on CO2. The results of (FEM)

show that REC significant also negative but EG show positive direction with CO2. The results of Sys-GMM indicate that AR and REC negative connection.

2.5 Hypotheses of the Study

H_1: Financial development has a significant impact on energy consumption.

H_2: Economic growth has a significant impact on energy consumption.

H_3: Urbanization has a significant impact on energy consumption.

H_4: Foreign direct investment has significant impact on energy consumption.

Chapter 3

Methodology

3.1 Data Description and Methodology

This part of the study presents the data collection mechanism from where the data has collected. Data collected from World Development Indicators (WDI) and use of methodology to capture the impact of independent variables (Economic growth, Urbanization, Foreign direct investment, and Financial development indicators) on dependent variables (Energy consumption) of overall world countries with different continents Asian, European, African, North & Latin American and Caribbean countries.

3.1.1 Population

Population of this study is based on all over the world countries.

3.1.2 Sample

In this study, a balanced panel of 136 countries is selected out of the 195 countries reported in **Table 3.1**, by taking annual data from the year 1990 to 2019. The choice of sample selection and countries is based on the availability of data and then dividing sample into four different groups Asian, European, African, North & Latin American and Caribbean countries.

Table 3.1: List of Countries

Albania	Cambodia	Finland
Algeria	Cameroon	Gabon
Angola	Canada	Georgia
Argentina	Chile	Germany
Armenia	China	Ghana
Australia	Colombia	Greece
Austria	Congo Dem(COD)	Guatemala
Azerbaijan	Congo Rep (COG)	Haiti
Bahrain	Costa Rica	Honduras
Bangladesh	Cote d'Ivoire	Hong Kong
Belarus	Croatia	Hungary
Belgium	Cyprus	Iceland
Benin	Czech Republic	India
Bhutan	Denmark	Indonesia
Bolivia	Dominican Republic	Iran
Bosnia and Herzegovina	Ecuador	Iraq
Botswana	Egypt	Ireland
Brazil	El Salvador	Israel
Brunei	Eritrea	Italy
Bulgaria	Estonia	Jamaica
Darussalam	Ethiopia	Japan
Jordan	Nigeria	Tajikistan
Kazakhstan	Norway	Tanzania
Kenya	Oman	Thailand
Korea	Pakistan	Togo
Kuwait	Paraguay	Tunisia
Kyrgyz Republic	Panama	Turkmenistan
Latvia	Poland	Trinidad and Tobago
Lebanon	Philippines	Turkey
Luxembourg	Peru	Ukraine
Lithuania	Portugal	UAE

Continued Table: 3.1 List of Countries

Libya	Qatar	UK
Malaysia	Romania	US
Malta	Russian Federation	Uruguay
Maldives	Saudi Arabia	Uzbekistan
Mexico	Senegal	Venezuela RB
Mauritius	Serbia	Vietnam
Mozambique	Singapore	Yemen
Moldova	Slovak Republic	Zambia
Morocco	Slovenia	Zimbabwe
Mongolia	South Africa	
Myanmar	Spain	
Nepal	Sri Lanka	
New Zealand	Sudan	
Netherlands	Suriname	
Namibia	Sweden	
Niger	Switzerland	
Nicaragua	Syrian Arab Republic	

List of Sample Dividing into 4 Groups

Asian Countries		
Armenia	Japan	Saudi Arabia
Azerbaijan	Jordan,	Singapore
Bahrain	Kazakhstan	Sri Lanka
Bangladesh	Kuwait	South Korea
Bhutan	Kyrgyz Republic	Syrian Arab Republic
Brunei Darussalam	Lebanon	Thailand
China	Malaysia	Turkey

Cambodia	Maldives	Tajikistan
Cyprus Georgia	Mongolia	Turkmenistan
Hong Kong	Myanmar	United Arab Emirates
India	Nepal	Uzbekistan
Indonesia	Oman	Vietnam
Iran	Pakistan	Yemen
Iraq	Philippines	
Israel	Qatar	
European Countries		
Albania,	Germany,	Portugal,
Austria,	Greece,	Romania,
Belarus,	Hungary,	Russia,
Belgium,	Iceland,	Serbia,
Bosnia and Herzegovina,	Ireland,	Slovak Republic
Bulgaria,	Italy,	Switzerland
Croatia,	Latvia,	Spain
Czech Republic,	Lithuania	Sweden
Denmark,	Luxembourg,	Slovenia
Estonia,	Malta,	Ukraine
Finland,	Moldova,	United Kingdom
France	Netherlands,	
African Countries		
Algeria	Ethiopia	Niger
Angola	Gabon	South Africa
Botswana	Ghana	Senegal
Benin	Kenya	Sudan
Cameroon	Libya	Togo

Congo Rep	Morocco	Tunisia
Congo Dem	Mozambique	Tanzania
Cote d'Ivoire	Mauritius	Zambia
Egypt	Namibia	Zimbabwe
Eritrea	Nigeria	
North/Latin American and Caribbean Countries		
Argentina	Ecuador	Paraguay
Brazil	El-Salvador	Panama
Bolivia	Guatemala	Peru
Chile	Haiti	Suriname
Canada	Honduras	Trinidad and Tobago
Costa Rica	Jamaica	US
Colombia	Mexico	Uruguay
Dominican Republic	Nicaragua	Venezuela

3.1.3 Sources of Data and Measurement

This study based on secondary data, which is already available and ready for use. The data for energy use kilogram of oil equivalent per capita, economic growth as a proxy of GDP per-capita and its (constant 2010 U.S.$) and urbanization (% of total urban population) data are collected from World Development Indicators, published by the World Bank. The financial development measure by three different indicators or proxies i.e., financial development of private, bank and private sectors (FDPS), (FDB),and (FDFS) respectively all three proxies measured as a percentage of GDP (Alam et al., 2015; Sadorsky, 2011; Saud et al., 2018).

3.2 Description of Variables

In this study energy consumption is dependent variable and economic growth,

urbanization, foreign direct investment and the financial development as independent variable.

3.2.1 Energy Consumption (EC)

Energy use refers to use of primary energy before transformation to other end-use fuels, which is equal to indigenous production plus imports and stock changes, minus exports and fuels supplied to ships and aircraft engaged in international transport (Saud et al., 2018).

3.2.2 Economic Growth (GDP)

Economic growth is a major contributor to energy consumption. Rising economic growth (income effect) leads to an increase in energy demand. This indicates that energy demand tends to grow with GDP, although, typically, at a lower rate. It is measured by GDP per-capita (constant. 2010 U.S $). It is the sum of gross-value added by all resident producers in the economy also plus several product taxes and then minus any subsidies not included in the value of the products.

3.2.3 Urbanization (URBN)

Urbanization is a natural process in which mass-relocation transfer from rural parts to urban zones. The purpose for this situation that peoples transfer between rural parts to urban zones for observing better and the well-settle life style of living, the better job opportunities, and easily accessibility of other daily life resources. In the initial phase of urbanization, the people consume extra electronic-goods that increase demand for energy (Saud et al., 2018).

3.2.4 Foreign Direct Investment (FDI)

It is an investment that controlling the ownership in a business in the form of one country by entity based another country. It is also differentiating from a foreign

portfolio investment by a notion of direct control. Therefore, the FDI are the net inflows of investment to obtain a lasting management interest Ten percent or more then voting-stock in the businesses operating in economy rather than that of investor. According to FDI the value of inward direct investment made by non-resident investors in the reporting economy. It is the sum of equity capital, re-investment of earnings. Regarding to the foreign investors, this sequence shows that newly investment inflow with minus dis-investment and it's divided by GDP in the economy.

3.2.5 Financial Development (FD)

Financial development brings various fluctuations inside a country. For example, the cost of borrowing is quite low in countries with strong and progressed developed structure. Furthermore, it delivers higher access to financial capital and raises transparency among borrowers and creditors. All these factors result in flow of investment between countries which helps in getting access to better technology. Additionally, financial sectors increase investing streams among borders and offer more prominent admittance to the advanced energy-effective items and cutting edge innovation. These exercises animate energy interest through energy utilization and business fixed venture.

The financial development offers low-cost loans to the producer then they buying innovative technology and tools and increases consumption for the energy Shahbaz et al. (2013). The Boutabba (2014) conclude that finance-energy linkage longer term positively and two-way connection among each other's.

Also Furuoka (2015) originate that finance granger causal with the demand of energy. Furthermore, most of the previous studies (Gould, Melecky, & Panterov, 2016; King & Levine, 1993; Law & Singh, 2014; Saud et al., 2018; Yang, Hui, Yasmeen, Ullah, & Hafeez, 2020b) among other, only rely on financial depth's indicators such as the money supply percentage of GDP, DCPS percentage of GDP, market-capitalization per cent by GDP and percentage of liquid liability by the GDP as alternative indicators of financial development.

3.2.5.1 Financial Development of Bank (FDB)

It is domestic credit to private sector by banks refers that to the financial resources delivered to private sector by different depository-corporations (the central banks except deposit taking organizations) such as through trade credits, loans, other accounts receivable, and the purchases of non-equity securities, that establish a claims for the re-payment. For certain nations these claims contain credit to public corporations (Saud et al., 2018; Sadorsky 2011).

3.2.5.2 Financial Development of Private Sector (FDPS)

It is the domestic credit to private sector refers that to the financial resources provided to private sector by financial-corporations, such as through loans, trade credit, other accounts receivable, and the purchases of non-equity securities that build a claim of repayment. On behalf of certain nations these claims incorporate credit to public enterprises. Its include the financial-firms like that monetary-authorities, as well as organizations do bring about some liabilities related time-saving deposits yet don't allow adaptable deposits. Most of the researcher has been used this FDPS indicators to measure the financial development (Bekhet et al., 2017; Islam et al., 2013; Mahalik et al., 2017; Salahuddin et al., 2018).

3.2.5.3 Financial Development of Financial Sector (FDFS)

It is domestic credit to private provided by the financial sector includes all credit to several sectors on a gross basis, with the exception of credit to the central government, which is net. Its include the financial-firms like that monetary-authorities, and also different deposit cash into banks along with different financial organizations where information are accessible (as well as organizations do bring about some liabilities related time-saving deposits yet don't allow adaptable deposits). There are some further financial firms like that, insurance corporations, foreign exchange enterprises, pension-funds, currency lenders, and also finance & leasing (Saud et al. 2018).

Table 3.3: Data Source and Variable Description

Variable	**Description**	**Symbol**	**Unit**	**Data Source**
Energy consumption	Its includes electricity, natural gas, petroleum products, and combustible renewable and waste	EC	(Kg of oil equivalent per capita)	World Development Indicator (WDI)
Economic Growth	Its gross domestic product divided by midyear population (GDP per capita)	GDP	(It Constant U.S.$ 2010)	WDI
Urbanization	It refers to people living in urban areas defined by national-statistical offices	URBN	(% of Total Population)	WDI
Foreign direct investment	The value of inward direct investment made by non-resident investor in the reporting economy or It is net inflow of investment.	FDI	(% of GDP)	WDI
Financial development of bank	It is domestic credit to private sector by banks (% of GDP).	FSB	(%)	WDI
Financial development of private sector	It is domestic credit to private sector (% of GDP).	FDPS	(%)	WDI
Financial development of financial sector	It is domestic credit provided by financial sector (% of GDP).	FDFS	(%)	WDI

3.3 Descriptive Statistics

Statistical behaviour of data is captured by using the descriptive statistics. Descriptive statistics includes mean which provide the average of data, median which divide the data set into two equal segments and it is the mid value of data set, standard deviation provides the information that how much the spread of data from its mean value. Mean and standard deviation must be used together if used separately both will be meaningless.

Positive and negative spread of data captured by using the skewness but kurtosis infers about the flatness of data spread. In this study by using the five different descriptive statistics (worldwide perspectives N=136, Asian, European, African, North & Latin American and Caribbean countries.

3.3.1 Descriptive Statistics of Worldwide (N=136) Countries

The **Table 3.2**, shows that descriptive statistics of all variables used in this study. The mean value of energy consumption is 7.41 and its standard deviation is 0.96. The maximum and minimum values are 9.59 and 5.65 respectively.

In energy consumption skewness is positive right tail, which shows that the data for this variable is positive skewed and it's making a curve, the curve show on right side. The value of kurtosis is less than three (1.96<3) it means that the curve of this variable has platykurtic.

The mean value of GDP is 8.46 with the maximum and minimum of 11.52 and 4.71 respectively. GDP is used as proxy of economic growth. Its standard deviation is 1.27. In GDP the skewness value is negative, which show that the data for this variable is negative skewness and it's making a curve, the curve show on left side. The value of kurtosis is more than three (3.35>3) it means that the curve of this variable has leptokurtic.

The mean value of URBN is 4.14 and its standard deviation is 0.34. It's maximum and minimum are 4.51 and 2.57 respectively. In URBN the skewness value is

negative, which show that the data for this variable is negative skewness and it's making a curve, the curve show on left side. The value of kurtosis is more than three (9.28>3) it means that the curve of this variable has leptokurtic.

The mean of FDI is 0.29 with maximum and minimum 2.86 and -7.18 respectively. Its standard deviation is 1.59. In FDI the skewness value is negative, which show that the data for this variable is negative skewness and it's making a curve, the curve show on left side. The value of kurtosis is more than three (5.7>3) it means that the curve of this variable has leptokurtic.

There are three proxies of financial development used in this study financial development of banks, private and financial sectors FDB, FDPS and PDFS respectively. The mean value of F DB is 3.58 with the maximum and minimum value of 5.25 and 0.75 respectively.

Its standard deviation is 0.71. In FDB the skewness value is negative, which show that the data for this variable is negative skewness and it's making a curve, the curve show on left side. The value of kurtosis is less than three (2.97<3) it means that the curve of this variable has platykurtic.

The mean value of FDPS is 3.75 with maximum and minimum value of 5.40 and 0.75 respectively. Its standard deviation is 0.84. FDPS is used as proxy of financial development. In FDFS the skewness value is negative, which show that the data for this variable is negative skewness and it's making a curve, the curve show on left side. The value of kurtosis is less than three (2.41<3) it means that the curve of this variable has platykurtic.

The mean value of FDFS is 4.08 with maximum and minimum value of 4.84 and 1.96 respectively. Its standard deviation is 0.76. FDFS is used as proxy of financial development.

In FDFS the skewness value is positive, which show that the data for this variable is positive skewness and it's making a curve, the curve show on right side. The value of kurtosis is less than three (2.53<3) it means that the curve of this variable has platykurtic.

Table 3.4: Descriptive Statistics of Worldwide N=136 Countries

	Mean	**Median**	**Maximum**	**Minimum**	**Std. Dev.**	**Skewness**	**Kurtosis**	**Jarque-Bera**	**Probability**
LEC	7.4168	7.365	9.59	5.65	0.968	0.3418	1.9666	39.6511	0.0000
LGDP	8.4623	8.3566	11.528	4.7178	1.2704	-0.1117	3.3583	4.6065	0.0999
LURBN	4.1449	4.2584	4.515	2.5738	0.345	-2.2305	9.2898	1536.137	0.0000
LFDI	0.2974	0.78	2.86	-7.18	1.596	-1.5129	5.746	431.325	0.0000
LFDB	3.584	3.625	5.25	0.75	0.7105	-0.2246	2.9763	5.2293	0.0731
LFDPS	3.7546	3.66	5.4	0.75	0.84	-0.0591	2.4195	9.0659	0.0107
LFDFS	4.0808	4.0131	5.847	1.9687	0.7639	0.1558	2.532	8.1657	0.0168

In this study the summary statistic of worldwide perspective N=136 countries shows in the **Table 3.2**. This includes the mean, Std. show standard deviation, median, maximum and minimum, and range of the variables, skewness, kurtosis etc.

Mean shows the averages of the variables, standard deviation describes the dispersion of the variables from the mean, minimum and maximum shows the lowest and largest value in the data of each variable. Skewness show positive and negative spread of data. Kurtosis show smoothness of data spread.

3.3.2 Descriptive Statistics of Asian Countries

The descriptive statistics of Asian Countries which are used in this study shows in table 3.3. The mean value of energy consumption is 7.69 and its standard deviation is 0.79. The maximum and minimum values are 9.19 and 6.56 respectively. In energy consumption skewness is positive right tail, which shows that the data for this variable is positive skewed and it's making a curve, the curve show on right side.

The value of kurtosis is less than three (1.85<3) it means that the curve of this variable has platykurtic. The mean value of GDP is 9.47 with the maximum and minimum of 10.76 and 8.00 respectively. GDP is used as proxy of economic growth. Its standard deviation is 1.09. In GDP the skewness value is negative, which show that the data for this variable is negative skewness and it's making a curve, the curve show on left side. The value of kurtosis is less than three (1.23<3) it means that the curve of this variable has platykurtic.

The mean value of URBN is 4.16 and its standard deviation is 0.27. It's maximum and minimum are 4.51 and 3.48 respectively. In URBN the skewness value is negative, which show that the data for this variable is negative skewness and it's making a curve, the curve show on left side. The value of kurtosis is less than three (2.68<3) it means that the curve of this variable has platykurtic.

The mean of FDI is 0.03 with maximum and minimum 2.53 and -7.18 respectively. Its standard deviation is 1.99. In FDI the skewness value is negative, which show

that the data for this variable is negative skewness and it's making a curve, the curve show on left side. The value of kurtosis is more than three (4.42>3) it means that the curve of this variable has leptokurtic. There are three different proxies of financial development used in this study financial development of banks, private and financial sector FDB, FDPS and FDFS.

The mean value of FDB is 4.10 with the maximum and minimum value of 5.25 and 3.11 respectively. Its standard deviation is 0.66. FDB is used as proxy of financial development. In FDB the skewness value is positive, which show that the data for this variable is positive skewness and it's making a curve, the curve show on right side. The value of kurtosis is less than three (1.69<3) it means that the curve of this variable has platykurtic.

The mean value of FDPS is 4.26 with maximum and minimum value of 5.40 and 3.14 respectively. Its standard deviation is 0.77. FDPS is used as proxy of financial development. In FDFS the skewness value is positive, which show that the data for this variable is positive skewness and it's making a curve, the curve show on right side. The value of kurtosis is less than three (1.31<3) it means that the curve of this variable has platykurtic.

The mean value of FDFS is 4.40 with maximum and minimum value of 5.84 and 1.96 respectively. Its standard deviation is 1.06. In FDFS the skewness value is negative, which show that the data for this variable is negative skewness and it's making a curve, the curve show on lift side. The value of kurtosis is less than three (1.87<3) it means that the curve of this variable has platykurtic.

In this study the summary statistic of Asian Countries shows in **Table 3.5**. This includes the mean, median standard deviation, and range of the variables, skewness, kurtosis etc. Mean shows the averages of the variables, standard deviation shows the dispersion of the variables from the mean, minimum and maximum shows the lowest and largest value in the data of each variable. Skewness show positive and negative spread of data which show that the data for this variable is negative skewness and it's making a curve, the curve show on lift side. Kurtosis show smoothness of data spread.

Table 3.5: Descriptive Statistics of Asian Countries

	Mean	**Median**	**Maximum**	**Minimum**	**Std. Dev.**	**Skewness**	**Kurtosis**	**Jarque-Bera**	**Probability**
LEC	7.691	7.47	9.19	6.56	0.7966	0.2925	1.8523	4.9095	0.0859
LGDP	9.4725	9.4	10.76	8	1.0995	-0.0615	1.2319	9.2927	0.0096
LURBN	4.1648	4.2763	4.515	3.4809	0.2735	-0.7838	2.6869	7.5593	0.0228
LFDI	0.0389	0.74	2.53	-7.18	1.9981	-1.2807	4.4245	25.4119	0.0000
LFDB	4.1015	3.89	5.25	3.11	0.6627	0.2895	1.6929	6.0461	0.0487
LFDPS	4.2694	3.96	5.4	3.14	0.7751	0.18	1.3162	8.7704	0.0125
LFDFS	4.4085	4.2068	5.847	1.9687	1.0679	-0.1274	1.8743	3.9412	0.1394

3.3.3 Descriptive Statistics of European Countries

The descriptive statistics of European Countries which are used in this study shows in table 3.4. The mean value of energy consumption is 7.98 and its standard deviation is 0.58. The maximum and minimum values are 8.84 and 6.98 respectively. In energy consumption skewness is negative left tail, which shows that the data for this variable is negative skewed and it's making a curve, the curve show on left side. The value of kurtosis is less than three (1.79<3) it means that the curve of this variable has platykurtic. The mean value of GDP is 3.91 with the maximum and minimum of 11.42 and 7.80 respectively. GDP is used as proxy of economic growth. Its standard deviation is 1.47. In GDP the skewness value is positive and kurtosis is less than three (1.55<3) its platykurtic.

The mean value of URBN is 4.14 and its standard deviation is 0.25. It's maximum and minimum are 4.39 and 3.74 respectively. In URBN the skewness value is negative, which show that the data for this variable is negative skewness and it's making a curve, the curve show on left side. The value of kurtosis is less than three (1.59<3) it means that the curve of this variable has platykurtic. The mean of FDI is 1.09 with maximum and minimum 2.46 and -0.46 respectively. Its standard deviation is 0.59. In FDI the skewness value is negative and value of kurtosis is more than three (3.78>3) it means leptokurtic.

The mean value of FDB is 4.01 with the maximum and minimum value of 4.77 and 3.03 respectively. Its standard deviation is 0.53. FDB is used as proxy of financial development. In FDB the skewness value is negative and value of kurtosis is less than three (1.89<3) it means platykurtic. The mean value of FDPS is 4.13 with maximum and minimum value of 4.93 and 3.08 respectively. Its standard deviation is 0.56. FDPS is used as proxy of financial development. In FDFS the skewness value is negative and value of kurtosis is less than three (1.91<3) it means that the curve of this variable has platykurtic. The mean value of FDFS is 4.21 with maximum and minimum value of 4.97 and 3.28 respectively. Its standard deviation is 0.52. FDFS is used as proxy of financial development. In FDFS the skewness value is negative and value of kurtosis is less than three (1.66<3) it means that the curve of this variable has platykurtic.

Table 3.6: Descriptive Statistics of European Countries

	Mean	**Median**	**Maximum**	**Minimum**	**Std. Dev.**	**Skewness**	**Kurtosis**	**Jarque-Bera**	**Probability**
LEC	7.9837	7.97	8.84	6.98	0.5812	-0.0441	1.7972	2.6059	0.2717
LGDP	9.3188	8.54	11.42	7.8	1.475	0.643	1.5513	6.7232	0.0347
LURBN	4.1476	4.2942	4.3956	3.7494	0.2533	-0.6652	1.5961	6.7022	0.035
LFDI	1.0921	1.09	2.46	-0.46	0.5998	-0.6039	3.789	3.7291	0.155
LFDB	4.0163	4	4.77	3.03	0.5325	-0.2697	1.8937	2.7144	0.2574
LFDPS	4.1384	4.18	4.93	3.08	0.5634	-0.3879	1.9153	3.1868	0.2032
LFDFS	4.2181	4.1774	4.9778	3.2898	0.5245	-0.3286	1.6634	3.9747	0.1371

In this study the summary statistic of European Countries shows in Table 3.4. This includes the mean, median standard deviation, and range of the variables, skewness, kurtosis etc.

Mean shows the averages of the variables, standard deviation shows the dispersion of the variables from the mean, minimum and maximum shows the lowest and largest value in the data of each variable. Skewness show positive and negative spread of data. Kurtosis show smoothness of data spread.

3.3.4 Descriptive Statistics of African Countries

The descriptive statistics of African Countries which are used in this study shows in **Table 3.5**. The mean value of energy consumption is 6.88 and its standard deviation is 0.63. The maximum and minimum values are 7.99 and 6.16 respectively.

In energy consumption skewness is positive right tail, which shows that the data for this variable is positive skewed and it's making a curve, the curve show on right side. The value of kurtosis is less than three (1.90<3) it means that the curve of this variable has platykurtic.

The mean value of GDP is 7.58 with the maximum and minimum of 8.93 and 5.10 respectively. GDP is used as proxy of economic growth. Its standard deviation is 1.21. In GDP the skewness value is negative, which show that the data for this variable is negative skewness and it's making a curve, the curve show on left side.

The value of kurtosis is less than three (2.65<3) it means that the curve of this variable has platykurtic. The mean value of URBN is 3.72 and its standard deviation is 0.55. It's maximum and minimum are 4.21 and 2.57 respectively.

In UBN the skewness value is negative, which show that the data for this variable is negative skewness and it's making a curve, the curve show on left side which show that the data for this variable is negative skewness and it's making a curve, the curve show on lift side. The value of kurtosis is less than three (2.64<3) it means that the curve of this variable has platykurtic.

The mean of FDI is 0.08 with maximum and minimum 2.24 and -6.43 respectively. Its standard deviation is 1.66. In FDI the skewness value is negative, which show that the data for this variable is negative skewness and it's making a curve, the curve show on left side. The value of kurtosis is more than three (6.84>3) it means that the curve of this variable has leptokurtic.

There are three proxies of financial development used in this study financial development of banks, private, and financial sectors FDB, FDPS, and FDPS. The mean value of FDB is 3.56 with the maximum and minimum value of 4.43 and 0.75 respectively. Its standard deviation is 0.77.

FDB is used as proxy of financial development. In FDB the skewness value is negative, it's making a curve, the curve show on left side. The value of kurtosis is more than three (4.29>3) it means that the curve has leptokurtic.

The mean value of FDPS is 3.84 with maximum and minimum value of 5.08 and 0.75 respectively. Its standard deviation is 0.97. In FDFS the skewness value is negative, which show that the data for this variable is negative skewness and it's making a curve, the curve show on left side. The value of kurtosis is more than three (3.07>3) it means that the curve of this variable has leptokurtic.

The mean value of FDFS is 4.32 with maximum and minimum value of 5.26 and 3.04 respectively. Its standard deviation is 0.58. FDFS is used as proxy of financial development. In FDFS the skewness value is positive. The value of kurtosis is less than three (2.00<3) it means that the curve of this variable has platykurtic.

In this study the summary statistic of African Countries shows in **Table 3.7**. This includes the mean, median standard deviation, and range of the variables, skewness, kurtosis etc.

Mean shows the averages of the variables, standard deviation shows the dispersion of the variables from the mean, minimum and maximum shows the lowest and largest value in the data of each variable. Skewness show positive and negative spread of data which show that the data for this variable is negative skewness and it's making a curve, the curve show on lift side. Kurtosis show smoothness of data spread.

Table 3.7: Descriptive Statistics of African Countries

	Mean	**Median**	**Maximum**	**Minimum**	**Std. Dev.**	**Skewness**	**Kurtosis**	**Jarque-Bera**	**Probability**
LEC	6.8892	6.735	7.99	6.16	0.635	0.6425	1.9045	9.9801	0.0068
LGDP	7.583	7.98	8.93	5.1	1.2133	-0.9415	2.6537	12.8296	0.0016
LURBN	3.729	4.0453	4.2161	2.5738	0.5521	-1.0662	2.6413	16.3658	0.0003
LFDI	0.0825	0.54	2.24	-6.43	1.6649	-1.8273	6.8496	98.6163	0
LFDB	3.5637	3.91	4.43	0.75	0.7786	-1.263	4.2914	28.1691	0
LFDPS	3.8445	4.115	5.08	0.75	0.9742	-0.7922	3.072	8.8035	0.0123
LFDFS	4.3283	4.2091	5.2609	3.0486	0.5893	0.0225	2.0029	3.4867	0.1749

3.3.5 Descriptive Statistics of North/Latin American and Caribbean Countries

The descriptive statistics of North, Latin American & Caribbean Countries which are used in this study shows in table 3.6. The mean value of energy consumption is 7.33 and its standard deviation is 1.00. The maximum and minimum values are 9.59 and 6.06 respectively. The value of kurtosis is less than three (2.13<3) it means platykurtic.

The mean value of GDP is 8.91 with the maximum and minimum of 10.86 and 7.17 respectively. GDP is used as proxy of economic growth. Its standard deviation is 0.97. In GDP the skewness value is positive, curve show on right side and value of kurtosis is (2.41<3) it means platykurtic.

The mean value of URBN is 4.25 and its standard deviation is 0.18. It's maximum and minimum are 4.51 and 3.82 respectively. In UBN the skewness value is negative, data negative skewness and it's making a curve, the curve show on left side. The value of kurtosis is less than three (2.28<3) it means platykurtic. The mean of FDI is 1.04 with maximum and minimum 2.86 and -2.42 respectively. Its standard deviation is 0.85. In FDI the skewness value is negative, the curve show on left side. The value of kurtosis is (4.46>3) it means leptokurtic.

The mean value of FDB is 3.40 with the maximum and minimum value of 4.90 and 2.08 respectively. Its standard deviation is 0.59. FDB is used as proxy of financial development. In FDB the skewness value is positive. The value of kurtosis is less than three (2.40<3) it means platykurtic. The mean value of FDPS is 3.56 with maximum and minimum value of 5.33 and 2.08 respectively. Its standard deviation is 0.76. FDPS is used as proxy of financial development.

In FDFS the skewness value is positive and the curve show on right side and value of kurtosis (2.58<3) it means platykurtic. The mean value of FDFS is 3.88 with maximum and minimum value of 5.46 and 2.35 respectively. Its standard deviation is 0.72. FDFS is used as proxy of financial development. In FDFS the skewness value is positive and the curve show on right side and The value of kurtosis is (2.65<3) it means platykurtic.

Table 3.8: Descriptive Statistics of Latin/ North American & Caribbean Countries

	Mean	**Median**	**Maximum**	**Minimum**	**Std. Dev.**	**Skewness**	**Kurtosis**	**Jarque-Bera**	**Probability**
LEC	7.3358	7.31	9.59	6.05	1.0053	0.6621	2.1363	28.8488	0.0000
LGDP	8.9173	8.97	10.86	7.17	0.9763	0.2959	2.4106	8.0522	0.0178
LURBN	4.2581	4.3203	4.515	3.8279	0.1873	-0.6157	2.2894	23.3302	0.0000
LFDI	1.0422	1.11	2.86	-2.42	0.8531	-0.9167	4.642	69.9109	0.0000
LFDB	3.4148	3.4	4.9	2.08	0.5945	0.0343	2.4091	4.0837	0.1298
LFDPS	3.569	3.44	5.33	2.08	0.7671	0.5181	2.583	14.3996	0.0007
LFDFS	3.8864	3.8431	5.4652	2.3527	0.7281	0.3759	2.6542	7.9026	0.0192

In this study the summary statistic of Latin/ North American & Caribbean Countries shows in **Table 3.6**. This includes the mean, median standard deviation, and range of the variables, skewness, kurtosis etc. Mean shows the averages of the variables, standard deviation shows the dispersion of the variables from the mean, minimum and maximum shows the lowest and largest value in the data of each variable. Skewness show positive and negative spread of data. Kurtosis show smoothness of data spread.

3.4 Correlation Analysis

Correlation analysis used to capture the degree of strength among variables. This tool also deals about the direction of relationship between variables. Correlation analysis among variables indicates positive and negative relationship among different variables. **Table 3.7**, depicts the correlation of different explanatory variable used in the empirical analysis. It is important to check the collinearity between variables. The ranges of correlation coefficient -1 to +1, in which -1 indicates a perfectly negative correlation also the +1 show a perfect positive correlation and 0 displays no correlation at all. Low correlation between two variables shows low chances of multicollinearity while high correlations between two variables indicate high chances of multicollinearity.

Correlation between GDP and energy consumption is positive. It means both variables move in same direction. Correlation shown connection among FDI and energy consumption is negative. Urbanization, financial development of bank FDB, private FDPS and financial sectors FDFS show positive relationship with energy consumption. Urbanization and GDP have positive relationship but FDI has negative relationship with GDP. The FDB, FDPS, and FDFS show positively connection with GDP. Also the FDB, FDPS and FDFS show positive relationship but FDI shows the negatively connection with urbanization. The FDB, FDPS, and FDFS have a negative relationship with FDI. The FDPS and FDFS have a positive relationship with FDB. Also the FDFS and FDPS have positive relationship with each other.

TABLE 3.9: Correlation Matrix

	LEC	**LGDP**	**LURBN**	**LFDI**	**LFDB**	**LFDPS**	**LFDFS**
LEC	1						
LGDP	0.7672	1					
LURBN	0.432	0.6887	1				
LFDI	-0.1798	-0.0089	-0.0322	1			
LFDB	0.4743	0.5653	0.2528	-0.1158	1		
LFDPS	0.528	0.602	0.2588	-0.1294	0.9503	1	
LFDFS	0.4818	0.468	0.1703	-0.2964	0.8117	0.8772	1

3.5 Econometric Model

3.5.1 Panel Data Analysis

Panel data set consists on both of the cross sectional also time varying data. When panel data have same series of time observations for each cross section of variable it called as balance panel. When a time observation differs among cross sections for each series the panel is called unbalanced panel (Gujarati & Porter, 2003). This section figures out the explanation regarding the panel estimation approach. In this study the panel data has been applied for their analysis. Based on previous studies this paper adopts the following energy demand function:

$$\text{LogEC}_{it} = \alpha + \beta_o LogEC_{it-1} + \beta_1 LogGDP_{it} + \beta_2 LogURBN_{it} + \beta_3 LogFDI_{it} + \beta_4 LogFD_{it} + \mu_{it} \quad (3.1)$$

Where EC denotes for energy consumption, GDP indicates economic-growth, URBN stands for urbanization, also the FDI denotes net inflow of foreign direct investment, correspondingly. FD stands for financial development indicators,

μ specifies error-term, and "I" indicate the country (i = 1....136) and t represents the time period (t = 1990....2019), separately. The ECit-1 shows that "lag term of energy consumption" and $\beta 0$, $\beta 1$, $\beta 2$, $\beta 3$ and $\beta 4$ denote coefficients of the corresponding explanatory variables.

In this study some control variables are used such as urbanization. To ignore the dynamic properties related to this data so these all variables converted into natural-logarithm Shahbaz, Shahzad, et al. (2016b). After including the indicators of financial development, the energy demand function is stated in model. 1–3.

Regression Equation

In the regression equation model 1, 2 ad 3 different financial development indicators used separately to investigate finance-energy nexus with estimating the role of urbanization, economic growth and foreign direct investment.

MODEL: 1

$$\text{LogEC}_{it} = \alpha + \beta_o LogEC_{it-1} + \beta_1 LogGDP_{it} + \beta_2 LogURBN_{it} + \beta_3 LogFDI_{it} + \beta_4 LogFDB_{it} + \mu_{it} \quad (3.2)$$

MODEL: 2

$$\text{LogEC}_{it} = \alpha + \beta_o LogEC_{it-1} + \beta_1 LogGDP_{it} + \beta_2 LogURBN_{it} + \beta_3 LogFDI_{it} + \beta_4 LogFDPS_{it} + \mu_{it} \quad (3.3)$$

MODEL: 3

$$\text{LogEC}_{it} = \alpha + \beta_o LogEC_{it-1} + \beta_1 LogGDP_{it} + \beta_2 LogURBN_{it} + \beta_3 LogFDI_{it} + \beta_4 LogFDFS_{it} + \mu_{it} \quad (3.4)$$

FDB, FDPS and FDFS stands for financial development of bank, private and financial sector. There are following test are applied on this study.

3.5.2 Panel Unit Root Test

Panel unit root test has been applied to check the stationary properties in financial development indicators, urban, FDI, GDP, and EC. The presence of CD limits the application of traditional unit root tests as these tests don't assume dependency in the panel. Presence of unit root provides the biased results and might be exist in the panel data due to the large number of observations. Unit root test based on the assumption whether there is any restriction on data series or not. In this study we have used different measures to detect the unit root in the data set. Therefore, this paper relies on the LLC (Levin, Lin, & Chu, 2002) and PP - Fisher Chi-square (Phillips and Perron 1988) these test robust cross sectional and heterogeneity. In the **Table 3.8**, show that the results of unit root test. Result indicates that unit root does not exist in any of the variable or the series are stationary at level.

Table 3.10: Panel Unit Root Test

	Levin, Lin & Chu t*		**PP - Fisher Chi-Square**	
Variable	**Statistic**	**Prob.**	**Statistic**	**Prob.**
lEC	-12.7918***	0.0000	652.235***	0.0000
lGDP	-8.37095***	0.0000	478.648***	0.0000
lURBN	-12.5736***	0.0000	2288.57***	0.0000
lFDI	-2.60935***	0.0045	939.815***	0.0000
lFDb	-4.76550***	0.0000	367.844***	0.0000
lFDps	-3.89992***	0.0000	340.971***	0.0004
lFDfs	-2.62001***	0.0044	120.794***	0.0014

*** indicate that Prob. value<0.01

3.5.3 Generalize Method of Movement (Sys-GMM)

The main implication this study is to estimate the longer run connection among the financial development with energy consumption controlling the role of GDP, FDI

and urbanization. Because of the presence of the lag term of the explained variable, we were unable to use the traditional methods for example random or fixed effect models, due to endogenity problem exist in data; then effective estimators couldn't be acquired.

Consequently, the generalized method of moments (GMM) was adopted to estimate the results (Arellano & Bond, 1991; Arellano & Bover, 1995; Blundell & Bond, 1998).

GMM models in the regression are more consistent and efficient estimation techniques, which also check the robustness and realization of the errors that are correlated between past and present. So for the handling the endogenity problem the GMM is best technique to manage these problems and GMM might successfully manage the issue of endogenity and omitted-variable biases.

The GMM consists of Diff-GMM and Sys-GMM and as per the choice of various weight matrixes, every one of them can be split into 1-step and 2-step GMM. Mostly, the Sys-GMM performs better in improving the efficiency of estimation than the Diff-GMM. As the generally the 2-step GMM performs well in handling the autocorrelation, endogenity and heteroscedasticity as the compared with 1-step GMM. Therefore, this study approved a (2SLS) two step Sys-GMM for estimation.

Finally, Arellano and Bover (1995) GMM estimation are much more systematic and proficient as compared to other GMM estimation techniques for handling the problem of auto correlation. In this study Sys-GMM technique has been applied for balance panel data analysis, which is robust to cross-sectional dependence and endogenity, to find the long run coefficient estimates of financial development, economic growth, FDI, urbanization, and energy consumption.

According to the hausman test of overall (N=136) and Asian, European, African, North/Latin American & Caribbean countries result are reported in **Appendix-A.** When endogenity exist in panel data so GMM apply the **Table 3.8** show that Wald endogenity test (F statistics, t statistics and chi-square) the P-value of all variables is less than 0.05 which show that endogenity present in panel data and null hypothesis is reject and alternative accept.

Table 3.11: Wald-Endogenity Test

		Value	**Df**	**Probability**
	t-Statistic	21.17011	530	0.0000
GDP	F-Statistic	448.1735	(1.530)	0.0000
	Chi-square	448.1735	1	0.000
	t-Statistic	97.43358	530	0.0000
UBN	F-Statistic	9493.303	(1.530)	0.0000
	Chi-square	9493.303	1	0.0000
	t-Statistic	271.9703	530	0.0000
FDI	F-Statistic	73967.87	(1.530)	0.0000
	Chi-square	73967.87	1	0.0000
	t-Statistic	95.29675	1613	0.0000
FDB	F-Statistic	9081.471	(1, 613)	0.0000
	Chi-square	9081.471	1	0.0000
	t-Statistic	143.0711	1613	0.0000
FDPS	F-Statistic	20469.33	(1, 613)	0.0000
	Chi-square	20469.33	1	0.0000
	t-Statistic	133.8488	1613	0.0000
FDPS	F-Statistic	17915.49	(1, 613)	0.0000
	Chi-square	17915.49	1	0.0000

Chapter 4

Results and Discussion

This chapter include the results of test that are applied to examines the financial development and energy consumption nexus from worldwide perspective and also interpret these results.

4.1 Impact of Financial Development on Energy Consumption in 136 Countries

The results of worldwide (N=136) countries are show in **Table 4.1** with Sys-GMM applied. Because the balance panel time series and cross-sectional data are taken as a natural logarithm, the long run coefficient estimate of GDP, FD, URBN, and FDI is statistically equal to elasticities of energy consumption concerning financial development, urbanization, economic growth and foreign direct investment, respectively.

For each model, of worldwide perspective N=136 countries the (ECit-1) the lagged term of energy consumption variable is highly persistent, positively and statistically one percent level of significant.

It means that the energy consumption in one year as compare to previous year highly influence or in a certain year energy consumption strongly affected by its pervious value. Concerning the impact of economic growth (GDP) on energy

consumption, the result shows that 1% increase in GDP positively and significantly increase energy consumption by 0.40, 0.43 and 0.73% respectively in all three models.

The result indicates that there is positive and significance connection among GDP and energy consumption. Industrial growth increases the demand of energy there is another possible options and its vital contribution in the production procedure.

Furthermore, these overall countries (N=136) in trade for world-wide and contributing to world growth, which eventually raise the utilization of energy. They additionally improvement of economic activities like that purchases, investment and utilization increment the interest of energy.

Our result mark with (Mahalik & Mallick, 2014) for India, Alam et al. (2015), (Kahouli, 2017) for (SMCs) and (Farhani & Solarin, 2017) for the US.

Concerning the link among urbanization and energy consumption, the result shows that increase in urbanization stimulate energy consumption. The result shows that 1% increase in urbanization significantly and positively increases energy consumption by 0.41 and 0.28% respectively.

The result shows that significant link among energy and urbanization also positive there is Urbanization is a natural process in which mass-relocation move from rural parts to urban zones. The purpose for this situation that peoples transfer between rural parts to urban zones for observing better and the well-settle life style of living, the better job opportunities, and easily accessibility of further daily life resources.

According to the results of 1st and 2nd model indicates that positively and significantly relationship among the urbanization with energy consumption but in the model 3 show that no connection among these variables or statistically insignificant and negatively connection between urbanization with utilization of energy.

6The consequence is similar with (Mahalik & Mallick, 2014) for India, (Kahouli, 2017) for (SMCs), (Liu et al., 2018) and (Shahbaz et al., 2016) for the Malaysia. Concerning the impact of FDI on energy consumption, the result explains that

increase in FDI 1% significant and also positive, then energy consumption increases by 0.022 and 0.0025% respectively.

FDI allow cheaper businesses and easily entrée to monetary capital which can be utilize to expansion in present construct or operations, new factories and plants, all of these activities increase the demand of energy. In overall countries FDI encourages the production level through new investment which rises the consumption related energy (Hafeez, Chunhui, Strohmaier, Ahmed, & Jie, 2018; Rauf et al., 2018).

The result shows in model 1 and 2 model that there is significance and positively connection among the FDI and energy consumption. But in the model 3 results also show that there is significant and negative connection among these variables of overall N=136 countries. It means that FDI one percent increase with decrease in the energy-consumption by 0.04%.

Also, FDI could lead in the local firm by using innovation in technology that might be help to decline energy use (Hermes & Lensink, 2003). Our results are similar with (Mielnik & Goldemberg, 2002) for 20 developing countries, (Sadorsky, 2010) for 22 developing countries and (Azam et al., 2015) for TMI (Thailand, Malaysia, and Indonesia) countries.

Regarding the nexus between the financial development and energy consumption. The result delivers strong proof that there is significant and negative connection among the energy consumption and financial development. The result shows that 1% increase in financial development to banking, private and financial sector will decrease energy consumption by 0.0427, 0.0432 and 0.1181% respectively.

The financial development decline energy consumption as it supports enterprises to improve energy efficiency and manufacture advanced energy-saving products by updating production technologies and equipment and by increasing the amount of R & D investment. One of the possible reason energy consumption decline is that overall N=136 countries utilizing energy-efficient production methods and green financing. The N=136 countries use effectiveness of the consuming in the energy tackle, energy productive innovation with efficient technology. To efficient use of technology can boost economic growth and reduce energy consumption.

So N=136 countries also focus on efficient energy related projects, which will not only bring new method of energy consumption and production, also bring advanced energy efficient technology. In this study results shows that financial development of bank, private and financial sector significantly and negatively impact on energy consumption.

There are three different financial development indicators or proxy used in this study financial development of bank, financial development of private sectors and financial development of financial sectors. . These proxies are alternative measure of financial development. According to financial development the overall finding demonstrations that all financial development measures used in different models deliver a significant and negative impact on energy consumption in overall N=136 countries.

It shows that changing the measures of financial development there will be no effect of energy consumption and they provide similar (significant and negative) results. Our results are in similar with (Al-mulali & Lee, 2013) for GCC regions; (Islam et al., 2013) for Malaysia; (Farhani & Solarin, 2017) for US; (Kahouli, 2017) for (SMCs); (Gomez & Rodríguez, 2019) for (NAFTA) countries; and (Ouyang & Li, 2018) for China.

Different diagnostic test used to ensure the validity of results, to check the instruments validity. Hansen (1982) test for over-identification restrictions the probability value of these test show in **Table 4.1**.

The greater p-value of Hansen-test show that validity of instrument used in estimation equation. In all three models higher prob value of (Hansen, 1982) test which show that validity of instrument under the null hypotheses of exogenous instruments.

ARB (1) and ARB (2) are (Arellano & Bond, 1991) tests for first and second order auto correlation in first difference error. For each models of N=136 countries reported in Table 4.1, the ARB (2) tests show that no evidence of auto correlation at conventional level of significance. The Hansen (1982) J-test for over-identification restrictions. The ARB (1) and ARB (2) are (Arellano & Bond, 1991) test for auto-correlation in first difference and second difference error.

Table 4.1: Impact of Financial Development on Energy Consumption in 136 Countries

	Model 1		**Model 2**		**Model 3**	
Variable	**Co-efficient**	**Prob.**	**Co-efficient**	**Prob.**	**Co-efficient**	**Prob.**
lEC(-1)	0.8571***	0.0000	0.8794***	0.0000	0.8294***	0.0000
lGDP	0.4024***	0.0000	0.4364***	0.0000	0.7658***	0.0000
lURBN	0.4187***	0.0000	0.2851***	0.0000	-0.4674*	0.0825
lFDI	0.0225***	0.0004	0.0251***	0.0004	-0.0431***	0.0021
Constant	2.1743***	0.0000	2.4307***	0.0000	3.2442***	0.0004
lFDB	-0.0427***	0.0000				
lFDPS			-0.0423***	0.0004		
lFDFS					-0.1181***	0.0001
Observation	4080		4080		4080	
Adjusted R^2	0.989		0.9898		0.6324	
Hansen J-Statistic prob.	0.0897		0.9496		0.16	
Difference in J-statistic	0.5061		0.2791		0.3419	
ARB (1)	0.0308		0.3212		0.002	
ARB (2)	0.9807		0.5066		0.7878	
Countries	N=136		N=136		N=136	

***, **, * indicate the level of significance. *** indicate the level of significance at 1%, ** indicate the level of significance at 5% and * indicate the level of significance at 10%. The regression coefficients are estimated using the (Arellano & Bover, 1995) and (Blundell & Bond, 1998) system GMM estimation approach.

LEC (-1) stand for lagged term of energy consumption. In all three model instrumental variables are 1st, 2nd and 3rd lags of lgdp, lfdi, lurbn, lfdb, lfdps, and lfdfs respectively. The Hansen (1982) J-test for over-identification restrictions. The ARB (1) and ARB (2) are (Arellano & Bond, 1991) test for auto-correlation in differences.

4.2 Impact of Financial Development on Energy Consumption in Asian Countries

The results of Asian countries are show in **Table 4.2** with Sys-GMM Panel regression applied. The panel data are taken as a natural-logarithm the longer term coefficient estimate of GDP, FD, URBN, and FDI is statistically equal to elasticities of EC.

For each model, of Asian countries the lEC(-1) the lagged term of variable energy consumption is highly persistent, significant with positive at the level of 1%. It means that the energy consumption in one year as compare to previous year highly influence or energy-consumption strongly affected in the certain year as the compare to its previous value.

Concerning the effect of economic growth (GDP) on energy consumption, the result indicates that increase in the GDP by 1%, significant and positive increase by 0.33, 0.18 also 0.97% energy consumption.

In the economic growth and energy consumption results also delivers that positive connection among these variables. Also these Asian countries also involve in international trade with contributing to world growth that eventually raise energy demand. The expansion in different activities of economic like that investment and purchase increase the energy demand.

The Asian countries should use effectiveness of utilizing the energy equipment, updating and innovative technology and energy proficient technology.

To efficient use of technology can boost economic growth and can reduce energy consumption. Our result mark with (Alam et al., 2015; Farhani & Solarin, 2017; Kahouli, 2017; Mahalik & Mallick, 2014).

About the relationship among urbanization and the energy consumption, the result tells that increase in urbanization stimulate energy consumption. The result shows that 1% increase in urbanization significantly and positively increases energy consumption by 0.80%.

The result shows that significant, positive link among urban and energy consumption Urbanization is a natural process that the mass-relocation moves from rural parts to urban parts.

The purpose for this situation that peoples transfer between rural to urban areas for watching of the healthier life style of living, the better job opportunities, and easily accessibility of additional resources for daily life events.

In model first and model second result conclude that positively association among urbanization and energy-consumption but model three founds that significant and negative association among urbanization with the consumption of energy.

Its means that 1% increase urbanization with decrease energy consumption by 0.76%.The result is similar with (Mahalik & Mallick, 2014) for India, (Liu et al., 2018) for China and (Kahouli, 2017) for SMCs.

Concerning the energy consumption and foreign direct investment FDI relationship, the result shows that statically insignificant connection among energy consumption and FDI.

The result shows that there is statistical insignificance and positive connection among Foreign direct investment and energy consumption on model one. In models two and model three result also shows that statistical insignificance and positive relationship among these foreign direct investment and energy consumption variable of Asian countries.

So conclude that in Asian countries foreign direct investment is no influence on the energy consumption. Regarding the financial development and energy consumption nexus and the result delivers strong proof that positive also the significant connection among the financial development and energy consumption.

The result shows that 1% increase in financial development increase energy consumption by 0.054%. The result shows that in Asian countries the financial development stimulates energy consumption.

The finance is elastic to energy it means that increase in financial development, energy consumption also increases. Furthermore, easy permission to debts, credits, or loans would lead to boost up confidence of investor for business development which increase demand of energy.

Another option can be that the financial development cannot inspire financial sectors, banking sectors and private sectors to provide more energy efficient projects and more credit for investment.

It's also offers low-priced loans to the producer then they buying advanced machinery and equipment then they also raise the demand of energy. Financial development increases the diversification of asset allocation, which creates a wealth effect that in turn boosts consumer and business confidence. The enhanced economic confidence increases economic activity and the demand for energy.

Furthermore, the lower debt rate that creates the opportunity for the peoples to use more financial resources. This is chance, increases the buying power of consumers for sustainable items like that an AC, vehicle, frigs, etc. and for that cases higher utilization of energy.

Also financial development facilitates new infrastructure and boost up industrial growth that impact energy consumption positively. The installation in green-technology and primary industries for Asian economies which necessity less utilization of energy and therefore reducing in energy demand (Nasreen, Anwar, & Ozturk, 2017).

So Asian countries should essential to focus on well-organized energy projects, which will not only bring new method of energy consumption and production, also

bring advanced energy efficient technology. There are different types of proxies' financial development of banks, private and financial sector used in this study.

In this study results shows that FDB and FDPS significantly and positively impact with the energy consumption. But the FDFS result indicates that statistical insignificant and negative impact on energy consumption.

These proxies are alternative measure of financial development. According to financial development the finding shows that financial development measures used in model 1 and model 2 deliver significantly, also positively influence on the energy consumption in Asian countries but model 3 deliver an insignificant means that no impact on these variables.

It shows that there is effect of energy consumption when different measure of financial development used and they provide not similar results for all models. Our results are in similar with (Mahalik & Mallick, 2014) for India, (Alam et al., 2015) for SAARC countries, (M. Destek, 2015) for Turkey, (Liu et al., 2018) for China, (Coban & Topcu, 2013) for EU countries, (K. Ahmed, 2017) for BRICS countries, (Lee, 2013) for GCC countries, (Mukhtarov, Mikayilov, Mammadov, & Mammadov, 2018) for Azerbaijan, (Sadorsky, 2010) for 22 countries and Furuoka (2015). Different diagnostic test used to confirm the validity of results, to check the instruments validity for over identification restriction the Hansen (1982) test are used and P-value of these test show in **Table 4.2**.

The greater P-value of Hansen test show that validity of instrument used in estimation equation. In all three models higher p-value of Hansen J-state which show that validity of instrument under the null hypotheses of exogenous instruments. ARB (1) and ARB (2) are Arellano and Bond (1991) tests for first and second order auto correlation in first difference error. For each models of Asian countries reported in **Table 4.2**, the ARB (2) tests show that no proof of auto correlation at conventional level of significance.

In all three models instrumental variables are 1st and 2nd lags of lgdp, lfdi, lurbn, lfdb, lfdps, and lfdfs respectively. The Hansen (1982) J-test for over-identification restrictions. The ARB (1) and ARB (2) are (Arellano & Bond, 1991) auto-correlation in differences.

Table 4.2: Impact of Financial Development on Energy Consumption in Asian Countries

	Model 1		**Model 2**		**Model 3**	
Variable	**Co-efficient**	**Prob.**	**Co-efficient**	**Prob.**	**Co-efficient**	**Prob.**
lEC(-1)	0.7349***	0.0000	0.7765***	0.0000	0.4499**	0.0441
lGDP	0.3372***	0.0000	0.1862***	0.0000	0.9708***	0.0000
lURBN	0.8005***	0.0000	1.0646***	0.0000	-0.7651**	0.0311
lFDI	0.0057	0.4723	0.0068	0.4289	0.0063	0.717
Constant	0.9604***	0.0001	1.0301***	0.0005	2.4382*	0.0695
lFDB	0.0546***	0.0016				
lFDPS			0.0970***	0.0000		
lFDFS					-0.16866*	0.0781
Observation	1320		1320		1320	
Adjusted R^2	0.9903		0.9906		0.4278	
Hansen J-Statistic prob.	0.1468		0.1302		0.8387	
Difference in J-statistic	0.5456		0.1932		0.8091	
ARB (1)	0.0349		0.0221		0.0724	
ARB (2)	0.2226		0.3677		0.1347	
Countries	N=44		N=44		N=44	

***, **, * indicate the level of significance. *** indicate the level of significance at 1%, ** indicate the level of significance at 5% and * indicate the level of significance at 10%. The regression coefficients are estimated using the (Arellano & Bover, 1995) and (Blundell & Bond, 1998) system GMM estimation approach. LEC(-1) stand for lagged term of energy consumption. In all three models instrumental variables are 1st and 2nd lags of lgdp, lfdi, lurbn, lfdb, lfdps, and lfdfs respectively. The Hansen (1982) J-test for over-identification restrictions. The ARB (1) and ARB (2) are (Arellano & Bond, 1991) auto-correlation in differences.

4.3 Impact of Financial Development on Energy Consumption in European Countries

The results of European countries are show in **Table 4.3** with Sys-GMM estimation technique are applied based on panel date taking as natural logarithm of all variables such as FD, EC, GDP, URBN respectively. For first and second model, of European countries the lEC(-1) the lagged term of energy consumption is highly persistent, positive and also significant at the level of 1% and model third show that 5% level of significant. It means that the energy consumption in one year as compare to previous year highly influence or in a specific year energy consumption emphatically influenced by its pervious worth.

Concerning the effect of economic growth on the energy consumption, the result shows that 1% increase in GDP positively and significantly increase energy consumption by 0.25, 0.10 and 0.20% respectively.

In all three models the result also indicates that positive relationship among the GDP and energy consumption. Industrial growth increases the energy demand, there is another possible option and also vital input for the process of production Also these European countries involving in trade for world-wide and contributing to world growth, which eventually raise the utilization of energy. They additionally improvement of economic activities like that buys; investment and utilization increment the interest of energy. Our result mark with (Mahalik & Mallick, 2014)

for India, (Alam et al., 2015) for SAARC countries, (Farhani & Solarin, 2017) for the US and Kahouli (2017) for SMCs.

Concerning the relationship between energy consumption and urbanization, the result shows that 1% increase in urbanization significantly and negatively decrease energy consumption by 0.60 and 2.16% respectively.

In European countries result indicates that there is a negative and the significant connection among the urbanization with the energy consumption in 1 and 2 models it means that increase in 1% urbanization reduce energy consumption by 0.60 and 2.16%. The model 3 result shows that positive relationship among energy consumption and also urbanization it means that 1% increase urbanization increase energy consumption by 1.30%. Urbanization is a natural process in which lots of peoples relocate move from rural zones to urban parts.

The purpose for this situation that people groups move from the rustic parts to urbanize zones for seeing of the improved way of life of living, effectively accessibility of different assets for everyday life exercises, the better job opportunities, and easily accessibility of different daily life activities. In model 3 the result is similar through (Liu et al., 2018) for China, Kahouli (2017) for SMCs, (Shahbaz et al., 2016) for Malaysia and (Mahalik & Mallick, 2014) for India.

Concerning the impact of foreign direct investment on energy consumption, the outcome explains that in all three models the mixed finding related energy consumption and FDI.

In model 1 result shows that in European countries no impact of FDI on energy consumption. But in model 2 results explain that the FDI and energy consumption there is significant and positive relationship it means that FDI increase 1% then, the energy consumption increase by 0.02%. The model 3 result shows that FDI and also energy consumption significantly and negatively influences from each other it means that 1% increase FDI decrease energy consumption by 0.44%. So results indicate that in model 1 and model 2 significant (positive also negative) effect of FDI on energy utilization but model 1 no impact between FDI and energy consumption due to different business plan, and technique of European countries.

Concerning the nexus among energy consumption and financial development. In European countries there is mixed result about finance-energy. The result delivers strong proof that there is significant positively, and negatively relationship among financial development and energy consumption in model 1 and model 3 but no finance-energy nexus in the model 2.

There are different financial developments proxies are used to see the validity of results. These proxies are alternative measure of financial development. In model 1 result indicates that FDB increase 1% the energy consumption reduces by 0.05%. The financial development decrease energy utilization as it supports enterprises to improve energy proficiency and manufacture advanced energy-saving items by updating technologies related production and equipment also expanding the amount of R and D.

One of the possible reason energy consumption decline is that European countries utilizing energy-efficient production methods and green financing. The European countries use effectively use utilization of energy equipment and energy efficient technology. To efficient use of technology can boost economic growth and decrease the consumption of energy. In model 1using proxy of FDB, result are similar with (Al-mulali & Lee, 2013) for GCC regions; (Islam et al., 2013) for Malaysia; (Farhani & Solarin, 2017) for USA; Kahouli (2017) for SMCs; (Gomez & Rodríguez, 2019) for (NAFTA) countries and (Ouyang & Li, 2018).

In model 2 conclude that there is statistical insignificant connection among energy-finance nexus it means that no effect of FD on EC by using proxy of FDPS in European countries due to different business plan. According to the Coban and Topcu (2013), study in twenty-seven (27EU) based on the GMM estimation technique his results indicate that there is no finance-energy association in (27EU) when sample divided into two groups in old member significant and positive connection between these variables. In the model 2 results are similar with (Coban & Topcu, 2013). So, in model 3 result indicate that in FDFS has 1% increase then energy consumption also increases by the 0.15%.

It means that this financial development indicator has elastic to energy consumption. When easily available of debts or loans its might be lead to enhance the

investor confidence and then development different business with raise utilization of energy. Also financial development facilitates new infrastructure and boost up industrial growth that impact energy consumption positively. So European countries should emphasis on effective energy projects, also not only brings new method of energy consumption and production, also bring advanced energy efficient technology. According to financial development the overall finding shows that all financial development measures used in different models deliver a (significant, positive and no impact) on energy consumption in European countries. It shows that there is strongly effect of energy consumption when changing a measure of financial development and they provide different results. In model 3 these result are similar with (Sadorsky, 2010); (Furuoka, 2015); (Mahalik & Mallick, 2014) for India; (Alam et al., 2015) for SAARC countries; (M. Destek, 2015) for Turkey (Shahbaz, Mallick, Mahalik, & Sadorsky, 2016b) for India; (Liu et al., 2018) for China; (K. Ahmed, 2017) for BRICS countries.

Different diagnostic test used in this study to check the instruments validity. The (Hansen, 1982) for over-identification restrictions the P-value of these test show in **Table 4.3**. The greater P-value of Hansen test show that validity of instrument used in estimation equation. In all three models higher p-value of Hansen J-state which show that validity of instrument under the null hypotheses of exogenous instruments. ARB (1) and ARB (2) are (Arellano & Bond, 1991) tests for first and second order auto correlation in first difference error. For each models of European countries reported in **Table 4.3**, the ARB (1) and ARB (2) both shows that no evidence of auto correlation at the conventional-level of significance.

***, **, * indicate the level of significance. *** indicate the level of significance at 1%, ** indicate the level of significance at 5% and * indicate the level of significance at 10%. The regression coefficients are estimated using the (Arellano & Bover, 1995) and (Blundell & Bond, 1998) system GMM estimation approach. LEC(-1) stand for lagged term of energy consumption. In all three models instrumental variables are 1st and 2nd lags of lgdp, lfdi, lurbn, lfdb, lfdps, and lfdfs respectively. The Hansen (1982) J-test for over-identification restrictions. The ARB (1) and ARB (2) are (Arellano & Bond, 1991) test for auto-correlation in differences.

Table 4.3: Impact of Financial Development on Energy Consumption in European Countries

	Model 1		**Model 2**		**Model 3**	
Variable	**Co-efficient**	**Prob.**	**Co-efficient**	**Prob.**	**Co-efficient**	**Prob.**
lEC(-1)	0.8987***	0.0000	0.8743***	0.0000	0.7747**	0.0430
lGDP	0.2550***	0.0000	0.1071***	0.0000	0.2028***	0.0000
lURBN	-0.6075**	0.0168	-2.1619**	0.021	1.3065***	0.0000
lFDI	0.0096	0.3831	0.0289**	0.013	-0.4401***	0.0002
Constant	8.3671***	0.0000	16.195***	0.0000	0.5033**	0.0108
lFDB	-0.0537***	0.0003				
lFDPS			0.016	0.401		
lFDFS					0.1523***	0.0000
Observation	1110		1110		1110	
Adjusted R^2	0.969		0.9702		0.7523	
Hansen J-Statistic prob.	0.1472		0.0544		0.9719	
Difference in J-statistic	0.2393		0.9355		0.8089	
ARB (1)	0.9249		0.4596		0.4908	
ARB(2)	0.0724		0.0686		0.7849	
Countries	N=37		N=37		N=37	

4.4 Impact of Financial Development on Energy Consumption in African Countries

The results of African countries are show in **Table: 4.4** with Sys-GMM estimation technique are applied based on panel date taking as natural logarithm of all variables such as FD, EC, GDP, URBN respectively.

For each model, of African countries the lEC(-1) the lagged term of energy consumption variable is extremely persistent, positive and statistically significant at the level of 1%. It indicates that the energy consumption in one year as compare to previous year highly influence.

Concerning the effect of GDP on energy-consumption, the result shows that 1% increase in GDP positively and significantly increase energy consumption by 0.33, 0.30 and 0.64% respectively.

In all three models, results explain that significant and positive effect among the GDP and EC. Also these African countries involve in trade for world-wide and contributing to world growth, which eventually raise the utilization of energy. They additionally improvement of economic activities like that purchases, investment and utilization increment the interest of energy. The African countries do not use effectiveness of the consuming of energy equipment and energy efficient technology. To efficient use of technology can boost economic growth and can reduce energy consumption. Our result mark with (Mahalik & Mallick, 2014) for India; (Alam et al., 2015) for SAARC countries; (Farhani & Solarin, 2017) for the US and (Kahouli, 2017) for (SMCs).

Concerning the outcome related urbanization with energy consumption, the result shows that there is statically insignificant connection among urbanization and energy consumption in all three models. So in this study conclude that in African countries urbanization has no influence on energy consumption.

Concerning the impact of foreign direct investment on energy consumption, the result shows that 1% increase FDI positive and significant increase energy consumption by 0.02% in model 3.

Foreign direct investment allows cheaper businesses and easily availability to financial capital also used to expansion in existing construct or operations, new factories and plants, all of these activities energy demand increased. In African countries FDI increase production over the fresh investment which results increases the demand of energy (Hafeez et al., 2018; Rauf et al., 2018). In model 1 and model 2 results indicate that statistical insignificant positive effect with energy consumption it means that it has no influence on energy consumption in African countries.

Concerning the nexus between financial development and energy consumption. The results show that 1% increase in financial development decline energy consumption by 0.21% in model 3. There are different types of proxies are used in this study.

These proxies are alternative measure of financial development. In African countries there are also mixed result regarding financial development and energy consumption model 1 and model 2 results show that there is statistical insignificant and negative connection among FD and EC. It shows that no effect of FDB and FDPS on energy consumption in African countries. These result are similar with (Coban & Topcu, 2013) for (EU27), (Keskingoz & Inancli, 2016) for turkey and (Topcu & Payne, 2017) for 32 high income countries.

In model 3 FDFS results indicate that positive, also significant impact with energy consumption it means that one percent increase of FD decline EC by 0.21%. There is different way when financial development decline energy consumption as new and updated production technology, better energy efficiency, advanced energy-saving products and higher the amount of Research and development investment. One of the possible reason energy consumption decline is that African countries utilizing energy-efficient production methods and green financing. The African countries use energy efficient technology.

To efficient know-how about technical advancement can boost economic growth and reduce energy consumption. In these African countries also important for that accomplish the complete energy potential with rise lower investment related to the energy projects. So conclude that the African countries need to implements their energy saving projects, to expend their businesses with low debt rate, raise

productivity related energy by improve energy conservation also efficiency and outsourcing to achieve its financial development with growth. The African countries should essential to attention on efficient energy projects and new method of energy consumption and production, also bring advanced energy efficient technology.

According to financial development the overall finding shows that all financial development measures used in different models deliver negative, significant and no effect on energy consumption in African countries. It shows that there is effect of energy consumption when the financial development measures changes and they provide different results. In model 3 results are in similar with (Al-mulali & Lee, 2013) for GCC regions; (Islam et al., 2013) for Malaysia, (Farhani & Solarin, 2017) for USA, (Kahouli, 2017) for SMCs, (Gomez & Rodríguez, 2019) for NAFTA countries and (Ouyang & Li, 2018) for 30 Chinese provinces.

Different diagnostic test used to ensure the validity of results, to check the instruments validity. For over-identification restriction (Hansen, 1982) test are used and the P-value of these test show in **Table 4.4**. The greater P-value of Hansen test show that validity of instrument used in estimation equation.

In all three models higher p-value of Hansen J-state which show that validity of instrument under the null hypotheses of exogenous instruments. ARB (1) and ARB (2) are (Arellano & Bond, 1991) tests for first and second order auto correlation in first difference error. For each models of African countries reported in **Table 4.4**, the ARB (2) tests show that no evidence of auto correlation at conventional level of significance.

***, **, * indicate the level of significance. *** indicate the level of significance at 1%, ** indicate the level of significance at 5% and * indicate the level of significance at 10%. The regression coefficients are estimated using the (Arellano & Bover, 1995) and (Blundell & Bond, 1998) system GMM estimation approach.

LEC(-1) stand for lagged term of energy consumption. In all three models instrumental variables are 1st and 2nd lags of lgdp, lfdi, lurbn, lfdb, lfdps, and lfdfs respectively. The Hansen (1982) J-test for over-identification restrictions. The ARB (1) and ARB (2) are (Arellano & Bond, 1991) tests for auto-correlation in differences.

Table 4.4: Impact of Financial Development on Energy Consumption in African Countries

	Model 1		**Model 2**		**Model 3**	
Variable	**Co-efficient**	**Prob.**	**Co-efficient**	**Prob.**	**Co-efficient**	**Prob.**
lEC(-1)	0.8818***	0.0000	1.0339***	0.0000	0.8769***	0.0000
lGDP	0.3349***	0.0000	0.3018***	0.0000	0.6423***	0.0000
lURBN	0.0086	0.9035	-0.0871	0.263	0.4238	0.2374
lFDI	0.0172	0.2866	0.0163	0.3223	-0.0484**	0.0202
Constant	3.8347***	0.0000	4.4438***	0.0000	1.3918	0.1782
lFDB	-0.0053	0.7908				
lFDPS			-0.0007	0.9694		
lFDFS					-0.2124**	0.0176
Observation	870		870		870	
Adjusted R^2	0.9713		0.9743		0.9884	
Hansen J-Statistic prob.	0.4716		0.4338		0.4937	
Difference in J-statistic	0.7796		0.8652		0.67	
ARB (1)	0.5746		0.7579		0.3681	
ARB (2)	0.4897		0.5691		0.4625	
Countries	N=29		N=29		N=29	

4.5 Impact of Financial Development on Energy Consumption in North/Latin American and Caribbean Countries

The results of North, Latin American and Caribbean countries are show in **Table 4.5** with Sys-GMM estimation technique are applied based on panel date and taking natural logarithm of all variables. For each model, of North, Latin American and Caribbean the lEC(-1) the lagged term of energy consumption significant, positive and also highly persistent at the level of 1%. It means that the energy consumption in one year as compare to previous year highly influence or in a specific year energy consumption strongly influenced by its pervious value.

Concerning the influence of economic growth on energy consumption, the result shows that 1% increase in GDP positively and significantly increase energy consumption by 0.67, 0.79 and 0.88% respectively.
The result also indicates that in all three model significant and positive association among the growth-energy linkages. These countries do not use efficiency of the energy consuming equipment and energy efficient technology. To efficient use of technology can boost economic growth and can reduce energy consumption. Our result mark with (Mahalik & Mallick, 2014) for India; (Alam et al., 2015) for SAARC countries; (Farhani & Solarin, 2017) for the US and (Kahouli, 2017) for SMCs. Concerning the relationship between urbanization and energy consumption, the result shows that increase in urbanization stimulate energy consumption. The result shows that 1% increase in urbanization significantly and negative decrease energy consumption by 1.32% in model 3.

In model 1 and model 2 outcomes indicate that urbanization and also the energy consumption has no connection its mean that statistical insignificant. Urbanization is a natural process in which lager population transfer to rural parts to urban areas. The purpose for this situation that peoples transfer from rural regions to urban parts for observing of the well life style of living, the better job opportunities, and easily accessibility of daily life resources. In the North, Latin American and

Caribbean countries result show that in 1 and 2 models no relationship among the urbn and energy but in the model 3 results explain that negative and statistical significant connection among the urbanization with energy consumption. Concerning the connection among FDI and energy consumption, the result shows that 1% increase FDI positively and significantly increase energy consumption by 0.03, 0.036% respectively.

The result indicates that positively and significantly the link among FDI and energy consumption, in the model 1 also model 2. The FDI allow cheaper businesses and easily availability to financial capital also used to expansion in existing construct or operations, new factories and plants, all of these activities energy demand increased. In North, Latin American and Caribbean countries FDI encourages the new investment like production level while result increases the utilization of energy (Hafeez et al., 2018; Rauf et al., 2018).In model 3 results also show that negative link among the energy consumption and FDI also significant of North, Latin American and Caribbean countries. It means that one percent increases the FDI while decrease by 0.02% energy consumption. Also, FDI could lead in the local firm by using innovation in technology that might be help to decline energy use (Hermes & Lensink, 2003). Our results are similar with (Mielnik & Goldemberg, 2002) for 20 developing countries; (Sadorsky, 2010) for 22 developing countries; (Azam et al., 2015) for (TMI) Thailand, Malaysia, and Indonesia countries.

Regarding the nexus between energy consumption and financial development. The result delivers strong proof that there is significant and negative relationship between financial development and energy consumption in model 2 and model 3.

The result shows in the 1 and 2 models that 1% increase in FD decrease EC by 0.097% and 0.096% respectively but model 1 show that no effect among these variables. There are different types of proxies are applied to see the validity of results. These proxies are alternative measure of financial development. Different way when financial development decline energy consumption as new and updated production technology, better energy efficiency, advanced energy-saving products and higher the amount of Research and development investment. One of the possible reason energy consumption declines is that North, Latin American and Caribbean

countries utilizing energy-efficient production methods and green financing. The North, Latin American and Caribbean countries use energy efficient technology with efficient and effectiveness. To efficient use of technology can boost economic growth and reduce energy consumption. So North, Latin American and Caribbean countries should have to concentrate on well-organized energy-projects, that could not only bring new method of energy consumption and production, also bring advanced energy efficient technology. In model 1 results show that statistical insignificant and negative impact it shows that FDB has no impact with the energy consumption in these countries. These result are similar with (Coban & Topcu, 2013) for EU27; (Keskingoz & Inancli, 2016) for turkey and (Topcu & Payne, 2017) for 32 high income countries.

According to financial development the overall finding demonstrations the measures of financial development used in various models deliver a significant and negative impact on energy consumption for North, Latin American and Caribbean countries in model 2 and model 3 but on impact on energy consumption in 1 model. It means that when changing the measure of financial development its effect on energy consumption and they provide different (significant, negative and no effect) results. Our results are in similar with (Al-mulali & Lee, 2013) for GCC regions; (Islam et al., 2013) for Malaysia; (Farhani & Solarin, 2017) for USA; (Kahouli, 2017) for SMCs; Gomez and Rodríguez (2019) for NAFTA countries and (Ouyang & Li, 2018) for 30 Chinese provinces.

Different diagnostic test used to ensure the validity of results, to check the instruments validity. The Hansen (1982), test of J-state for over-identification restrictions the P-value of these test show in **Table 4.5**. The greater P-value of Hansen test show that validity of instrument used in estimation equation. In all three models higher p-value of Hansen J-state which show that validity of instrument under the null hypotheses of exogenous instruments. ARB (1) and ARB (2) are (Arellano & Bond, 1991) tests for first and second order auto correlation in first difference error. For each models of North, Latin American and Caribbean countries stated in the **Table 4.5**, the ARB (2) tests show that no indication of auto correlation at conventional level of significance.

Table 4.5: Impact of Financial Development on Energy Consumption in North/Latin American and Caribbean Countries

	Model 1		**Model 2**		**Model 3**	
Variable	**Co-efficient**	**Prob.**	**Co-efficient**	**Prob.**	**Co-efficient**	**Prob.**
lEC(-1)	1.0041***	0.0000	1.0122***	0.0000	1.0075***	0.0000
lGDP	0.6758***	0.0000	0.7951***	0.0000	0.8894***	0.0000
lURBN	0.0651	0.5886	0.2067	0.2275	-1.3257***	0.0000
lFDI	0.0365***	0.0055	0.0365**	0.0433	-0.0233	0.3288
Constant	0.9095**	0.0418	-0.3889	0.5903	5.3745***	0.0000
lFDB	-0.0092	0.6779				
lFDPS			-0.0972***	0.001		
lFDFS					-0.0967***	0.0001
Observation	720		720		720	
Adjusted R^2	0.9863		0.9884		0.763	
Hansen J-Statistic prob.	0.0988		0.4528		0.1297	
Difference in J-statistic	0.5553		0.505		0.9377	
ARB (1)	0.0077		0.0393		0.0215	
ARB (2)	0.4027		0.3704		0.1155	
Countries	N=24		N=24		N=24	

***, **, * indicate the level of significance. *** indicate the level of significance at 1%, ** indicate the level of significance at 5% and * indicate the level of significance at 10%. The regression coefficients are estimated using the (Arellano & Bover, 1995) and (Blundell & Bond, 1998) system GMM estimation approach. LEC(-1) stand for lagged term of energy consumption. In all three models instrumental variables are 1st and 2nd lags of lgdp, lfdi, lurbn, lfdb, lfdps, and lfdfs respectively. The Hansen (1982) J-test for over-identification restrictions. The ARB (1) and ARB (2) are (Arellano & Bond, 1991) tests for auto-correlation in differences.

Chapter 5

Conclusions and Policy Implication

The study captures the impact of financial development on the energy consumption incorporating the role of GDP, FDI and urbanization by using the Sys-GMM estimation technique and the balance panel data of (N=136) countries over the period of the year 1990 to 2019. Furthermore, analyse financial development and its indicators when sample dividing into four groups Asian, European, African, North/Latin American and Caribbean countries. There are various financial development indicators used in this study. The main findings from the empirical analysis are as follows: In the financial development indicator has significant and negative impact on energy consumption its mean that financial development cannot increase energy consumption from worldwide perspective. GDP also positive influences on energy consumption its mean that economic growth promotes energy consumption. Also FDI has significant influence with energy consumption and URBN significant and positive influence on energy consumption. In Asian countries result indicate that financial development indicators increase energy consumption by using financial FDB and FDPS. In European countries shows mixed results about the indicators of financial development on energy consumption. The FDB reduce energy consumption and FDPS has no impact on energy consumption also the FDFS increase energy consumption. In all these finding related European countries show that changing the measure of financial development strongly impact

with the energy consumption. In African countries FDB and FDPS has statistically insignificant but FDFS has negative influence on the energy consumption. Finally, in Latin North American and Caribbean countries result indicate that FDPS and FDFS significant and negative effect on energy consumption but FDB has no effect with the energy consumption.

Some following policy implication of this study based on empirical analysis. The development of the financial sector is broadly thought to be beneficial for several parts of the economy; be that as it may, financial-development probably won't control the expansion in energy utilization from the overall viewpoint. Therefore, policymakers should discreetly analyse the effect of financial-development with the energy-consumption based on the specific conditions and carefully scrutinize their connection in individual countries while formulating energy policies.

In the Asian countries the finding also asks for the consideration of policymaker to build up a strategy to decline the results of energy utilization by boosting the financial sector to give more loan to highly technical advancement enterprises to prove energy proficiency, by accepting energy-conservation policies and also controlling different resources, which is conducive to realizing sustainable development.

5.1 Limitations of the Study

Thus, this study's first restriction is related to the limited period 1990-2019 because of the difficulty of finding accessible data for a more extended period in most countries. Also, this study extended the sample period in the earlier decades including 1960 to 2019 and 1970 to 2019; but the lack of availability of the country panel data was unable to support the empirical-analysis.

Secondly, this study analyses from worldwide perspective with macro level perception and many micro factors are certainly ignored due to different reason. For example, many political or economic events took place during the sample period which might have affected the relationship between energy consumption and financial development, which were not taken into consideration. So that this study

concentrates our research objective on worldwide perspective and it is genuinely tough to explain too many problems in a single study.

For instance, numerous economic or political occasions occurred during the sample period which may have influenced the finance-energy nexus, which were not thought about. So the goal that this study focuses our research objective for worldwide countries point of view and it is genuinely tough to explain too many problems in a single study.

Finally, this study is limited to panel data analysis. It fails to provide country-level findings of the connection between EC, FD and GDP. Accordingly; these limitations can provide some directions for future studies using an alternative methodology and econometric techniques.

5.2 Future Direction

Since about the above limitations, we advise focusing connection among the financial development and energy consumption from the nonlinear view in the future research. The conflicting results of various literature related this domain may be brought about by at least one element which could essentially influence the financial development on energy utilization. Likewise, it is additionally important to give close consideration to the micro events that happened in recently decades connecting to energy consumption (in particular, the issue of structural-break) as this could give us a more explicit view on the connection between finance-energy nexus.

This study is limited to panel data analysis. Thus, its extension through country-level analyses based on time series data will give complementary findings of the connection among these variables.

Finally, future studies may use econometric techniques, including cross-sectional dependence and co-integration analysis. Also further sample dividing into regional vice like in Asian countries (South Asian, West and North Asian) that give more consistence finding.

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Appendix-A

Table 5.1: Table Hausman Test

		Overall N=136 Countries		
	Test summary	**Chi-Sq. Statistic**	**d.f**	**Prob.**
FDB	Cross-sectional Random	36.82793	4	0.0000
FDPS	Cross-sectional Random	31.302706	4	0.0000
FDFS	Cross-sectional Random	1.881375	4	0.7576
		Asian Countries		
	Test summary	**Chi-Sq. Statistic**	**d.f**	**Prob.**
FDB	Cross-sectional Random	13.2995	4	0.0099
FDPS	Cross-sectional Random	15.810692	4	0.0033
FDFS	Cross-sectional Random	1.874473	4	0.7588
		European Countries		
	Test summary	**Chi-Sq. Statistic**	**d.f**	**Prob.**
FDB	Cross-sectional Random	23.139212	4	0.0001
FDPS	Cross-sectional Random	65.854005	4	0.0000
FDFS	Cross-sectional Random	1.076842	4	0.8979
		African Countries		
	Test summary	**Chi-Sq. Statistic**	**d.f**	**Prob.**
FDB	Cross-sectional Random	10.807661	4	0.0288
FDPS	Cross-sectional Random	9.836983	4	0.0433
FDFS	Cross-sectional Random	6.644601	4	0.1559
Latin American & Caribbean, North American Countries				
	Test summary	**Chi-Sq. Statistic**	**d.f**	**Prob.**
FDB	Cross-sectional Random	13.371054	4	0.0096
FDPS	Cross-sectional Random	19.241876	4	0.0007
FDFS	Cross-sectional Random	4.005561	4	0.4053