ELECTRICITY CONSUMPTION AND FOREIGN DIRECT INVESTMENT: EMPIRICAL EVIDENCE FROM INDONESIA

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Abstract

Over the last three decades, most of developing countries pay more attention to foreign direct investments (FDI) activities, at both national and international level. Economists believe that FDI is one of the most important sources of globalization and an important catalyst for economic growth, especially for the developing countries. FDI can be one of the sources of capital to stimulate the economy of the country, as well as a contributor to the national development through the transfer of an asset, generators of employment, high productivity, competitiveness, management, and technology spillovers. However, deficiency in quality and a limited quantity of electricity is one of the issues that remains a perpetual bugbear that hampering Indonesia's economic and social development. The objective of this study is to investigate whether electricity consumption affects the inflow of FDI in Indonesia. The analysis is based on Autoregressive Distributed Lag (ARDL) model using time series annual data from 1980-2016 of FDI, electricity consumption, and other macroeconomic variables such as GDP, exchange rate, openness, labor force, and education expenditure as control variables. Using various econometric techniques like Unit Root Test, Bounds Test, Cointegrating and long-run test and Granger causality test, it was found that there are a long-run relationship and positive correlation between electricity consumption and FDI in Indonesia. However, Granger causality result shows that there is no causality running from FDI to electricity consumption and vice versa.

Keywords: electricity consumption, foreign direct investment, Indonesia

Abstrak

Sepanjang tiga dekad yang lalu, kebanyakan negara sedang membangun lebih menumpu ke atas aktiviti pelaburan langsung asing (FDI), di peringkat kebangsaan dan antarabangsa. Ahli ekonomi percaya bahawa FDI adalah salah satu daripada sumber globalisasi yang paling penting dan pemangkin penting bagi pertumbuhan ekonomi terutamanya di negara sedang membangun. FDI boleh menjadi salah satu sumber modal untuk merangsang ekonomi negara, serta penyumbang kepada pembangunan negara dengan pemindahan aset, penjana pekerjaan, produktiviti tinggi, daya saing, pengurusan, dan tumpuan teknologi. Walau bagaimanapun, kekurangan dalam kualiti dan kuantiti elektrik yang terhad merupakan salah satu isu yang menghalang pembangunan ekonomi dan sosial Indonesia. Objektif kajian ini adalah untuk menyiasat sama ada penggunaan elektrik mempengaruhi aliran masuk FDI di Indonesia. Analisis ini berdasarkan kepada model Lag Terdistribusi Autoregressive (ARDL) dengan menggunakan data tahun siri masa 1980-2016 meliputi FDI, penggunaan elektrik, dan pemboleh ubah makroekonomi seperti KDNK, kadar pertukaran, keterbukaan, tenaga buruh, dan perbelanjaan Pendidikan sebagai pemboleh ubah kawalan. Dengan pelbagai teknik ekonometrik seperti Ujian Unit Root, Ujian Bounds, Cointegrating dan uji jangka panjang dan ujian kausal Granger, didapati bahawa terdapat hubungan jangka panjang dan korelasi positif antara penggunaan elektrik dan FDI di Indonesia. Walau bagaimanapun, hasil kausal Granger menunjukkan bahawa tidak ada hubungan kausaliti dari FDI ke penggunaan elektrik dan sebaliknya.

Kata kunci: penggunaan elektrik, pelaburan langsung asing, Indonesia.

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List of Abbreviations

ADF	Augmented Dickey-Fuller
ARDL	Autoregressive Distributed lag
CUSUM	Cumulative Sum of Recursive Residuals
ECM	Error Correction Model
ECT	Error Correction Term
EDU	Education Expenditure
ELC	Electric Power Consumption
EXC	Exchange Rate
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GMM	Generalized Method of Moment
LFP	Labor Force Participation
MNEs	Multinational Enterprises
OLS	Ordinary Least Squares
OPN	Openness
TNCs	Transnational Corporations
UNCTAD	United Nations Conference on Trade and Development
VEC	Vector Error Correction
VECM	Vector Error Correction Model
WEF	World Economic Forum

CHAPTER ONE

INTRODUCTION

1.1 Background of Study

Amid the 60s, Foreign Direct Investment (FDI) was essentially not an extremely alluring but rather respected with incredible doubt by most developing nations including Indonesia. FDI was viewed as a risk to national sovereignty and was associated with decreasing social welfare by manipulating transfer costs and the formation of enclaves. The coming to the energy of President Soeharto in 1965 saw a sharp change in monetary strategy settings, with the presentation of multi-year financial plans to manage improvement.

On March 11, 1966, Soeharto's New Order government profoundly changed the FDI atmosphere while reestablishing Indonesia's association with the industrialist world economy. In response to the pressure of the early 1980s, Indonesia is compelled to change their monetary arrangement to wind up noticeably more market-situated, and FDI had all the earmarks of being one of the most straightforward approaches to get an external source of financing without expanding the outside obligation of the nation.

The roles and benefits of FDI in developing economies have been long debated. FDI is no longer considered only as an augmenting the capital inflows, however as a noteworthy channel for innovation and administration practice transfer, and aptitudes improvement and advancement, and additionally to access global promoting systems (Hymer, 1976; Rugman, 1980; Dunning, 1980; Mallampally & Sauvant, 1999; Nunnenkamp, 2002). In this manner, the worldwide economy has been totally changed

as of late and has been currently endeavoring to draw in foreign investment. According to Bouoiyour (2003), a country can draw in a foreign investment offering income tax holidays, import duty exemptions and subsidies to outside firm, and in addition measures like market preferences, foundations and once in a while even monopoly rights.

In Indonesia, the FDI inflow pattern is increasing from 1980 to 2016. However, when we compare it with other neighboring countries like Singapore, Malaysia, and Thailand, we can see that Singapore recorded the highest position since the 1980s, showing its most favorable destination in the inflows amongst the four nations, while Indonesia is the least (refer Figure 1.1).

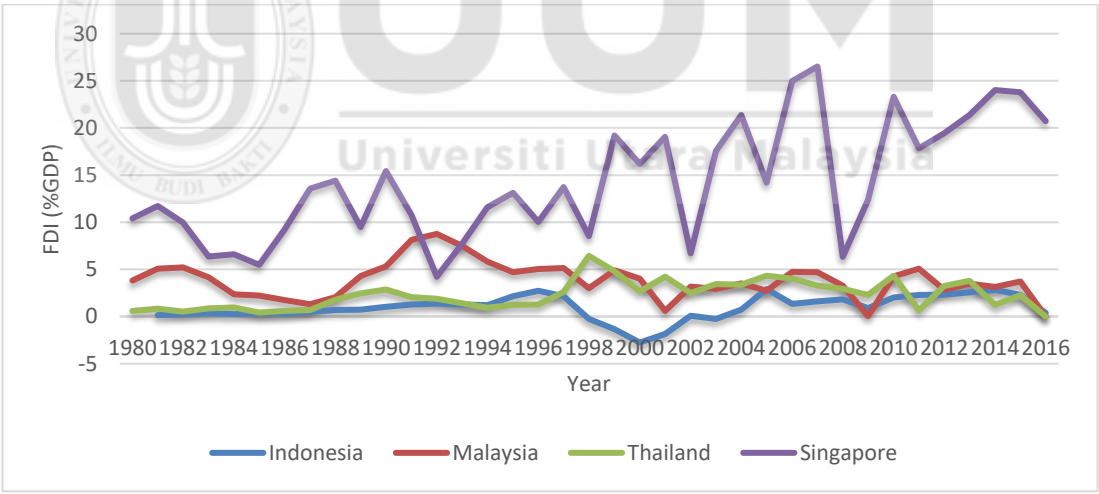

Figure 1.1
The FDI inflow in Malaysia, Indonesia, Thailand and Singapore from 1980-2016
Source: World Development Indicator

As indicated by UNCTAD (2000, pp. 19-20), there are generally three categories of factors that may determine FDI inflow to a host nation, in particular, economic variables, government policies, and transnational corporations (TNCs) strategies. Under economic factor, there are three keys that investor seeks before investing, which

are competitiveness indicators, resource endowment, and market opportunities (Ishak & Rahmah, 2002). Under government policies, there are four factors which are macro policy, private, trade and industry, and FDI policies. While under TNC strategies there are two factors which are risk perception and location integration. The reason for high FDI inflow in Singapore is it's their highly competitive environment as shown in OECD International Direct Investment Statistic Yearbook (Ismail & Yussoff, 2002). Undertakings in both advanced and emerging economies are looked with the logically more competitive environment in a quick moving innovative world. To cope and succeed they have to rebuild their amenities, activities, and talents to the evolving innovation. In the case of FDI, the competitive environment is a basic essential to guarantee a generous inflow of outside money to the host country.

In spite of the fact that there are different elements that influence FDI inflows, this study will concentrate on the competitiveness indicator which is related to physical infrastructure; in this context, it is electricity consumption. Foreign investors are more likely to pick nations where there is sufficient accessibility of infrastructure especially electricity since electricity is the main concern amongst all the other infrastructure problems in Indonesia. According to the previous study, infrastructure assumes a critical part in stimulating FDI (Wheeler & Mody, 1992; Loree & Guisinger, 1995; Richaud et al., 1999; Morisset, 2000; Asiedu, 2002; Sekkat et al., 2004). The quality of infrastructure available is one of efficiency consideration for multinational enterprises (MNEs) while deciding to relocate export-platform. As it were, quality of physical infrastructure might be an important consideration for MNEs in their locational choice for FDI in general and for efficiency-seeking in production.

As it is by and large known, electricity improves the profitability of capital, labor, and various other factors of production. When there is a shortage of electricity in the host country, the country should find other alternatives to generate electric power which is costly. Greater in the cost of power generation has two potential ramifications for FDI. To begin with, it diminishes the nation's income, and second, it expands production costs in respect to those of its outside partners. Consequently, Indonesia's business will be more inefficient. As costs rise, business productivity falls, foreign investors move away to another country, loss of taxes from foreign investor causes GDP to drop, increase in unemployment, and ultimately reduce personal income.

It ought to likewise be noticed that there is a two-path connection amongst FDI and accessibility of electricity. From one perspective, FDI can enhance the attractiveness of the host nation, be that as it may, on the other, the attractiveness of the host nation economy is likewise critical to pulling in a substantial amount of FDI in any case. Theoretically, the flow of FDI is inducing electricity consumption through transportation, manufacturing sectors development and the expansionary of industrialization while power is required to help the manufacturing process.

Table 1.1

Rate of Distributed Electricity per Population

Country	Electrification rate	Unelectrified population (million approx.)
Indonesia	74.4%	62.4
Malaysia	99.4%	0.2
Thailand	99.3%	0.5
Singapore	100%	0.0

Source: ASEAN-RESP, 2012; PLN's RUPTL 2012-2021

Table 1.1 shows that Singapore has a better infrastructure in terms of its electricity and it has become one of the important factors in pulling in the expansive volume of outside money to the nation.

Figure 1.2 indicates electric power utilization (kWh per capita) of four countries, and Indonesia is the lowest amongst four. With the highest amount of population but lowest rate of electricity consumption, we understand that there is power outages issue in Indonesia. The lack of a solid, cost-effective source of power threatens to hamper industrial growth and the buildup of a manufacturing sector on the same scale as its neighboring nations. As indicated by the Investment Coordinating Board (BKPM) report, power deficiencies remain a noteworthy deterrent for foreign investors doing business in Indonesia (The Jakarta Post, June 16, 2015).

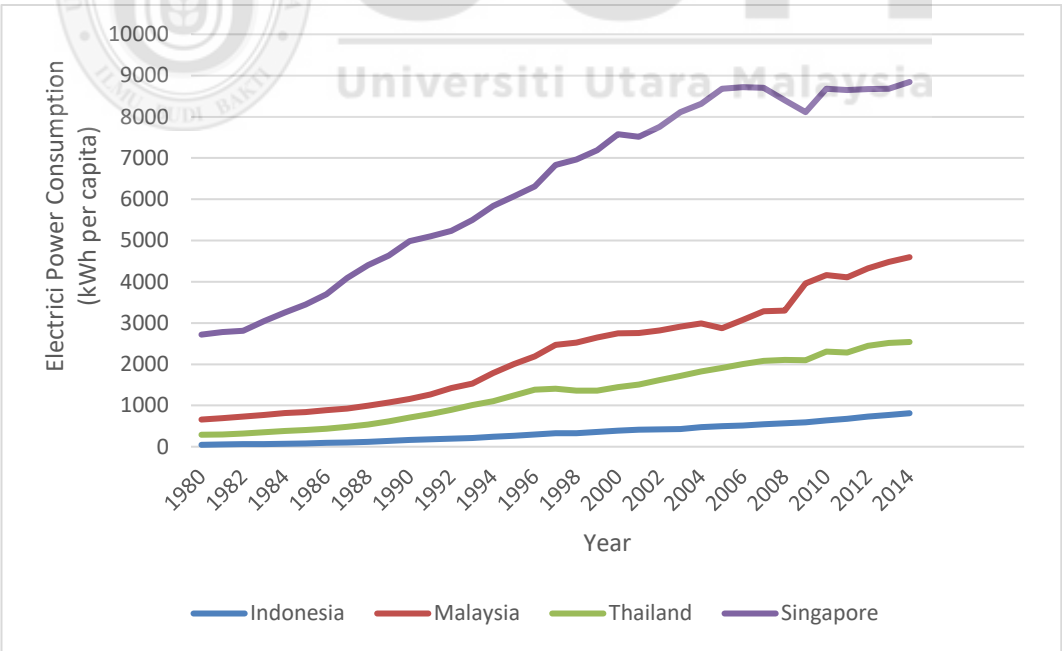

Figure 1.2
The Electric Power Consumption in Malaysia, Indonesia, Thailand & Singapore (1980-2014)
Source: World Development Indicator

Hence, the study is taken to identify whether there are relationship and existence of causality amongst electricity consumption and FDI inflow in Indonesia.

1.2 Problem Statement

The inflow of FDI in an economy develops the major sectors of the country, thereby prompting enhanced production, manufacturing and transportation activities over the last decades. Both Northeast and Southeast Asia have been part of this development with increased inflows of FDI and greater foreign participation in their economies. Like other developing countries, Indonesia also faced an ever-increasing FDI inflow from 1% in 1981 to 4% in 2000, which is, however, still low compared to another neighboring country within the region, with lower inflows of FDI than could be expected from its size and other country characteristics. The insufficient public funds and the poor business environment with inefficient institutions seems to be an important explanation behind the low inflows of FDI.

With the number of inhabitants in excess of 250 million, more than half of whom live in urban territories, Indonesia has a substantial local market, and, a developing and wealthy white-collar class bolsters GDP development, where around 60% of GDP is derived from private consumption (Badan Pusat Statistik, Average 2010-13). However, deficiency in quality and a limited quantity of infrastructure is one of the issues that remains a perpetual bugbear that hampering Indonesia's economic and social development. As per the World Economic Forum (WEF's) Global Competitiveness Report 2015-2016, Indonesia positions the 62nd out of 140 economies in terms of infrastructure development, significantly lagging behind its regional peers like Singapore, Malaysia, Thailand, and, embarrassingly, even Laos.

These infrastructures include all aspects such as transportation, electricity, clean water, social security, and healthcare, but this study is going to focus on electricity only.

In the midyear of 2015, East Asia Forum reported that more than 50% of households are not having better basic needs and only 81% of households have access to electricity. Tragically, this circumstance is not extraordinary. The nation's interesting topography, an archipelago of more than 17,000 islands, poses enormous infrastructure challenges to achieving nationwide electrification, and fast urbanization has progressively overwhelmed the grid. More than 30 million Indonesians confront the absence of electricity, while millions more experience frequent blackouts, unpredictable power outages and unstable connections (World Resources Institutes, 9 March 2017).

Electricity is extremely important a crucial contribution of energy for the greater part of the nation's economic activities, especially for nations which concentrate on industrialization improvement, for example, Indonesia. In addition, electricity also has been a major source of the betterment of the standard of living and has played a crucial role in the technological and scientific advancement (Rosenberg, 1998). The situation can be more serious if the quality of the existing infrastructure is poor. Therefore, priority should be given to infrastructure investment both for future growth needs and the potential of a good infrastructure for job creation and an increase of export activity. To proactively cope with increasing electricity demand accompanying economic growth, it is inevitable that Indonesia attempt to reveal the causal connection running from FDI inflow to electricity consumption and vice versa, in order to create a suitable electricity policy.

1.3 Research Questions

From a hypothetical stance, the direction of the casual relationship electricity consumption and FDI is not clear. As countries develop, they will start relying more on manufacturing sectors subsequently need to expand greater power control. Then again, expanded utilization of power may lead to more efficient production, thus pull in more foreign investors. Even with the power emergency in Indonesia, an examination of the idea of the connection between power utilization and FDI in this nation might bear some significance with both policymakers and professionals. From this statement, research question can be formed as follows:

i. Is there any connection between electricity consumption and FDI inflow in the long run and short run?

ii. Is there any presence of a causal association between electricity consumption and FDI inflow in Indonesia?

1.4 Research Objective

The overall objective of this study is to test the impact of the electric power consumption on FDI inflow in Indonesia including other determinants. Specific objectives of this study are:

i. To investigate the long-run and short-run connection between the electric power consumption and FDI inflows in Indonesia.

ii. To test the existence and direction of the causal association between electricity consumption and FDI inflow in Indonesia.

1.5 Scope and Limitation of the Study

This study analyzes the connection between electricity consumption and FDI inflow in Indonesia for the period 1980-2016. Albeit economic hypotheses do not explicitly state a relationship between electricity consumption and FDI inflow, observational examination of it has been one of the most attractive areas of energy economics literature for the recent year. Apart from electricity, there are many aspects of infrastructure that we can include in our study, for instance, transportation facilities like road network, ports, airports, etc. However, an objectively measured and constructed comprehensive indicator of infrastructure accessibility is not accessible for all components. Thus, electric power consumption is chosen to check on the quality of physical infrastructure in attracting FDI into Indonesia.

On top of that, the data collected are mostly from secondary sources, thus, lack of data is one of the limitations faced while writing this research. The distance of research's location is one of the reasons constraining the data collecting process.

1.6 Overview of the Study

The remainder of this study is divided into four chapters. In Chapter 2, reviews on FDI theory, other alternatives to international business arrangement, and empirical studies between FDI and electric power consumption and other determinants from various journals and articles are made. Moreover, this study will also discuss the types of approach that had been used in previous research based on this analysis. Overview of the methodology adopted is discussed in Chapter 3. This chapter will explain the variables to be used for the empirical analysis as well as the sources of the data and estimation techniques. Meanwhile, Chapter 4 presents and analyses the empirical

relationship between FDI and electricity consumption, as well as other macroeconomic variables, for the estimation of the long and short-run and cause-impact relationship in Indonesia. As such, the results are presented on the technique-by-technique basis, in the course of testing the statistical hypothesis about the relationship amongst the variables. The fifth chapter will end this study with a summary of research findings, conclusions, as well as policy implications. It equally stresses the areas of coverage and limitations of the study, which is expected to ease further research in this and similar areas in international economics.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews on FDI theory, other alternatives to international business arrangement, and empirical studies between FDI and electric power consumption and other determinants. As such, the chapter is classified based on theoretical and empirical literature.

2.2 The Determinants of FDI: Theory Overview

In recent times, there have been so many theories that have tried to explain the determinants of FDI. These theories form the primary path towards the improvement of organizing the structure for the development of FDI. Extensive variety of theories on FDI or MNCs have been created by bulging researchers, for example, the theory of the Product Cycle by Vernon, Industrialization theory by Hymer, Dynamic Comparative Advantage by Kojima, Eclectic Paradigm theory by Dunning, Internationalization theory by Rugman, and Knowledge and Capital theory by Markusen.

Based on all the theory, a model with different theories had been employed to recognize the elements of FDI, and to some degree connected to traditional international trade theory, for example, Heckscher-Ohlin model and Ricardian model. Both models impose monopoly framework and clarify on market failure and proprietorship gain that results in speculators' market control.

Nevertheless, eclectic paradigm or OLI structure was introduced by Dunning (1973; 1980) was the main theoretical model which gives more attention to the factors that induce FDI or MNCs. As indicated by the OLI structure, the elements of FDI are a mixture of three segments: ownership, location and internalization advantages (Dunning, 1980). There are three motives were associated with the inward movement of FDI; the search of market, resource and work efficiency (Dunning, 1993).

In addition, a few researchers such as Buckley and Casson (1976), Hymer (1976) and Krugman (1980) argued proprietorship benefit as one of the important factors of FDI. The investigation by Krugman (1983) and Helpman (1984) proposed FDI models, that are being referred to as horizontal and vertical FDI models. Meanwhile, Markusen (1997) at that point combined horizontal and vertical model thus proposed information capital model which at the later stage changed into what is known as FDI Imperative model.

Grossman and Helpman (1991) later presented the elements of FDI based on risk diversification. As indicated by this model, a market risk which includes interest rate, exchange rate, and inflation risk tend to discourage foreign investors from investing. High loan fee vulnerability may influence return on investment and diminish the inward FDI. Also, a diligent increase in the exchange rate may expand the cost of an investor in investment and reduce the inflow of foreign investments. Uncertainty in price, described by high inflation rates, additionally increases the production cost, therefore obstructing FDI stream.

Although many theoretical papers have tried to explain the FDI issue, there is still no agreement on any superior or general theory of FDI to explain the existence of MNCs, international production, and FDI.

2.3 Alternatives to International Business Arrangements

There are a variety of ways in which an organization can enter a foreign market. Not all market entry strategy works for all international markets. Direct exporting might be the most suitable technique in one market while in another may need to set up a joint venture and in another may well license in manufacturing. There will be a number of factors that will influence the choice of strategy, including, however not limited to, tariff rates, the degree of adaptation of product required, marketing and transportation costs. While these factors may well increase the costs, it is expected the increase in sales will offset these costs. The following strategies are the other alternatives to international business arrangements:

2.3.1 Direct Exporting

Direct exporting is selling directly into the chosen market using the first instance resources. Many companies, once they have established a sales program turn to agents and/or distributors to represent further in that market. Agents and distributors work closely with the exporter in representing interests. They become the face of the company and thus it is important that choice of agents and distributors is handled in much the same way would hire a key staff person.

2.3.1 Licensing

Licensing is a relatively sophisticated arrangement where a firm transfers the rights to the use of a product or service to another firm. It is a particularly useful strategy if the purchaser of the license has a relatively large market share in the market you want to enter. Licenses can be for marketing or production.

2.3.1 Franchising

Franchising is a typical North American process for rapid market expansion, but it is gaining traction in other parts of the world. Franchising works well for firms that have a repeatable business model (e.g. food outlets) that can be easily transferred into other markets. Two caveats are required when considering using the franchise model. The first is that the business model should either be very unique or have the strong brand recognition that can be utilized internationally and secondly it must be creating future competition in the franchise.

2.3.1 Partnering

Partnering is almost a necessity when entering foreign markets and in some parts of the world (e.g. Asia) it may be required. Partnering can take a variety of forms from a simple co-marketing arrangement to a sophisticated strategic alliance for manufacturing. Partnering is a particularly useful strategy in those markets where the culture, both business and social, is substantively different than your own as local partners bring local market knowledge, contacts and if chosen wisely customers.

2.3.1 Joint Ventures

Joint ventures are a particular form of partnership that involves the creation of a third independently managed company. It is the 1+1=3 process. Two companies agree to work together in a particular market, either geographic or product and create a third company to undertake this. Risks and profits are normally shared equally. The best example of a joint venture is Sony/Ericsson Cell Phone.

2.4 Review of Empirical Literature

This section will review the empirical studies that examined the connection between FDI and electricity consumption, and another controlling variable such as GDP, exchange rate, openness, labor force participation and education expenditure.

2.4.1 Electricity Consumption and FDI

The connection between energy consumption and FDI has been assessed in the writing by several empirical studies. Elliot et al. (2013) found a noteworthy and negative association between FDI inflow and energy consumption. In this study, the authors examined the connection between the energy intensity of Chinese urban communities and the area of outside firms utilizing a unique dataset of 206 of the largest prefecture-level cities in the vicinity of 2005 and 2008.

Moreover, Lee (2013) reviewed the commitments of the influx of FDI to energy use, economic growth and demand for clean energy utilizing the information of G-20 nations from 1971 to 2009, and found no persuading verification of FDI interface with clean energy use. Nonetheless, the exact outcomes demonstrate that FDI has assumed

a vital part of financial development while diminishing energy power by the mean of energy efficient equipment.

Meanwhile, Omri and Kahouli (2014) examined at the interrelationships amongst economic growth, FDI, and energy consumption utilizing dynamic panel data models in concurrent conditions for a worldwide panel comprising 65 nations and found that there is a one-way causality running from energy consumption to FDI inflows for the low-pay nations and one-way causality running from FDI to energy consumption for the global panel.

In Pakistan, the investigation by Zaman et al. (2012) re-explored power utilization using the multivariate technique to examine economic growth rate, population growth and FDI for a period of (36) years which ranges from the year 1975 to 2010. Using bounds testing methodology for cointegration that examines both the long and short-run estimates. The author uses Dynamic short-run causality test to determine the causality direction between electricity and its determinants using Wald-F statistics as a parameter. The result presents electricity usage in Pakistan as a cointegrated function of FDI influx, wage, and population growth

Also, a similar study by Tang (2009) in Malaysia context investigated the relationship between FDI, monetary development, and power utilization. The study used the bound testing system for integration to examine the potential of long-run coefficients. While the Granger causality test is used to investigate the causal link among electricity consumption and its determinants. The result of this investigation found that power usage FDI, salary and population growth are cointegrated. Furthermore, the result

observed that FDI inflow, as well as population growth, have a positive relationship with power usage in Malaysia. This is affirmed by Granger causality which argued that power usage FDI and salary are two-way causalities.

Later on, Bekhet and Othman (2011) investigated the causal association between power utilization, monetary development, expansion and FDI in Malaysia for the period 1971-2009. The vector error correction model (VECM) was utilized to evaluate the causal association between power utilization with separate autonomous factors. All factors were observed to be co-integrated demonstrating the presence of long-run relationship amongst them. Moreover, the outcome for long-run causality from power utilization to FDI, GDP development, and inflation was observed to be significant.

Leit (2015) investigated the connection between energy consumption and FDI for the period 1990-2011 by utilizing panel data. The experimental outcomes prove that the association amongst energy consumption and FDI validate the environmental Kuznets curve assumptions. A positive effect amongst FDI and the vitality utilization is presumed that the vitality utilization is important to pull in FDI in Portugal.

Mielnik and Goldemberg (2002) analyzed the relationship between FDI and energy consumption treating economic growth as a control variable in energy demand function. The sample use time span beginning from 1987 till 1998. The experimental outcomes demonstrated a rise in FDI is due to the lessening of energy intensity. They justified their results by the idea that foreign investors bring with them their own advanced technology while investing in emerging economies to boost the benefits. As result, the residential yield rises with less energy consumption.

On the other hand, Antweiler et al. (2001) made a contradictory remark arguing that FDI influences the local production of the host country, nevertheless, no influence was found on the quantity of energy consumed. With less outrageous outcomes and more rational, Cole (2006) reaffirmed the effect of FDI on energy usage differs over the nations as economic structure, economic environment, energy prices and the stage of development, vary from one country to another. Further studies by Hubler (2009) assessed the effect of FDI and exchange of energy-saving machinery on energy consumption inside the general equilibrium framework. The author argued that FDI could be assumed to be a motivating force to execute energy-efficient technology that reduces energy consumption.

Therefore, these findings imply that the association amongst power usage and FDI are inconclusive and differ across different countries, therefore, policies recommended for one country cannot be used for other countries.

2.4.2 Other Determinants of FDI

The role of development in drawing in FDI has additionally been the subject of discussion. Bigger host nations' business sectors may be connected with higher FDI because of the bigger potential request and lower costs because of scale economies. Artige and Nicolini (2010) expressed that size of the market is measured by GDP per capita or GDP is by all accounts the utmost vital FDI determinant in economic literature. Jordaan (2004) concluded that countries which experience growth in the market and have stable power supply will experience more FDI inflow. This according to the author will boost the firm’s profitability and operations done by them will be conducted efficiently. For example, an investigation into the concentration of FDI in

central and Eastern Europe reveals that high population tends to entice the inflow of FDI (Resmini, 2000). In a similar study by Bevan and Eastrin (2004) presenting a comparative outcome where progress economies with bigger economies also have a tendency to pull in more FDI.

From the studies of Froot and Stein (1991), defunct in the capital market, devaluation of the liquid asset (currency) encourages FDI. Likewise, the contribution found in the work of Klein and Rosengren (1994) proved the evidence of the wealth effect on FDI. The work of Cushman (1985, 1988) proposed a theoretical model from the view of host country's input using production process. The result concluded that FDI inflow increased with a decrease in the host country exchange rate. Nevertheless, some of the available numerous studies gave recognition to the perception that a real appreciation in a host country's currency attracts FDI. For example, Waldkirch (2003) argued the inflow of FDI in Mexico for the period 1980 – 1998 is because of appreciation in Mexican pesos. An earlier study by Campa (1993) suggested that an increase in capital flow influenced the efficient performance of firms in the host country and under such a condition that it would be reasonable to assume that a host country's currency would appreciate.

Besides that, various empirical studies suggest that trade (imports and export) supplements rather than substitutes for FDI. MNEs tend to place resources into the trade partner markets with which they are commonplace. Oladipo (2013), analyzed the macroeconomic determinants of FDI inflow in Nigeria for the time of 1985 to 2010 by utilizing Generalized Method of Moment (GMM) estimation and found that trade openness has a positive association FDI in Nigeria. Essentially, Buckley et al. (2002)

observed that countries with open trade regime would benefit from increased FDI to their economies. In contrast, Jordaan (2004) stated that when there is the existence of trade restriction, import activities are lesser than export, this lead foreign investor to establish their plant and replace export from their home country to the host country. The existence of trade barriers might be associated with more horizontal FDI, as investment firms may confront difficulties in importing their products to the country, thus, foreign firms may profit by dodging trade boundaries through building production destinations abroad. In other words, even though there is a trade barrier, FDI inflow still can have a positive sign if the investments are market-seeking.

Apart from that, labor force participation is one of the critical contributions to the economic development and may ease a nation's dependence on foreign labor. An expansion in its supply will enhance the production capability of firms. Ismail and Yussof (2002) demonstrated two diverse outcomes on their study where the size of the labor force has a significantly positive impact on FDI inflow in Thailand, however, it does not significantly determine FDI inflows to Malaysia.

Porter (1990) specified in his investigation that making a labor market competitive environment is ending up progressively essential in pulling in FDI. The way to enhancing labor market competitiveness lies in raising human asset capacities, that is to make appropriate investments in human capital through advanced education. Education is essential to the development and furthermore viewed as just instrument through which the society can be changed (Heckman & Klenow, 1997; Michaelowa, 2000). The more aggressive an economy and its labor market are, the more probable that a nation will gain from participation in the competition in the worldwide market

(Mortimore et al., 1997). Dauda (2009) found the presence of a long-run connection between investment in education and economic growth in Nigeria by utilizing yearly time series data from 1977 to 2007 and employed Johansen co-integration technique and error correction methodology. Correspondingly, Adefabi (2005) additionally revealed that there is a long-run relationship between education and economic growth. A knowledgeable labor force appeared to have a huge impact on economic growth both a factor in the production function and through the total factor of production.

2.5 Conclusion

The overall findings show there is a positive connection between electricity consumption and FDI. For example (Tang, 2009; Mielnik & Goldemberg, 2000; Sadorsky, 2010) has demonstrated that there is a positive connection between FDI and electricity consumption.

Nevertheless, the fact that there exists a strong association between power utilization and FDI does not by any means gather a 'causal' relationship. The relationship might just keep running from electricity consumption to FDI, as well as from FDI to electricity consumption. These causality issues, in this way, recommend the need to complete further examinations. A foremost inquiry concerning this issue is which variable should overshadow the other – is power utilization a boost for FDI or does FDI prompt power utilization?

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter discusses the theoretical framework and the methodology adopted in this research. It equally describes the variables to be used for the empirical analysis as well as the sources of the data and estimation techniques.

3.2 Theoretical Framework and Model Specification

As evident from numerous research works, there is no such theory that can unify the factors that influence FDI, neither is there a solidarity factor which does. Attempts by every model identify a similar phenomenon. Following the study of Lipsey (2004), this study builds on the macroeconomic approach that has been identified by Kiyoshi Kojima (1982). Lipsey (2004) depicts the macroeconomic view as viewing FDI as a particular type of the stream of capital from home nations to host nations. Kojima (1982) called it 'the principle of DFI (direct foreign investment) originating in the marginal industry'.

There are three theories of macroeconomics FDI theory; capital market theory, location theory, and institutional theory. The capital market theory is also known as the 'local currency theory', is considered one of the earliest theories which explained FDI. FDI, in general, arose because of capital market imperfections (Aliber, 1970; 1971). According to Nayak & Choudhury (2014), differences between the source and host country currencies was the result of FDI specifically. When there is depreciation in host country currency, the price of raw materials will be cheaper, and this

encouraged FDI to take advantage on market capitalization rate, compared to the country that has grounded country currencies (Aliber, 1970; 1971).

While location-based theory clarified the achievement of FDI amongst nations in light of the national abundance of a nation, for example, its natural assets enrichment, accessibility of labor, size of the domestic market, well-conditioned facilities and trade regime policy (Popovici & Calin, 2014). Significance variables such as country's growth level, market size, location, spoken language and additional institutional aspects such as investor security and trade barriers were regarded as important elements of FDI flows.

Institutional FDI theory focuses on a nation's capacity to pull in, assimilate and retain FDI (Wilhems & Witter, 1998). The role of adjusting or fitting the inward and outward FDI is based on the desire of its nation. The theory itself endeavors to clarify the uneven circulation of FDI movements amongst nations. There are four fundamental pillars lay on this theory of which the most important is government followed by cultural, education and market. Inquisitively, this theory has been experimentally tested in most African case. As referred in Makoni (2015), Muthoga (2003) found a few variables that can upgrade a nation's appeal towards outside investors which are economic growth rate, the rate of return on investment, credit availability, the absence of trade barriers, and level of domestic investment.

The previous study has examined the association of FDI flows with a few macroeconomic determinants such as the size of the market, potential growth of the host market, economic stability, the level of openness of the host economy, and income

level, as well as the quality of institutions and level of development. As mentioned earlier, this study intends to investigate the association amongst variable of interest electricity consumption and FDI inflow in Indonesia, take into account other five controlling variables. Following the theoretical and empirical framework by Lipsey (2004), Walsh and Yu (2010), the model can be specified as follows:

$$FDI_t = \alpha + \gamma_1 lnELC_t + \delta_2 lnGDP_t + \theta_3 lnEXC_t + \rho_4 lnOPN_t + \tau_5 lnLFP_t + \pi_6 lnEDU_t + \varepsilon_t \quad [3.1]$$

where FDI denotes net inflow of foreign direct investment as a percentage of GDP in Indonesia; ELC denotes electricity consumption per capita measured in kWh; GDP denotes the market size of Indonesia; EXC denotes exchange rate measured by annual average of the exchange rate; OPN denotes how flexible the market is, measured by summation of export and import over GDP; LFP denotes labor force participation in manufacturing sector; and EDU denotes education expenditure refers to the current operating expenditures in education, including wages and salaries. All independent variables are in natural logarithms.

3.3 Justification of Variables

The definitions and measurement of these variables are based on the World Bank's World Development Indicators and International Financial Statistic Yearbook (IFSY). References different from the above sources are cited in the definitions.

3.3.1 Foreign Direct Investment (FDI)

This refers to the net investment inflows to procure an enduring administration premium in an enterprise operating in an economy. It is the aggregate capital value,

reinvestment of income, other long-haul capital, and short-run capital as appeared in a balance of payments. This series demonstrates net inflows in the economic account from a foreign investor and is partitioned by GDP. Dermihan and Masca (2008) and Suleiman et al. (2015) had utilized a similar estimation of FDI in their investigation.

3.3.2 Electric Power Consumption (ELC)

Electric power utilization measures the production of power plants and combined heat and power plants less transmission, distribution, and transformation losses and own use by heat and power plants. It is constructed by indexing electric power consumption (kWh per capita) aligned with a previous study (Ranjan & Agrawal, 2011; Alam, 2013). Based on the previous study, the expected result should portray a positive relationship with FDI (Mielnik & Goldemberg, 2000).

3.3.3 Growth Domestic Product (GDP)

This measured the market size of the country. The estimation is GDP partitioned by midyear populace. Data are in constant 2010 U.S. dollars. This variable has been used in several studies, such as (Charkrabarti, 2001; Artige & Nicolini, 2005; Demirhan & Masca, 2008; Suleiman et al., 2015) and it is expected to have influence on FDI inflows with a positive sign and significant (Schneider & Frey, 1985; Tsai, 1994; Asiedu, 2002; Yasin, 2005; Razafimahefa & Hamori., 2005; Krugell, 2005; Sidiropoulos et al.,2010).

3.3.4 Exchange Rate (EXC)

Exchange rate refers to the official exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market. It is calculated as yearly average based on monthly averages (local currency units relative to the U.S.

dollar). The expected sign of the coefficient, based on past literature such (Asiedu, 2006) can be either positive or negative.

3.3.5 Openness (OPN)

The openness of the economy (trade regime) is captured by the variable named open, which is characterized as the proportion of trade flows (exports plus imports) over GDP (macroeconomic factors that are relied upon to have an impact on the area of FDI). This variable has been used in (Charkrabarti, 2001; Keyou et al., 2009; Wafure et al., 2010). The expected result of openness on FDI depends on the type of investment. It can have a positive effect towards FDI even though there is trade barrier (Jordan, 2004).

3.3.6 Labor Force Participation (LFP)

This refers to labor force participation in the manufacturing sector, including individuals aged 15 and older who supply labor for the production of merchandise and services during a predefined period. It incorporates individuals who are currently employed and people who are unemployed but seeking work as well as first-time job-seekers. The variable has been used in Ismail and Yussof (2002) study, and it is hypothesized that the quantity of the labor force in the host country shall have a positive impact on the FDI inflows.

3.3.7 Education Expenditure (EDU)

Education expenditure refers to the current operating expenditures in education, including wages and salaries and excluding capital investments in buildings and equipment. Based on the previous study, a well-educated labor force appears to have

a significant influence on FDI inflow both as a factor in the production function and through the total factor of productivity (Lucas, 1990; Zhang & Markusen, 1999; Adefabi, 2005). The expected result of education expenditure on FDI inflow is positive.

3.4 Source of Data

The secondary data sources are used in this study. The nature of the data is formed by time-series data; composed of annual data on FDI inflow, electric power consumption (ELC), gross domestic products (GDP), exchange rate (EXC), openness (OPN), labor force participation (LFP), and education expenditure (EDU) in Indonesia, between 1980 and 2016. The data on FDI, ELC, GDP, EXC, OPN, and EDU are obtained from World Bank's World Development Indicators; while data on LFP is obtained from the International Financial Statistic Yearbook (IFSY).

3.5 Method of Estimation

This section highlights the techniques of estimation employed in the research. The study will examine the relationship between FDI and electricity consumption including other controlling variables using Autoregressive Distributed Lag (ARDL) method presented by Pesaran and Smith (1998) and Pesaran et al. (2001). On a comparison, ARDL is favored in this research because of the advantages it has over the traditional test of cointegration, an example of which include Eagle and Granger (1987) two-step residual-based test for cointegration as well as the wide system cointegration test proposed by Johansen (1988) and Johansen and Juselius (1990).

The first pros of the bounds testing approach to cointegration discussed in this study is that can be utilized in any situation irrespective of the variable is *I*(0), *I*(1), or mutual cointegrated or not. Also, this test is the best fit for small samples such as the one being used in this present study in which the hierarchy of interested variable is unknown, or it might never be same. Moreover, the investigation by Banerjee et al. (1993;1998) differentiates the Engle-Granger test of cointegration approach with ADRL. The author concluded that ADRL does not categorize short-run dynamics into the residuals terms. Therefore, the statistical properties of ADRL are best used in examining the availability of cointegration. In addition, pertaining to the Monte Carlo experiment, Pesaran and Shin (1999) concluded that bounds testing method is more efficient in smaller samples.

3.5.1 Unit Root Test

At the preliminary stage, a unit root test is employed to investigate the stationarity of the data sets. This is a necessary test as it reveals the order of integration among the macroeconomic variables. With this, we can be assured that no variables are integrated at *I*(2) to do away from biased results. As posited by Ouattara (2004), the computation for *F*-statistic for cointegration is meaningless if the variable is integrated into *I*(2). In view of this, Pesaran et al. (2001) critical bounds are grounded on the on the idea that such variables should be stationary at *I*(0) or *I*(1).

Conferring to the study of Dickey and Fuller (1979;1981), the stationarity of time series data is observed if its mean and variance are constant over time. This study used Augmented Dickey-Fuller (ADF) unit root test to observe the stationarity. The ADF test is grounded in the following regression:

$$\Delta y_t = \alpha_0 + \gamma Y_{t-i} + \alpha_2 t + \sum_{i=1}^{n} \beta_i \Delta Y_{t-i} + \varepsilon_t \quad [3.2]$$

where t is the linear time trend, α_0 is a constant, under null hypothesis $\gamma = 0$ against the alternative hypothesis of $\gamma < 0$, Δ is the difference operator, and ε_t is the error term.

3.5.2 ARDL Bounds Test

To analyze the presence of a long-run relationship between a set of variables, the bounds testing approach to cointegration is employed by means of an ARDL model. Following Pesaran et al. (2001) suggestion, Eq. (3.3) is estimated with the Ordinary Least Squares (OLS) estimator presented below:

$$\begin{aligned}\Delta FDI_t = \alpha + \sum_{i=1}^{k} \beta_i \Delta FDI_{t-i} + \sum_{i=1}^{k} \gamma_i \Delta lnELC_{t-i} + \sum_{i=1}^{k} \delta_i \Delta lnGDP_{t-i} + \\ \sum_{i=1}^{k} \theta_i \Delta lnEXC_{t-i} + \sum_{i=1}^{k} \rho_i \Delta lnOPN_{t-i} + \sum_{i=1}^{k} \tau_i \Delta lnLFP_{t-i} + \\ \sum_{i=1}^{k} \pi_i \Delta lnEDU_{t-i} + \varphi_1 lnFDI_{t-1} + \varphi_2 lnELC_{t-1} + \varphi_3 lnGDP_{t-1} + \\ \varphi_4 lnEXC_{t-1} + \varphi_5 lnOPN_{t-1} + \varphi_6 lnLFP_{t-1} + \varphi_7 lnEDU_{t-1} + \varepsilon_t \quad [3.3]\end{aligned}$$

where Δ is first differenced series, FDI_t is the dependent variable, *ln*ELC_t, *ln*GDP_t, *ln*EXC_t, *ln*$OPNI_t$, *ln*LFP_t, *ln*EDU_t are independent variables, ε_t is the white noise error term and φ_i φ_2 φ_3 φ_4 φ_5 φ_6 and φ_7 correspond to the long run parameters. The null hypothesis for no long-run relationship between electricity consumption and FDI is not rejected when:

$$H_0: \varphi_1 = \varphi_2 = \varphi_3 = \varphi_4 = \varphi_5 = \varphi_6 = \varphi_7 = 0 \quad [3.4]$$

The determination of lag structure completes the first estimation as presented in Eq. (3.3) in its unconstrained form, then the equation is reestimated in its constrained form by excluding factors such as FDI_{t-1}, $lnELC_{t-1}$, $lnGDP_{t-1}$, $lnEXC_{t-1}$, $lnOPNI_{t-1}$, $lnLFP_{t-1}$, and $lnEDU_{t-1}$. An F-statistic is then computed and compared to the non-standard critical bounds values which are lower and upper bound critical values reported in Pesaran et al (2000). The lower bound of critical values assumes that all explanatory variables are $I(0)$, while the upper bound of critical values assumes that all explanatory variables are $I(1)$.

Given that the sample size of this study is relatively small (T=32), the critical values tabulated in Pesaran et al. (2000) are inappropriate. With regard to this, Narayan (2005) simulated a new set of critical values for small samples. For making a decision, if the computed *F*-statistic falls below critical lower bounds value, then the null hypothesis of no long-run relationship is not rejected, but if the computed *F*-statistic greater than the upper bound critical value, the null hypothesis of no cointegration is rejected. If the computed *F*-statistic falls within the critical lower and upper bounds values, then no conclusion can be drawn about a long-run relationship without knowing the order of integration of the variable of interest.

3.5.3 Autoregressive Distributed Lag

Next step is estimate the long-run coefficients of variables of ARDL (2, 1, 0, 2, 0, 1,0). If there is any long-term cointegrating relationship found between the series, the residuals from the equilibrium regression can be used to estimate the ECM and to analyze the long-run and short-run effects of the variables as well as to see the adjustment coefficient, which is the coefficient of the lagged residual terms of the long-

run relationship identified in cointegration. The ECT value should be negative and significance to indicate the speed of adjustment toward the long-run equilibrium. The ECM used in this study is estimated from the following equation:

$$\Delta FDI_t = \alpha + \sum_{i=1}^{k} \beta_i \, \Delta FDI_{t-i} + \sum_{i=1}^{k} \gamma_i \, \Delta lnELC_{t-i} + \sum_{i=1}^{k} \delta_i \, \Delta lnGDP_{t-i} + \sum_{i=1}^{k} \theta_i \, \Delta lnEXC_{t-i} + \sum_{i=1}^{k} \rho_i \, \Delta lnOPN_{t-i} + \sum_{i=1}^{k} \tau_i \, \Delta lnLFP_{t-i} + \sum_{i=1}^{k} \pi_i \, \Delta lnEDU_{t-i} + \omega ECT_{t-1} + \varepsilon_t \quad [3.5]$$

Next, to ensure goodness of fit for the chosen ARDL model, stability parameter, and diagnostic tests will be employed, which include serial correlation, heteroskedasticity, and normality test, in addition, stability tests known as Cumulative Sum of Recursive Residuals (CUSUM) tests will also be conducted. Following Pesaran (1997), Brown et al. (1975) stability tests CUSUM is updated recursively and plotted against the breaks point. If the plots of CUSUM statistic stay within the 5% level of significance, the null hypothesis cannot be rejected, and all coefficients are stable.

3.5.4 Pairwise Granger Causality Test

Despite the fact that the confirmation acquired so far has recognized the connection between FDI and electricity consumption, the outcomes are not adequate to distinguish whether the course of the relationship is from FDI to ELC or the other way around. The presence of a long-run connection amongst the variables being referred to is just fundamental yet not an adequate condition for dismissing the non-causality hypothesis (Morley, 2006). As it were, the presence of cointegrating connections amongst the underlying variables recommends that there must be Granger causality in no less than

one direction. To ascertain the direction of causality between the variables, the following VEC model is estimated:

$$\Delta FDI_t = \alpha_1 + \sum_{i=1}^{k} \beta_{1i}\, \Delta FDI_{t-i} + \sum_{i=1}^{k} \gamma_{1i}\, \Delta lnELC_{t-i} + \sum_{i=1}^{k} \delta_{1i}\, \Delta lnGDP_{t-i} + \sum_{i=1}^{k} \theta_{1i}\, \Delta lnEXC_{t-i} + \sum_{i=1}^{k} \rho_{1i}\, \Delta lnOPN_{t-i} + \sum_{i=1}^{k} \tau_{1i}\, \Delta lnLFP_{t-i} + \sum_{i=1}^{k} \pi_{1i}\, \Delta lnEDU_{t-i} + \omega_1 ECT_{t-1} + \varepsilon_{1t} \quad [3.6]$$

$$\Delta lnELC_t = \alpha_2 + \sum_{i=1}^{k} \gamma_{2i}\, \Delta lnELC_{t-i} + \sum_{i=1}^{k} \beta_{2i}\, \Delta FDI_{t-i} + \sum_{i=1}^{k} \delta_{2i}\, \Delta lnGDP_{t-i} + \sum_{i=1}^{k} \theta_{2i}\, \Delta lnEXC_{t-i} + \sum_{i=1}^{k} \rho_{2i}\, \Delta lnOPN_{t-i} + \sum_{i=1}^{k} \tau_{2i}\, \Delta lnLFP_{t-i} + \sum_{i=1}^{k} \pi_{2i}\, \Delta lnEDU_{t-i} + \omega_2 ECT_{t-1} + \varepsilon_{2t} \quad [3.7]$$

$$\Delta lnGDP_t = \alpha_3 + \sum_{i=1}^{k} \delta_{3i}\, \Delta lnGDP_{t-i} + \sum_{i=1}^{k} \beta_{3i}\, \Delta FDI_{t-i} + \sum_{i=1}^{k} \gamma_{3i}\, \Delta lnELC_{t-i} + \sum_{i=1}^{k} \theta_{3i}\, \Delta lnEXC_{t-i} + \sum_{i=1}^{k} \rho_{3i}\, \Delta lnOPN_{t-i} + \sum_{i=1}^{k} \tau_{3i}\, \Delta lnLFP_{t-i} + \sum_{i=1}^{k} \pi_{3i}\, \Delta lnEDU_{t-i} + \omega_3 ECT_{t-1} + \varepsilon_{3t} \quad [3.8]$$

$$\Delta lnEXC_t = \alpha_4 + \sum_{i=1}^{k} \theta_{4i}\, \Delta lnEXC_{t-i} + \sum_{i=1}^{k} \beta_{4i}\, \Delta FDI_{t-i} + \sum_{i=1}^{k} \gamma_{4i}\, \Delta lnELC_{t-i} + \sum_{i=1}^{k} \delta_{4i}\, \Delta lnGDP_{t-i} + \sum_{i=1}^{k} \rho_{4i}\, \Delta lnOPN_{t-i} + \sum_{i=1}^{k} \tau_{4i}\, \Delta lnLFP_{t-i} + \sum_{i=1}^{k} \pi_{4i}\, \Delta lnEDU_{t-i} + \omega_4 ECT_{t-1} + \varepsilon_{4t} \quad [3.9]$$

$$\Delta lnOPN_t = \alpha_5 + \sum_{i=1}^{k} \rho_{5i}\, \Delta lnOPN_{t-i} + \sum_{i=1}^{k} \beta_{5i}\, \Delta FDI_{t-i} + \sum_{i=1}^{k} \gamma_{5i}\, \Delta lnELC_{t-i} + \sum_{i=1}^{k} \delta_{5i}\, \Delta lnGDP_{t-i} + \sum_{i=1}^{k} \theta_{5i}\, \Delta lnEXC_{t-i} + \sum_{i=1}^{k} \tau_{5i}\, \Delta lnLFP_{t-i} + \sum_{i=1}^{k} \pi_{5i}\, \Delta lnEDU_{t-i} + \omega_5 ECT_{t-1} + \varepsilon_{5t} \quad [3.10]$$

$$\Delta lnLFP_t = \alpha_6 + \sum_{i=1}^{k} \tau_{6i}\, \Delta lnLFP_{t-i} + \sum_{i=1}^{k} \beta_{6i}\, \Delta FDI_{t-i} + \sum_{i=1}^{k} \gamma_{6i}\, \Delta lnELC_{t-i} + \sum_{i=1}^{k} \delta_{6i}\, \Delta lnGDP_{t-i} + \sum_{i=1}^{k} \theta_{6i}\, \Delta lnEXC_{t-i} + \sum_{i=1}^{k} \rho_{6i}\, \Delta lnOPN_{t-i} + \sum_{i=1}^{k} \pi_{6i}\, \Delta lnEDU_{t-i} + \omega_6 ECT_{t-1} + \varepsilon_{6t} \quad [3.11]$$

$$\Delta lnEDU_t = \alpha_7 + \sum_{i=1}^{k} \pi_{7i}\, \Delta lnEDU_{t-i} + \sum_{i=1}^{k} \beta_{7i}\, \Delta FDI_{t-i} + \sum_{i=1}^{k} \gamma_{7i}\, \Delta lnELC_{t-i} + \sum_{i=1}^{k} \delta_{7i}\, \Delta lnGDP_{t-i} + \sum_{i=1}^{k} \theta_{7i}\, \Delta lnEXC_{t-i} + \sum_{i=1}^{k} \rho_{7i}\, \Delta lnOPN_{t-i} + \sum_{i=1}^{k} \tau_{7i}\, \Delta lnLFP_{t-i} + \omega_7 ECT_{t-1} + \varepsilon_{7t} \quad [3.12]$$

With the assumption of being correlated and producing white noise. All the variables, used in the analysis have unit roots, approximately of 5% significance. The null hypothesis for the test is that the lagged values of, say X do not explain the variation in another variable, Y.

Generally, results from past investigations can be ordered into three sorts; unidirectional causality, bi-directional causality, and no causality (Akinlo, 2008). The two-variable causality assumes that the current FDI is related to past values of itself as well as that of electricity consumption and the current value of electricity consumption is linked to both its previous values as well as the past values of FDI (Engle & Granger, 1987; Gujarati, 2004). The causality results are very useful in determining the appropriate strategies to attract FDI inflow. Based on the finding, it would then be conceivable to decide, which strategy is the most proper for Indonesia situation. Furthermore, this can be chosen either by focusing on electricity generation or controlling the power use. In other words, this study will enable us to better understand the role of electricity towards Indonesia economy.

3.6 Conclusion

The theoretical framework shows the relationship between FDI and electricity consumption including other controlling variables such as GDP, exchange rate, openness, labor force participation and education expenditure. To implement the framework, four separate econometric tests have been conducted namely Unit Root test, Bounds test, ARDL estimation, and Pairwise Granger causality. Overall this chapter clarifies the process of the methodology applied in this research to test the data in order to produce results to verify the hypothesis developed.

CHAPTER FOUR

DATA ANALYSIS

4.1 Introduction

This chapter will present and analyze the estimation results of the long-run and short-run relationship, and cause-effect relationship between FDI and electricity consumption, as well as other macroeconomic variables. As such, the results are presented on the technique-by-technique basis, in the course of testing the statistical hypothesis about the relationship amongst the variables.

4.2 Descriptive Statistics

The results of the descriptive statistics are presented in Table 4.1, for the years under consideration.

Table 4.1
Descriptive Statistics

Variable	Mean	Maximum	Minimum	Std. Dev.
FDI	0.935	2.916	-2.757	1.305
*ln*ELC	5.576	6.699	3.956	0.825
*ln*GDP	7.659	8.214	7.167	0.310
*ln*EXC	8.242	9.381	6.448	0.977
*ln*OPN	25.187	26.141	24.209	0.612
*ln*LFP	9.164	9.656	8.461	0.353
*ln*EDU	21.650	24.027	20.199	1.373

Standard deviation is a scientific instrument to enable us to survey how far the qualities are spread above and underneath the mean. An exclusive expectation deviation demonstrates that the information is broadly spread (less reliable) and a low standard deviation demonstrates that the information is bunched nearly around the mean (more

reliable). As can be observed from the table, each of the variables has low standard deviation except for FDI. This means that each of the variable observation does not have a wide deviation from the average value. Similarly, the minimum and maximum values describe each variable as it appears, in terms of the lowest and highest values in each series. As such, the minimum observation, when compared to the maximum observation gives the range of the observation value for each of the variables of analysis.

4.3 Augmented Dickey-Fuller Unit Root Test

As the initial stage, stationarity of the variable was examined by using ADF unit root test. This test is to confirm that there are no variables that stationary at the second difference *I*(2).

Table 4.2
Unit Root Test (ADF) Result – FDI is Dependent Variable

Variable	Level		First Difference	
	Intercept	Trend and Intercept	Intercept	Trend and Intercept
FDI	-2.245 (0.195)	-2.219 (0.465)	-4.598*** (0.001)	-4.524*** (0.005)
*ln*ELC	-5.223*** (0.000)	-1.059 (0.921)	-3.077** (0.038)	-4.508*** (0.006)
*ln*GDP	0.096 (0.961)	-2234 (0.457)	-4.530*** (0.000)	-4.500*** (0.005)
*ln*EXC	-1.347 (0.597)	-1.868 (0.650)	-6.250*** (0.000)	-6.312*** (0.000)
*ln*OPN	-0.392 (0.900)	-3.190 (0.103)	-7.207*** (0.000)	-7.088*** (0.000)
*ln*LFP	-1695 (0.425)	-2.416 (0.366)	-8.928*** (0.000)	-8.839*** (0.000)
*ln*EDU	1.133 (0.997)	-2.060 (0.549)	-3.920*** (0.005)	-4.304*** (0.009)

Note: ***, ** Implies significance at 0.01 and 0.05 respectively. The probability value is in parentheses

The outcomes from the ADF test are shown in Table 4.2. The outcome shows that all variables are non-stationary at level but stationary at first difference except for electricity consumption where it is stationary at both, level and first difference. In first differencing it is clear that all variables reject the null hypothesis at one percent significant value saying there is no stationarity and accept that all variables integrated of order one.

4.4 Bounds Test

At this section, the result of optimal lag length is automatically selected by using E-views 9 and based on Akaike Information Criterion (AIC). When two (2) is chosen as maximum lags the ARDL model is selected to be (2, 1, 0, 2, 0, 1,0). After ADF result guarantee that no series at the second difference, the presence of a long-run association between the variables is checked by using Bound Test.

Table 4.3
ARDL Bounds Test
Null Hypothesis: No long-run relationships exist

Significance level	I(0) Lower Bound	I(1) Upper Bound
10%	1.99	2.94
5%	2.27	3.28
2.5%	2.55	3.61
1%	2.88	3.99
F-statistic	6.20***	

Note: *** Implies significance at 0.01

Table 4.3 shows the result of *F*-statistics is 6.20. The critical value is rejected at 1% level of significance where the lower bound value is 2.88 and upper bound value is 3.99. Based on the result, the null hypothesis is rejected, and it confirms that there is

the presence of a long-run association between dependent variable FDI and all independent variables. In other words, all the variables are cointegrated.

4.5 Coefficient Estimation

Since there is an association between FDI and its determinants, computation of the short-run and long-run coefficients are required. The estimation results of variables of ARDL (2, 1, 0, 2, 0, 1,0) model is presented in Table 4.4.

Table 4.4
ARDL Cointegrating and Long-run Estimation Results

Regressor	**Coefficients**	**t-values**
C	98.827*	1.957
*ln*ELC	11.970***	3.666
*ln*GDP	-7.744	-1.693
*ln*EXC	-5.994***	-4.774
*ln*OPN	-0.260	-0.145
*ln*LFP	-8.240***	-4.425
*ln*EDU	1.205***	2.751
ECT (-1)	-1.417***	-7.067
ECT= FDI – (11.970**ln*ELC – 7.744**ln*GDP – 5.994**ln*EXC – 0.260**ln*OPN – 8.240**ln*LFP + 1.205**ln*EDU + 98.827)		

Note: *, *** Implies significance at 0.10 and 0.01

From Table 4.4, it depicts the sign for ECT (-1) is negative and statistically significant at one percent significant value. It is shown that lagged ECT is -1.417. Conferring to the argument of Bhattacharya found on Research Gate, the ECT of (-1.417) and a significant p-value implies that the whole system can get back to the long-run equilibrium at speed of 141% indicating a sizable speed of adjustment of disequilibrium correction for reaching the long-run equilibrium at a steady state position. Moreover, we found that there is a positive association between two independent variables *ln*ELC and *ln*EDU with dependent variable FDI in the long-run and both are statistically significant. The coefficient value for *ln*ELC is 11.99 which

means rise 1% in electricity consumption will lead to 11.99% rise in FDI inflow. The outcomes illustrate that better infrastructure can attract more investors to a country and the result is in line with a previous study (Mielnik & Goldemberg, 2000). The coefficient of EDU is 1.205, it implies that a rise of 1% in education expenditure will prompt to 1.205% rise in FDI inflow. This result is similar to Asiedu (2006), where higher education and will attract FDI inflows.

The other two controlling variables that are significant in the long-run is EXC and LFP, but both are correlated negatively. The coefficient for both is -5.99 and -8.24 respectively. It indicates that a rise of 1% in the exchange rate will lead to 5.99% reduction in FDI inflow, and a rise of 1% in labor force participation will lead to 8.24% reduction in FDI inflow. The negative relationship between EXC and FDI is different with the previous study (Froot & Stein, 1991; Blonigen, 1997) where depreciation on the currency of host country tend to increase inward FDI. Also, the negative result between LFP and FDI is contradicted with the earlier hypothesis, nevertheless the result is similar with the case of Malaysia, where the size of the labor force does not significantly determine FDI inflows (Ismail & Yussof, 2002).

While GDP and OPN are shown to be insignificant and negatively correlated with FDI in the long-run. This contrary with past examinations where FDI pulled in to the nation that has vast market size (Charkrabarti, 2001; Artige & Nicolini, 2005; Demirhan & Masca, 2008; Suleiman et al., 2015) and practices free trade policies (Charkrabarti, 2001; Keyou et al., 2009; Wafure et al., 2010; Rajan et al., 2011).

The diagnostic results are shown in Table 4.5. This model passed through analytical test statistics where the probability values for serial correlation test, heteroskedasticity, and normality is higher than 5% significance level which underpins the results of the ARDL model.

Table 4.5
Diagnostic Checking Result

Diagnostic Test	**Test-statistic**	**p-value**
Serial correlation LM	0.143	0.768
Heteroskedasticity	0.838	0.522
Normality Jarque-Bera	3.052	0.217

Finally, CUSUM test is tested in order to check the stability of the model. As can be seen from Figures 4.1, the plots are fluctuating and well inside the 5% critical limits, implying that the coefficients in the ECM are stable within the sample period 1980 to 2016.

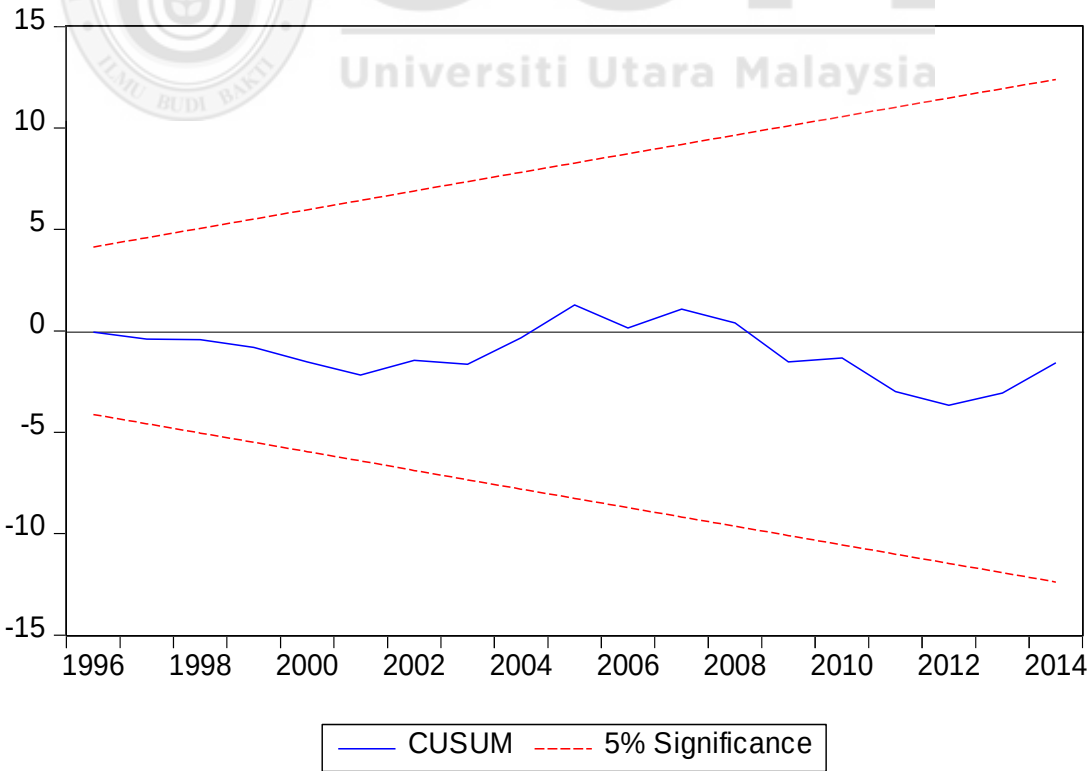

Figure 4.1
Plot of Cumulative Sum of Recursive Residuals

4.6 Granger Causality

Cointegrating association only indicates the presence of a long-run association between the variables but does not give detailed information regarding the direction of causality. It is ideal to determine if FDI is the variable that causes ELC (FDI → ELC) or it is ELC that causes FDI (ELC → FDI). This section discusses and observes the causality test outcomes amongst the variables of interest. The result is shown in Table 4.6.

Table 4.6
Pairwise Granger Causality Results

Dep. Variable	F-statistic (p-values)						
	ΔFDI	$\Delta lnELC$	$\Delta lnGDP$	$\Delta lnEXC$	$\Delta lnOPN$	$\Delta lnLFP$	$\Delta lnEDU$
ΔFDI	-	0.820 (0.451)	0.481 (0.623)	1.306 (0.286)	2.736* (0.082)	0.407 (0.669)	1.010 (0.377)
$\Delta lnELC$	1.014 (0.376)	-	0.798 (0.460)	3.239** (0.054)	10.478*** (0.000)	4.071** (0.029)	10.364*** (0.000)
$\Delta lnGDP$	2.147 (0.135)	0.196 (0.823)	-	2.007 (0.152)	10.489*** (0.000)	0.597 (0.557)	7.010*** (0.003)
$\Delta lnEXC$	0.324 (0.726)	0.248 (0.782)	1.093 (0.348)	-	16.512*** (0.000)	0.549 (0.583)	13.511*** (0.000)
$\Delta lnOPN$	1.421 (0.258)	0.112 (0.894)	0.467 (0.631)	1.201 (0.315)	-	1.648 (0.210)	3.464** (0.045)
$\Delta lnLFP$	0.153 (0.859)	1.318 (0.284)	0.006 (0.994)	2.841* (0.075)	1.370 (0.270)	-	3.418** (0.047)
$\Delta lnEDU$	1.016 (0.375)	0.863 (0.284)	1.086 (0.351)	0.708 (0.501)	1.735 (3.464)	0.137 (0.873)	-

Note: *, **, *** Implies significance at 0.10, 0.05 and 0.01 respectively. The probability value is in parentheses

According to the result in Table 4.6, the probability values for our variable of interest FDI and ELC is higher than the 5% level, meaning that null hypothesis cannot be rejected and there is no causality running from electricity consumption to FDI and vice versa. The result implies that electricity consumption in Indonesia does not influence FDI inflow and FDI inflow also does not influence electricity consumption as well.

This is contrary to the previous study where the results revealed a two-way causality amongst electricity consumption and FDI in Malaysia. Tang (2009) and Alam (2013) also found there is a one-way relationship running from electricity consumption to FDI for India and a one-way relationship running from FDI to electricity consumption for Pakistan. In other words, we can say that FDI and ELC in Indonesia are independent. Even though ELC does not Granger cause FDI, there is a one-way causality running from ELC to EXC, OPN, LFP, and EDU.

Apart from a variable of interest, the result also displays that there is no causality running from FDI to other controlling variables except OPN. There is a one-way causality running from FDI to OPN. This means that the incoming of a foreign investor to Indonesia that change or cause Indonesia trade system from trade barriers to free trade.

4.7 Conclusion

The chapter empirically investigates the association between a dependent variable and independent variables in long-run and short-run. First, descriptive statistics of all variables have been shown to demonstrate the wider view of collected data through mean, standard deviation and range of variables. Afterward, ADF test, Bounds test, Cointegrating and long-run test and Granger causality test applied to illustrate the existence of long-run and short-run relationship amongst the variables as well as the causality flow. The long-run association result shows that there is significant and positively correlated between the variable of interest, FDI, and electricity consumption. However, there is some control variables have demonstrated the insignificant result and contradict the earlier hypothesis. While the Granger causality

shows that both FDI and electricity consumption are independent and does not influence each other.

CHAPTER FIVE

CONCLUSION AND DISCUSSIONS

5.1 Introduction

This chapter comprises the summary of research findings, conclusions, as well as policy implications. It equally stresses the areas of coverage and limitations of the study, which is expected to ease further research in this and similar areas in international economics.

5.2 Summary of Findings

This research work lends voice to an important economic relationship between electricity consumption and FDI inflow in Indonesia, take into account another five controlling variables. It is particularly important in the contemporary debate on countries' electricity consumption, considering the country experiences issues to supply enough power to its people and business and coupled with the pronounced level of resource mismanagement. This investigation in this manner adds to the assortment of information by looking at the impacts of electricity consumption, and other applicable controlling factors on FDI in Indonesia, by utilizing the ARDL limits testing approach for cointegration; and the examination of the direction of causality amongst the factors.

The findings of the study show that the association amongst electricity consumption and FDI is positive and significantly correlated, thereby confirming one of macroeconomic theory which is the location theory of FDI. This theory upholds that

the quality and availability of electricity to be specifically important for MNEs in their locational choices to operating their business and production undertaken for efficiency considerations. The ECT is viewed measurably noteworthy with a negative sign and the analytical tests together with CUSUM technique for steadiness test show the strength of the consequences of ARDL model. However, the results of the Granger causality appear on no confirmation of causality amongst FDI and electricity consumption, which means both variables are independent. The estimated absence of any causality between FDI and electricity consumption may be due to a variety of reasons. Perhaps there is another independent factor that jointly influences both the FDI and electricity consumption, which could explain the strong association between the two uncovered by earlier regression methods. As a result, current causality tests on the relationship between FDI and electricity consumption suffer from incomplete specification due to exclusion of variables that are crucial but are omitted.

5.3 Policy Implications

Indonesia is a nation that is rich with a youthful and vast populace, and a developing economy. However, the nation is being let down by its energy sector. In spite of having abundant natural resources at its disposal (counting coal and gas), Indonesia has not possessed the capacity to sufficiently take care of the domestic demand for electricity resulting in continuous power outages and in one of the most minimal charge rates in the area (Indonesia Investment, 16 Aug 2014). The most efficient pathways will vary depending on the particular needs and advantages of the country. As Indonesia, to tackle the electricity crisis, Indonesia require expansive scale investments to be infused in the electricity sector and needs to make another electricity supply action sooner

rather than later to maintain the FDI inflow and address electrification challenges over its archipelago.

Even though there is no causality between FDI and electricity consumption, there are a number of policy implications for Indonesia that can be taken based on the long-run cointegrating results. Since the outcome appears there is certain connection amongst power and FDI, this means that the significance of power in drawing in FDI inflow in Indonesia. In other words, electricity consumption shortage may limit the foreign investor to invest in Indonesia. First, a policy for increasing electricity supply investment is, therefore, likely to enhance economic growth for Indonesia by drawing in more outside investor. In the quest for proceeding with FDI inflow, Indonesia should put more undertakings into growing power supply investment while executing national power supply infrastructure as a system toward a strategy toward advanced development in the long haul.

Second, the authority also can start a noteworthy electricity preservation and proficiency change program as a part of the ongoing reform processes because of electricity saving potentials. While electricity conservation intends to lessen the requirement for electricity without decreasing the end-user benefit, it provides a range of personal as well as social rewards also. Third, the administration's long-term electricity policy ought to be centered around growing new wellsprings of fuel like natural gas, to supplant low-quality coal as it intensifies ecological condition, and on enhancing the thermal efficiency of power generation. Last but not least, Indonesia should implement policies on tariff reform as what has been done in China (Shiu &

Lam, 2004). It is argued that these policies will improve the efficiency of price differentials amongst rural and urban areas.

5.4 Limitations and Recommendation for Further Studies

The study is to explore the connection between power utilization and FDI inflow in Indonesia within 1980-2016 period. Further research may be conducted with panel approach by comparing two or three countries as it has the upsides of bigger number observation, a higher level of flexibility, and a decrease of collinearity among explanatory variables which would enhance the effectiveness of the Granger causality test. Subsequently, an examination stretching out time series investigation to panel examination would be more intriguing. Besides that, this investigation depends on a bidirectional framework, for the following examination, it can be expeditiously connected with the multidirectional framework, where power utilization and FDI are introduced to be controlled by other monetary factors. It is hoped that as better information winds up plainly accessible, further light can be shed on this vital issue of the causality between infrastructure and FDI inflow in Indonesia. Furthermore, the current study demonstrates that the electricity consumption is a fundamental segment to invigorate FDI inflow in Indonesia. For future research, it is recommended to investigate and investigate the likelihood of energy sustainable and inexhaustible in a nation since it is a need so as to guarantee smooth usage of development projects and to empowering nation's FDI inflow.

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