The Determinants of Foreign Direct Investment Inflow in BRICS Countries: An Evidence of Panel Data Analysis

Master Thesis

Name: Gusti Ngurah Agung Dananjaya

Student ID: 456432

Supervisor: Prof. dr. Casper de Vries

Second Reader: dr. J. Emami Namini

Business and Economics

International Economics

Erasmus School of Economics

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Abstract

There has been growing interest in foreign direct investment (FDI) particularly among policymakers and in academia due to its positive relationship with the development and real growth of the host country. According to the World Investment Report (2011), emerging economies together attracted more than half of global FDI inflows in the year 2010. This study examines the determinants of FDI inflows in the BRICS (Brazil, Russia, India, China, and South Africa) economies using a fixed effects panel model. The model is developed to determine the factors that influence the FDI inflows in the BRICS economies during the last 26 years (1990 – 2016). The study finds that infrastructure, stable macroeconomic conditions, and trade openness are significant determinants for FDI in BRICS countries. We also conclude that the previous FDI lags have an impact on the current FDIs in BRICS countries. The findings are consistent with existing empirical evidence provided by previous studies on FDI inflows in BRICS economies. In addition, the findings of the study reveal that the financial crisis did not have a significant impact on FDI inflows into the BRICS, which in agreement with UNCTAD and World Bank data that shows that FDI inflow to the BRICS increased during the financial crisis. The study contributes to the existing literature by testing the accuracy of the fixed effect models and utilizing panel data on two new variables, namely, natural resources and good governance.

Keywords: BRICS, foreign direct investment, fixed effects, panel data, determinants FDI inflows

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1. Introduction

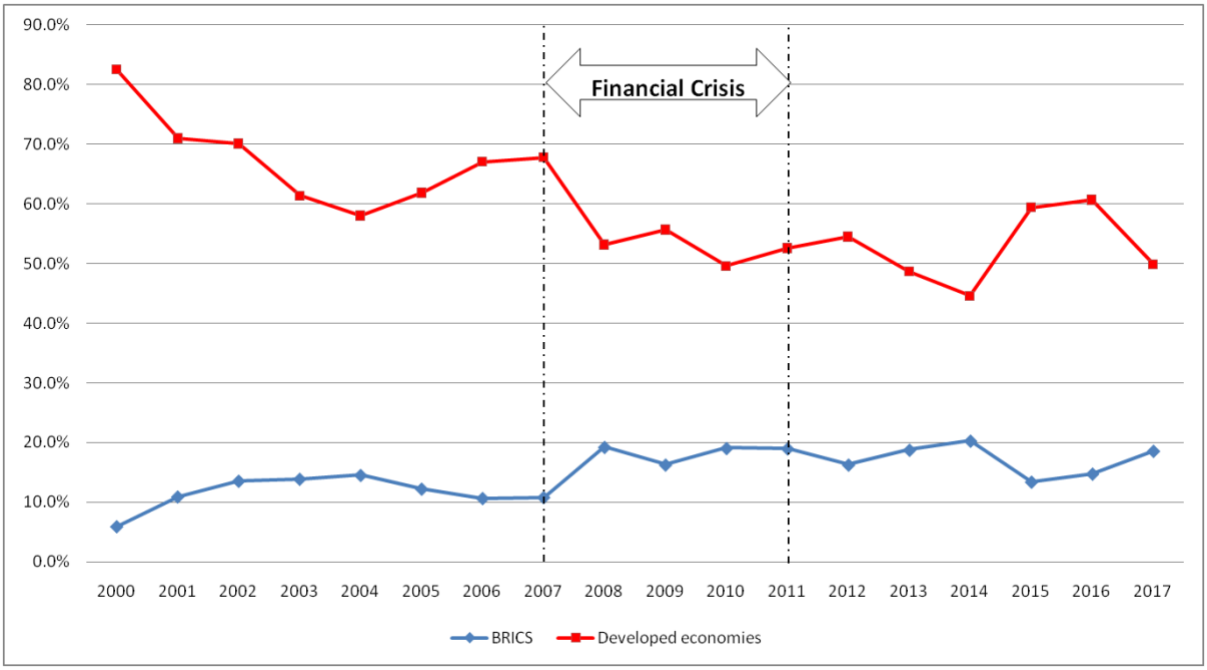
There has been growing interest in foreign direct investment (FDI) particularly among policymakers and in academia due to its positive relationship with the development and real growth of the host country. FDI is defined as an investment involving a long-term relationship and reflecting a lasting interest in and control by a resident entity in one economy of an enterprise resident in a different economy. It involves the transaction between two entities and all subsequent transactions between them among foreign affiliates (UNCTAD, 2008). With the rise of globalization, FDI has increasingly been viewed as an important factor for productivity, as well as a source of aggregate demand and real economic growth for both developing and developed countries since it augments the level of investment or capital stock in the host country. In addition, FDI increases employment by creating new production capacity and jobs, transferring of intangible assets such as technology and managerial skills to the host country and provides source of new technologies, processes, products, organizational technologies and management skills (Ho & Rashid, 2011).

The significant increase in FDI inflows in the BRICS (Brazil, Russia, India, China, and South Africa) economies is the motivation behind this study, due to the fact that the BRICS are projected to meet or exceed FDI inflows to developed countries in terms of growth. The BRICS have common characteristics such as large population, which is the indication of a large consumer market, and rapid economic growth. However, these five countries are significantly different on political, geographical, and cultural scales, necessitating further investigation into the most important point of their economic congruence. The BRICS hold 40 percent of the world's population, spread out over three continents and account for 25 percent of global GDP (IMF, 2009). According to United Nations Conference on Trade and Development (UNCTAD), developing economies have attracted over 50 percent of global FDI inflows since 2010 (UNCTAD, 2013). Since 2012, FDI inflows to developing economies have surpassed the FDI inflows to developed economies; with the BRICS playing a pivotal role in the paradigm shift in global investment. The BRICS economies have similar characteristics such as the significant increase in FDI inflows from 2000 to 2017, which have grown from $80.6 billion to $265.6 billion.

Furthermore, during the financial crisis, FDI flows to the BRICS remained stable relative to global economies. Evidenced in 2009 by a 30 percent inflow decline compared to a 40

percent decline in developed countries. As a result, between 2007 and 2012, FDI inflows to the BRICS increased by 25 percent, while inflows to developed economies declined by 33 percent indicating rapid recovery from the crisis in the BRICS economies. As shown in Figure 1, the global share of FDI inflows to the BRICS economies has steadily risen even during the financial crisis, to a record 20.3 percent in 2014. On average, over half (51%) of FDI inflows to the BRICS was channeled to China between 2000 and 2017, followed by Brazil (22%), Russia (13%), India (11%) and South Africa (2%).

Figure 1: Growth rate of FDI inflows to BRICS and development economies, 2000 - 2017



Source: UNCTAD, FDI/MNE database (www.unctad.org/fdistatistics)

Moreover, the combined economies of these countries appears likely to become the largest global economic group by the middle of this century (Cheng, Gutierrez, Mahajan, Shachmurove & Shahrokhi, 2007). The rapid economic growth and industrialization of the BRICS is the impetus for this study, since we seek to establish the primary economic components that facilitate increased FDI inflows and overall economic growth. Once the primary economic drivers of the BRICS are established, it is possible to build effective models to enhance the growth and development of developing and less developed economies. The BRICS are interesting candidates to investigate due to their comparable economic growth and glaring socioeconomic disparities. It is evident that the current rapid growth of the BRICS economies can at least be partially attributed to FDI inflows, whose volume and magnitude are determined and affected by multiple factors. In particular, this study focuses

on the factors that significantly influence FDI inflows to the BRICS, the research question for this study is:

RQ: "What are determinants that affect FDI inflows in BRICS?"

Based on the research question, we rely on the panel data for the last 26 years (1990 onwards) since unlike time series data or cross-sectional data, panel data is more accurate model and relatively robust for capturing economic complexities across different economic cycles. Furthermore, when analyzing the panel data, we utilize the fixed effects model since previous studies (Wei & Zhu, 2007; Xie & Wang, 2009; Moussa, Çaha & Karagô, 2016) find that the fixed effects model is more effective and robust when modelling panel data pertaining to FDI determinants. Some studies such as Ranjan & Agrawal (2011) and Agrawal (2015) analyze the determinants of FDI inflows by using the random effects due to the rejection of the fixed effect model by the Hausman specification test. To ensure that the fixed effects model is appropriate to analyze the determinants of BRICS, we conduct the Hausman specification test. Also, we apply the unit root test and the cointegration test to ascertain the stationarity of the variables and identify potential long-run relationships within variables. Furthermore, this study expands the scope of previous studies by extending the variables, namely; natural resources and good governance.

This study is structured as follows; section 2 presents a review of the literature; section 3 discusses related theoretical framework and hypotheses; section 4 discusses the data and the methodology; section 5 explains the results and the empirical analysis; section 6 provides the conclusions of the study.

2. Literature Review

The BRICS countries are considered as the new emerging countries whose markets are developing significantly. As a result, the countries play a major role in the global economy. Studies by Dunning (1973 and 1981) show that the classical models determine many nations' FDI. It gives a comprehensive evaluation of the ownership, location and the internationalization (OLI) model. Another study by Duran (1999) which investigates the key drivers of FDI between 1970 – 1995 using panel data and time series suggests that the market size, macroeconomic stability, domestic savings, trade openness, country's solvency, and

growth variables are the important factors of FDI. Furthermore, a more recent study by Ranjan & Agrawal (2011) investigates the main causes of FDI inflows in Brazil, Russia, India, and China. They used a Random effect model to analyze data collected between 1985 and 2009. The findings of the study indicate that trade openness, market size, macroeconomic stability, labor cost, and growth prospects are the main determinants of FDI inflows in BRICS countries. Nevertheless, growth prospects and macroeconomic stability have a minimum impact on the nations' FDI flows. Labor availability and macroeconomic stability also have insignificant influence on the level of foreign investment.

Khachoo & Khan (2012) also investigates the key determinants of FDI inflow in developing countries using panel data. The finding shows that the amount of total reserves, market size, labor cost, and infrastructure are directly linked to FDI flows. However, the trade openness variable is insignificant with the FDI inflow. Moreover, Jadhav & Katti (2012) investigate different factors that contribute to FDI inflows. They examine political and institutional elements that make some countries attractive to foreign investors. Evidence from BRICS countries shows that regulatory quality and government effectiveness are directly linked to the level of FDI inflows in most BRICS countries. However, other factors such as accountability, political stability, and control of corruption limit the flows of FDI in BRICS economies. The results imply that some factors that governments pay attention to in the implementation of strategies for boosting economic growth are not essential in attracting FDI inflows.

Furthermore, Tintin (2013) investigates the determinants of FDI inflows in six Central and Eastern European countries (CEEC). He incorporates institutional variables and traditional factors into the studies, which indicate whether the determinants of FDI inflow vary across European Union, China, Japan, and the United States of America. From the research, it is evident that trade openness, GDP size, national institutions, and EU membership have a significant influence on FDI in the four countries. Moreover, Policymakers in every country need to eliminate barriers to FDI inflows in order to sustain economic growth. It is also important to enhance economies' absorptive capacity with the aim of realizing maximum benefits of the effects of FDI. As demonstrated by Rogmans & Ebbers (2013) in the study on the determinants of FDI inflows in the Middle East and North Africa (MENA) region, trade openness improves countries' capability to maximize the benefits of FDI inflows. In their research, Rogmans and Ebbers examine panel data between 1987 and 2008, which shows that

natural resources endowments diminish FDI inflows because most countries with mineral deposit often develop protectionist policies that prevent the entry of foreign investors.

Additionally, Agrawal (2015) examines the link between FDI inflows and economic growth in the five BRICS members between 1989 and 2012. The researcher utilizes the causality assessment and integration of empirical methodologies at the panel level in order to identify long-run relationships between FDI inflows and economic growth within the individual countries. The results of the cointegration test indicates that the presence of a long-run relationship between FDI inflows and economic growth in BRICS economies since economic growth and FDI are cointegrated at the panel level. This implies that long-run co-movement exists between FDI inflows and economic growth. Thus, there is a potential causality between the two variables which suggests that FDI inflows and economic growth have an impact on each other.

3. Theoretical Framework and Hypotheses

3.1 Theoretical Framework

In order to comprehend and address the research question, this chapter will first discuss the FDI theories based on Ricardian model, the Heckscher Ohlin Samuelson (H-O-S) model, and the Ownership, Location and Internalization (OLI) paradigm. Also, a brief summary of the main FDI determinants from previous studies and we will present the hypotheses development of this study.

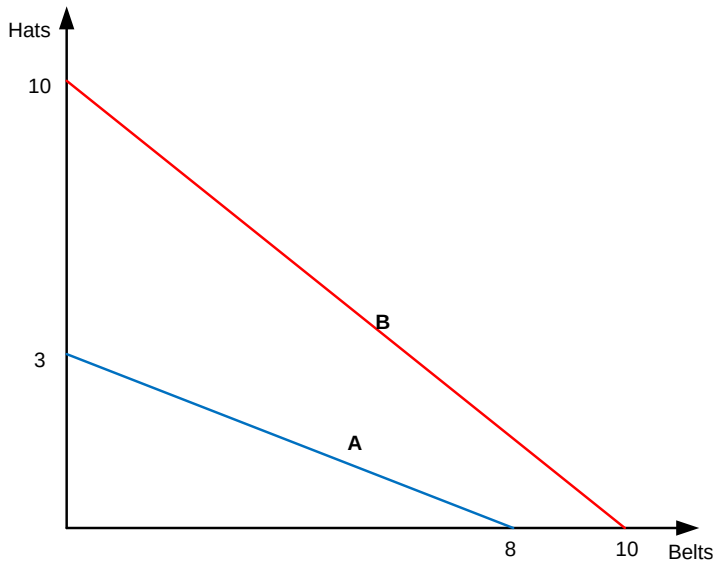
3.1.1 Ricardian Model

The standard Ricardian model assumes two goods, two countries, and one factor of production; which is labor in each country. The factor of production is internationally immobile, implying that the labor is able to move domestically but not internationally. However, goods are traded freely across the two countries under the assumption that there is no transportation costs and therefore the model assumes a perfectly competitive market (Emmanuel, 1972). Markusen (2005) states that in Ricardian model of trade, countries that have more advanced technologies usually attract more FDI inflows than countries with outdated technologies. For instance, two countries A and B, have leather processing facilities and only two goods, namely hats and belts. Using its technological resources, country A is

able to produce 3 million hats or 8 million belts, while country B can produce 10 million hats or 10 million belts (Figure 2).

Evidently, the technological resources of country B give it an absolute advantage in the production of both goods. However, country B has a comparative advantage in producing hats since its technological advances provide higher efficiency in producing the goods and it is 3.3 times better at producing hats, and only 1.25 times better at producing belts compared to country A. Consequently, country B has an absolute advantage and a comparative advantage in producing hats due to technological advances. It implies that foreign investors will invest in country B due to its high production efficiency.

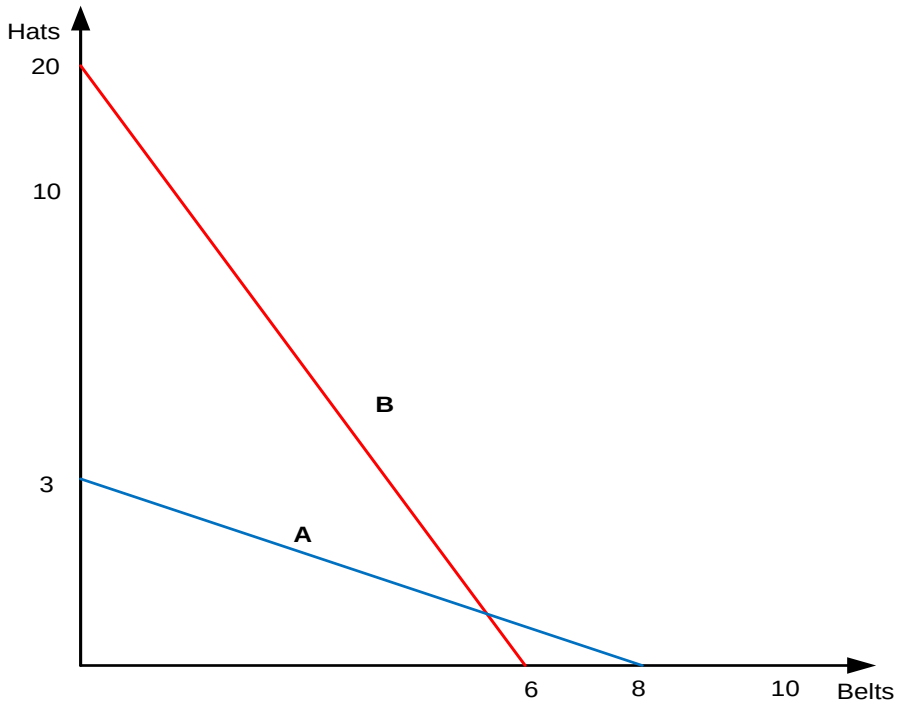
Figure 2: Ricardian model on comparative advantage



Assuming country B requires less unit labor requirements to produce both hats and belts, it implies that country B has an absolute advantage in producing both goods. Within this context, the production technology of country B is more advanced compared to the production technology of country A. FDI by multinational enterprises (MNEs) will occur in country B if the technology transfer costs are lower compared to the technology gaps. Quinn (1969) noted that, FDI by MNEs is the primary conduit for the transfer of technology from developed economies to developing economies. Consequently, foreign investors will invest in country B due to its high production efficiency. Evidently, the Ricardian model considers FDI as firms located in technologically advanced (developed) economies investing in less technologically advanced (developing) economies.

Consequently, based on the Ricardian model, workers in country B receive higher wages compared to workers in country A since country B has an absolute advantage in the production of goods. This is contingent on the assumption that labor has a fixed supply and is internationally immobile while the goods can be freely traded. Since country B has a comparative advantage in hats, then without technology transfer country B exports hats while country A exports belts. Country A therefore has a comparative advantage in producing belts but country B has an absolute advantage in producing both goods since it requires less unit of labor to produce each good compared to country A. In addition, the cost of technology transfer is comparatively lower to the technology gap in country B resulting in higher FDI. An inflow of FDI in country B would result in a steeper PPF (production possibility frontier) curve since in the absence of trade barriers and transportation costs, FDI would result in enhance technology and managerial skills transfer in country B resulting in higher production efficiency of hats (see Figure 3). This would increase the absolute advantage of country B in the production technology of hats while decreasing the comparative (relative) advantage of producing belts compared to country A.

Figure 3: Ricardian model on comparative advantage adjusted for FDI inflow



As noted by Root (1994), FDI is the organic combination and mobility of capital, technology and management skills from the firms in the home country to the host countries. Developing economies need to adopt new technologies in order to reduce their technology gap to enhance production, which is achieved through FDI and trade. Efforts by developing countries to attract FDI are predicated on the need for technology transfer and managerial talent inherent in FDI (Root, 1994). FDI from developed economies to developing economies involves technology transfer, which encompasses the development of production sites and modification of operating procedures in order to meet the conditions and labor input of the host country. Consequently, with regard to the Ricardian model, an increase technology transfer through FDI will increase the sophistication of production and goods by increasing the Ricardian trade cut-off, which will in turn enhance the quantity and quality of the host country's export basket.

3.1.2 H-O-S Model

An alternative theory to the Ricardian model is the Heckscher-Ohlin-Samuelson (H-O-S) model, which is a part of the neoclassical trade theory. The H-O-S model assumes two countries, two goods, and two factor endowments (capital and labor), with the same preferences and technology between countries, no transportation costs, and constant return to scale. Bilas & Bosnjak (2015) states that international trade between countries occurs due to specialization. Meaning that a country with labor abundant will have a comparative advantage in the labor-intensive good and it is the mirror image for a country with capital-intensive good. Unlike the Ricardian model, the H-O-S model determines the pattern of trade rather than technology. Consequently, according to the H-O-S model, the capital abundant country will specialize in the capital-intensive good and it is the mirror image for the labor abundant country (Corden, 1974). This implies that the two countries will export the capital-intensive and labor-intensive good respectively. According to Romlis (2004), trade patterns are driven by specialization in the production of goods that intensively use the abundant production factor. Each country will produce more of their respective goods and the excess resulting in international trade between two countries. The inherent implication of the H-O-S model is that the absolute prices of the factors of production will be consistent across both countries under free trade. However, this does not imply that the country that produces capital abundant goods does not produce labor abundant goods. Rather relative to the country

that produces labor abundant goods, the cost of labor in the capital abundant country is high (Mundell, 1957).

According to the H-O-S model, international trade is determined by the relative endowment of labor and capital. As a result, developed countries have low interest rates (cost of capital) while developing countries have low wage rates (cost of labor). FDI flows are determined by the unit labor cost and therefore FDI flows will tend to focus on developing countries due to the wage rate differentials between developed and developing countries. In addition, any government intervention in international trade such as through tariffs will result in tariff jumping resulting in FDI to substitute international trade (Mundell, 1957). It is also assumed that under the H-O-S framework that the developed country is endowed with skilled labor compared to the developing country and therefore MNEs will hire skilled labor in the developing country based on the domestic wage rate which is lower in developing countries. This is because of the wage rate constraints in the developing country imposed by wage formation and economic development (Hirsch, 1976). Furthermore, MNEs will hire skilled labor from the developed countries and transfer them to the developing countries while also transferring advanced technology to fill any existing technology gap between the developed and developing countries (Corden, 1974). Consequently, under the H-O-S framework, FDI inflows to developing countries is driven by a lower wage rate, tariff barriers and technological gap in the developing country, which benefit the MNEs.

Consequently, the developing country (labor abundant) will receive FDI from the developed country (capital abundant) as a result of labor costs differentials which leads to investment flows from developed to developing economies (Mundell, 1957). An inflow in FDI leads to an increase in the wage rate due to the increase in the relative production costs. In addition, according to the H-O-S framework, an increase in capital results in international trade specialization and therefore FDI inflows facilitate the relative endowment of capital. Therefore, in accordance to the H-O-S framework, FDI inflows facilitate the transition from developing to developed economies.

3.1.3 OLI Paradigm

A fourth model for FDI is the OLI paradigm. OLI stands for Ownership, Location, and Internalization (OLI). This paradigm is a framework used by MNEs to determine whether

they should establish infrastructure in foreign countries. Ownership indicates firm-specific knowledge that companies in a country have. Firms with sufficient knowledge about an industry can sustain their performance in different foreign markets without succumbing to the effects of competition. Hausmann & Fernandez-Arias (2000), as well as Kalotav & Sulstarova (2010), add various adjustments to the theory showing that home country advantages such as favorable policies and access to essential assets help firms to venture into different sectors. Location determines whether a company has access to resources in a foreign country where it intends to establish operations. According to Buckley et al. (2007), firms can establish different production processes in diverse countries as long as they have access to essential resources. Ramasamy, Yeung & Laforet (2012) also note that foreign investors need to examine factors such as openness to FDI and the level of risk in a country when venturing into places.

The 2016 International Country Risk Guide illustrates that availability of natural resources and a company's intellectual assets are among major factors that compel foreign multinationals to set up offices in host countries (Ramasamy et al., 2012). In contrast, internalization allows companies to use local resources in production processes instead of importing them. However, businesses lack the incentive to establish offices in foreign countries if it is more profitable to import resources that they require in the host country (Van Tulder, 2010). Internalization helps countries to cut production processes; meaning that if the price of producing goods in foreign country is cheaper than in the home country, then it is the best to produce the goods in foreign country and import it to the home country. In addition, internalization contributes to the growth of most BRICS economies. However, the home country environment and ownership have a significant influence on the increase in the number of multinationals in BRICS countries. For instance, China and Russia abolished restrictive policies in the early 1990s to create an attractive environment for foreign investment (Van Tulder, 2010).

3.1.3a Horizontal FDI

The OLI framework relates to two different types of FDI, namely, horizontal and vertical FDI, which have distinctive objectives and benefits to MNEs and the host country respectively. Horizontal FDI is widely known as a market-seeking form of investment, where MNEs aim to replicate production and distribution facilities and operations in a foreign

market. Taken from Dunning's (1980) OLI paradigm, market seeking investment targets local market penetration of host countries. Moreover, this is often linked to market size and potential market growth, per capita income, access to regional markets and/or a certain type of consumers. The conventional horizontal FDI model therefore assumes that the parent firm will establish subsidiaries that produce and sell to the local market in the host country (Yeaple, 2003). In the horizontal model, there is minimal trade between the parent and subsidiary since the operations of the subsidiary are oriented towards the host market.

Horizontal FDI essentially involves the production of similar products in different countries through similar production processes to the home country. Since each plant serves the local market of the host country, horizontal FDI substitutes international trade by mitigating costs such as tariffs and transportation costs (Markusen & Venables, 2000). This leads to a spillover effect, which is through both domestic and foreign capital stocks, which leads to growth in skills and technology. The increase in capital stock as well as the technological advancements resulting from horizontal FDI enhance production which in turn leads to lower export prices. According to Blomström & Kokko (1998), entry of MNEs enhance the efficiency of local firms resulting in productivity spillovers. In addition, local firms may utilize the global supply infrastructure of MNEs to enter foreign market, which leads to market access spillovers. Collectively, horizontal FDI enhances technology transfer linkages and local investment of MNEs, which leads to economic growth and enhances the global competitiveness of local firms leading to an increase in international trade.

3.1.3b Vertical FDI

Vertical FDI is carried out for efficiency-seeking purposes, whereby MNEs establish part of their production processes in a foreign country in an effort to reduce global production costs. According to Dunning (1993), firms are driven to undertake vertical FDI in order to benefit from arbitrage opportunities that arise from cost differentiation and factor endowments, while utilizing the merits of economies of scale and scope. The main assumption under the vertical FDI is that the parent establishes subsidiaries in the host countries in order to conduct specific stages of production, with the home country maintaining market dominance for the final products. As a result, the production process comprises of significant trade between the parent and the subsidiary (Nunn, 2007). However, most MNEs maintain a combination of both vertical and horizontal FDI, and therefore the primary intention of FDI can be

determined based on the intra-firm flows, with high flows indicating vertical FDI, while low flows indicating horizontal FDI (Costinot, Oldensky and Rauch, 2011).

One of the major effects of vertical FDI is the increases of employment levels in the host country due to its labor intensity. In addition, it allows local firms to replicate the technologies and processes used by MNEs, which effectively augments the demonstration effect and technology diffusion. Vertical FDI primarily relies on factor endowments of the host country and therefore it facilitates easy imitation of technology and knowledge transfer to local firms. In addition, local firms are able to establish international channels through MNEs, which enhance market access spillovers. However, there are too few studies to draw this conclusion. Blomström and Kokko (1998) argue that the diffusion of technology enhance competition in the local market, which in turn augments productivity in the host country. In contrast to horizontal FDI, vertical FDI is largely oriented towards the endowments of the host country to enhance efficiency and therefore does not have a significant impact on increasing international trade (Markusen & Venables, 2000).

3.2 Hypotheses

Based on the literature review, there are seven germane categories of FDI determinants, which are: market size, economic stability, infrastructure, natural resources, trade openness, good governance, and labor costs. In the sub-section below, we discuss these determinants of the FDI.

3.2.1 FDI inflows and Market Size

According to horizontal FDI, MNEs engage in market-seeking investments in order to penetrate local markets and augments their global market share. One of the key determinants of horizontal FDI is a large market, which implies that a country has a high consumption potential. As a result, foreign companies are motivated to invest in different sectors to meet the needs of distinctive groups of consumers. Nations with a larger consumer market have higher FDI inflows compared to countries with small markets (Ranjan and Agrawal, 2011). Some of the main determinants of a country's market size include Gross Domestic Product (GDP) (Tintin, 2013). The factors have significant influences on FDI inflows since they indicate the market size of consumers in different countries (Lankes and Venables, 1996). However, Asiedu (2002) and Hollan and Pain (1998) find that the size of the host country's

market and economic development have a negligible effect on FDI inflows. Despite these conflicting views, the first hypothesis is:

H1: A larger market size of the host country attracts more FDI

3.2.2 FDI inflows and Wage (Labor Costs)

The H-O-S model assumes that a labor abundant country has a comparative advantage in the labor-intensive goods. Thus, the flows of FDI to the countries with lower wage rates, which commonly constitute developing countries. High labor costs in the host country drive companies to develop production facilities in foreign countries where they can access cheaper human resources. Therefore, high labor costs in the host country result into an increase in production expenses that make other countries attractive to foreign investors. Lankes and Venables (1996) state that the level of labor costs in every country can be estimated through calculation of the wage rate.

Furthermore, Jaumotte (2004) finds that some of the FDI in developing countries is driven by cheaper labor costs which can lead to an increase of FDI. This form of FDI is also known as "vertical FDI". Vertical FDI incorporates removing to the developing country the labor-intensive stages of the production process in order to benefit from lower labor cost. The labor costs advantage that may arise is only benefited by FDI that is in need of low quality labor. For other types of FDI, quality labor is more important than cheap labor. For example, firms that produce differentiated goods and are in search of new markets need local staff that will be able to operate the production technology used in the source country. Taking this into consideration, the empirical evidence on the relationship between labor costs and FDI inflows leads to contradicting results.

H2: Lower labor cost in the host country will drag FDI into the country

3.2.3 FDI inflows and Infrastructure

Well-developed infrastructural facilities often indicate the level of economic growth that nations experience. They also offer opportunities for foreign investors to venture into different sectors in the host country. As a result, nations that have opportunities to attract FDI

stimulates economic growth through investment in infrastructure (Ranjan and Agrawal, 2011).

H3: A good infrastructure in the host country leads to greater FDI inflow.

3.2.4 FDI inflows and Economic Stability

A country with stable macroeconomic conditions and high and sustained growth rates will receive more FDI inflows than a more volatile economy. The proxies measuring the economic stability is Inflation rate (Duran, 1999; Dasgupta and Ratha, 2000). According to Charkrabarti (2001), inflation is also an indicator of the potential risk in a foreign market. Since a high inflation rate is an indicative of the budgetary imbalance and ineffective monetary policy. Investors seek countries with economic stability since such countries have low economic risk and therefore high inflation rate is associated with low FDI inflows (Vijayakumar, Sridharan, and Rao, 2010). As a result, the empirical hypothesis for inflation is:

H4: Stable macroeconomic conditions with high and sustained growth rates attract FDI to the host country

3.2.5 FDI inflows and Trade Openness

Mundell (1957) expands on the H-O-S model by expounding on the effects that government intervention in international trade has on international trade, such as tariff jumping. Restrictive policies generally attract higher horizontal FDI since MNEs will seek to mitigate the high export costs. Conversely, flexible international trade policies enhance global trade and largely attract vertical FDI. The UNCTAD framework considers trade openness as proxy to a country's international trade policy as argued by Vijayakumar et al (2010).

In addition, Dunning (1994) contends that a high trade openness is positively associated with FDI inflow. According to Gastanaga, Nugent and Pashamova (1998), trade openness has different effects on FDI contingent on the form of investment. Horizontal FDI is associated with low trade openness due to high trade restrictions and trade barriers which leads to the development of production sites in foreign markets. This is predicated on the tariff jumping hypothesis that contends that foreign firms seeking to enter local markets will establish subsidiaries if they find it difficult to import their products to the host country. Conversely,

MNEs engaging in vertical FDI will seek countries with high trade openness in order to avoid the high transaction and export costs associated with trade protection in countries with low trade openness (Wheeler and Mody, 1992). Trade openness is the ratio of total trade (exports plus imports) divided by GDP. Therefore, the empirical hypothesis for trade openness is:

H5: A positive and significant relationship between FDI inflows and Trade openness

3.2.6 FDI inflows and Natural Resources

The OLI framework identifies location as elemental to facilitating firms to have access to resources in a foreign country. In addition, the framework underscores the utility of local resources gained through internalization as pivotal to facilitating FDI. Bevan, Estrin, and Meyer (2004) emphasize that countries with natural resources such as gas and oil attract more foreign investors than less endowed nations. Besides, the availability of natural resources is one of the main determinants of the location of enterprises that foreign investors establish in host countries (Dunning & Lundan, 2008). However, various theories oppose the view that natural resources contribute to an increase in the flow of FDI. Corden and Neary (1982) test the Dutch disease theory, which postulates that the manufacturing sector usually declines in productivity as a result of an increase in income from gas and oil.

"Dutch disease" explains the causal relationship between the development of an economic sector and the overall decline in economic growth. The phenomenon is exemplified in the challenges that the Dutch economy experienced after discovering large gas reserves in 1959. While the quality of the country's exports increased, there was a significant inflow of foreign currency, which led to an appreciation of the domestic currency, effectively leading to a decline in the overall price competitiveness of the country's exports in the global market. As a result, the unemployment rate increased from 1.1% to over 5% in the 1970s (Bevan et al., 2004). In addition, corporate growth declined rapidly during this period, while wages increased sharply as the high wage rate in the gas and oil sector spilled over into other sectors. Consequently, other sectors of the country's economy were less attractive to foreign investors due to an increase in the foreign exchange and operational costs, resulting in a significant decline in FDI. Dutch disease is often used to refer to the negative economic impact that results from a significant increase in foreign earnings which lowers the overall competitiveness of a nation's exports in other industries. The phenomenon applies to FDI in

that FDI inflows decline as the value of a country's domestic currency increases due to the significant increase in the global demand of its natural resources.

H6: FDI inflows are negatively associated with a country's endowment of energy resources.

3.2.7 FDI inflows and Good Governance

Political and institutional factors that determine a country's business environment affect FDI. According to Rodrik and Subramanian (2004), good governance in the host country increases FDI inflows because companies are assured of a stable regulatory framework that protects their interests as well as the well-being of consumers. In contrast, Acemoglu and Simon (2005) indicate that weak institutions promote corruption that increases the cost of business operation for foreign companies besides limiting the productivity of investment options.

Bussee and Hefeker (2007) note that foreign companies prefer to sign long-term contracts that allow them to avoid uncertainty resulting from various institutional activities in the host country. Therefore, the stability of public systems and effectiveness of the rule of law are essential components of strategies that countries employ to increase FDI inflows.

H7: A positive and significant relationship between FDI inflows and Good governance

4. Data and Methodology

4.1 Data

The data set consists of yearly observations for the period 1990-2016 for the BRICS. As there are limited data for Russia and South Africa before 1990, this study makes use of data from 1990 onwards. The required data set was obtained from the World Bank. The dependent variable in this study is FDI inflows in US$ dollar in each BRICS countries Meanwhile, the independent variables are:

Table 1 Independent variable definitions

Variables	Definition	Sources
GDP	Market size refers to all the final goods and services consumed domestically in a given year. It is the sum of gross value added by all residents in a country plus any taxes minus subsidies.	World Bank
Inflation	It refers to the economic stability of a country.	World

		Bank
Trade Openness	It refers to the ratio of exports plus imports divided by GDP.	World Bank
Infrastructure	It refers to the electric power consumption (kWh per capita). This equals to the amount of production in power plants and the combined heat and power plant less transmission, distribution, and transformation losses and own use by heat and power plants.	World Bank
Natural Resources	The share of total natural resources in GDP (expressed in percentage).	World Bank
Wage	Worker's remittances and the compensation received by employees denoted in US$.	World Bank
Good Governance	It measures the six governance and institutional-related indicators from the World Bank's development indicators namely: control of corruption, voice and accountability, regulatory quality, political stability and absence of violence/terrorism, government effectiveness, and the rule of law.	World Bank
Crisis Dummy	Is a dummy variable referring to the year of crisis.	

Note: *Data on Good Governance for 1990-1995, 1997, 1999 and 2001 are missing. Therefore, the time series starts from 1996.*

4.2 Methodology

We use panel data estimation to observe the FDI inflows of the BRICS countries using time series observations that span from 1990-2016. Panel data is a combination of time series and cross-sectional data. Panel data analysis is suitable for studying FDI because it is able to generate two-dimensional information that cannot be otherwise obtained through pure time series or cross-sectional assessments (Baltagi & Kao, 2001). Panel data analysis facilitates a higher level of accuracy in model parameter inferences considering that panel data has more degrees of freedom and higher sample variability as compared to cross-sectional data. Hsiao, Mountain & Ho-Illman (1995) suggested that the econometric estimates obtained through panel data are more accurate due to the efficiency in estimating the parameters and the reduction in the influence of omitted variable bias.

Furthermore, panel data regression can be used in cases where the availability of time series and/or cross-sectional data is limited. It helps these cases because we can increase the sample

size when our time series or cross-sectional dimension is constrained. Belsley (1991) points out that model specification requires the classification of the effect of each variable in order to prevent multicollinearity. However, panel data captures intertemporal information of individual subjects that can be used to control for latent and omitted variables. This relationship cannot be uncovered using only cross-sectional or time series data and as a result, panel data is also considered effective in detecting dynamic relationships.

Economic activities are innately dynamic and time series estimations generally require time adjusted data in order to control for collinearity (Nerlove, 2002). Panel data analysis mitigates this and gives a more accurate time adjustment estimates. Identifying the determinants of FDI using panel data is effective since it controls for potential missing or unobserved variables, and limits collinearity. In addition, it is possible to generate more accurate FDI predictor coefficients for individual BRICS economies by grouping the data, unlike time series data, which only generates the predictors of an individual economy using data specific to the economy. If the economic behavior of the BRICS is similarly contingent on the hypothesized variables, the economic behavior of an individual economy can be discerned from the economic behavior of the other economies using panel data. As a result, panel data allows for more accurate depiction of a country's economic behavior since it is possible to supplement the observations an economy with data on other similar or related economies.

Panel data also offers a large number of observations that expand variability in the study of different events. Since it captures micro unit details that facilitate comprehensive analysis of data. For instance, it facilitates aggregating and disaggregating data analysis across heterogeneous micro units which cannot be achieved using time series data. These further underscores the significance of panel data in policy evaluation since unlike panel data; the findings from aggregate data analysis are highly accurate and provide comprehensive information. Consequently, the panel data is effective in predicting the aggregate unit and micro unit outcomes based on aggregate data. Implying that the FDI data in this study encompasses time series observations for the BRICS economies, and therefore has inter-observational heterogeneity and minimal homogeneity.

The main approaches used in the modelling of panel data are:

4.2.1 Fixed Effects Model

A fixed effects model, also referred to as the Least Squares Dummy Variables (LSDV) model, considers group-specific constant values instead of an overall constant value for the model. The model includes a dummy variable that represent each group, i.e. each of the economy being considered. The model is:

$$y_{i,t} = \alpha + \beta 1 Xi_{i,t} + \cdots + \beta n Xi_{i,t} + \mu_i + \varepsilon_{i,t} \quad (1)$$

Where,

$y_{i,t}$ is the dependent variable at country *i* at time *t*.

α is the constant.

$Xi_{i,t}$ is the independent variable at country *i* at time *t*.

μ_i is the dummy variable for a specific country *i*.

$\varepsilon_{i,t}$ is the error term.

4.2.2 Random Effects Model

The Random effects model is an alternative approach of estimation in which the constant for each section is regarded as random instead of a fixed value. The intercepts for each cross-sectional value have common part indicated as α, which is constant for all cross-sectional units. In contrast, the random variable μ_i is utilized to assess the random deviation of every entity's intercept value from α. The model is:

$$y_{i,t} = \alpha + \beta 1 Xi_{i,t} + \cdots + \beta n Xi_{i,t} + \omega_{i,t} \quad (2)$$

Where, $\omega_{i,t} = \mu_i + v_{i,t}$

$y_{i,t}$ is the dependent variable at country *i* at time *t*.

α is the constant.

$Xi_{i,t}$ is the independent variable *i* at country *i* at time *t*.

μ_i is within-entity error.

$v_{i,t}$ is between-entity error.

There are no dummy variables in the random effects model to capture the heterogeneity in the cross-sectional dimension, which occurs through the μ_i terms. The parameters α and β are estimated consistently based on generalized least squares (GLS). GLS has an asymptotic efficiency, given it provides lower estimated variance, and is preferred to OLS in highly heteroscedastic or autocorrelated samples.

Moreover, random effects model is appropriate when randomly sampling from a large number of countries, but otherwise in our case the number of countries is certainly not randomly sampled. Thus, the fixed effects assumption is more appropriate in this study.

4.2.3 Common Constant Method

Common constant method, also known as the pooled OLS method, estimates results under the principal assumption that there are no differences among the data matrices of the cross-sectional dimension (N). In the panel data analysis, the fixed effects model assumes that each country differs in its intercept term, while the random effects model assumes that each country differs in its error term. The fixed effects model is considered to be more effective when the panel data is balanced. Otherwise, the random effect method is considered to be more appropriate.

4.2.4 Hausman Test

The Hausman test is oftentimes used to choose between the fixed effects and random effects models. Asterious & Hall (2006) recommended that the necessity to understand the disparities between fixed effects and random effects models prior to selecting one of them. The specification test is used to determine whether the unobserved error component is exogenous with respect to the premise that if there is no correlation (H_0), then the ordinary least square (OLS) or the Generalized Least Square (GLS) of the random effects model are consistent. Therefore, the random effects model is more effective in analyzing the panel data if individual time-specific effects and/or constant are uncorrelated with the explanatory variables. The alternative hypothesis (H_1) is that OLS of the fixed effect model is consistent but the GLS of the random effects model is not consistent. This implies that the fixed effects model is suitable for the analysis and that the random effect model produces biased estimators, effectively violating one of the Gauss-Markov assumptions (Hausman, 1978).

The BRICS countries have similar economic characteristics, implying a high probability that the unobserved individual effects and the determinants of FDI in each country are correlated. However, to specifically determine whether to use a fixed or random effect model, we use the Hausman test, which is specified as follows:

The Hausman Test formula:

$$H = (\beta_1 - \beta_0)'[Var(\beta_1) - Var(\beta_0)]^{-1}(\beta_1 - \beta_0) \quad (3)$$

Related to the hypotheses of Hausman test, Asterious & Hall, (2006) point out that the OLS of the fixed effect model (β_1) and the GLS of the random effects model (β_0) are considered as estimators and therefore for H_0, β_0 and β_1 equally exhibit consistency, but only β_0 is efficient, then we use the random effects model. Conversely, for H_1, β_1 exhibits both consistency and efficiency while, β_0 is inefficient, then we use the fixed effects model. The hypotheses for Hausman test can therefore be expressed as:

H_0 = *p*-value > α = β_0 and β_1 are consistent, β_0 is efficient

Conclusion: Use random effects model

H_0 = *p*-value < α = β_1 is consistent and efficient, β_0 is inefficient

Conclusion: Use fixed effects model

Prior to implementing the model, it is essential to ensure that all the variables are stationary since stationary time series are not affected by short term variations and tend to defer to long-run means over time. In contrast, the mean values of non-stationary time series are time-dependent and therefore unstable at level. It is also important to ensure that the time series data is cointegrated which ensures that the variables have a similar order of integration of the same order and do not have any serial correlation. The Augmented Dickey-Fuller (ADF) test is the most common method for the cointegration test to see the long-run relationship between variables.

Specifically, this thesis estimates the following regressions to test the hypotheses:

Fixed Effect Model 1:

$$LFDIinflow_{i,t} = \alpha_i + \beta_1 LRGDP_{i,t} + \beta_2 LWage_{i,t} + \beta_3 Infrastructure_{i,t} + \beta_4 Inflation_{i,t} + \beta_5 TradeOpenness_{i,t} + \beta_6 NaturalResources_{i,t} + \beta_7 GoodGovernance_{i,t} + \gamma_1 CrisisDummy_i + \varepsilon_{i,t} \quad (4)$$

Where,

$LFDIinflow_{i,t}$ is the logarithm of the net inflows of Foreign Direct Investment (in current US$) for country i at time t.

$LRGDP_{i,t}$ is the logarithm of Gross Domestic Product in current US$ for country i at time t and is the measure of market size.

$LWage_{i,t}$ is the logarithm of the worker's remittances and compensation of employees received in US$ for country i at time t.

$Infrastructure_{i,t}$ is the infrastructure for country i at time t.

$Inflation_{i,t}$ is the Inflation rate for country i at time t.

$TradeOpenness_{i,t}$ is the trade openness for country i at time t.

$NaturalResources_{i,t}$ is the share of natural resources for country i at time t.

$GoodGovernance_{i,t}$ is the Governance indicator for country i at time t.

$CrisisDummy_i$ is a dummy variable to control for aggregate macro influences for country i.

Fixed effect Model 2:

We also consider lags of several of the variables to account for the influence of previous year on the current year of foreign direction inflow of the current year. Specifically, the study considers the first difference of GDP, wage, and good governance.

$$LFDIinflow_{i,t} = \alpha_i + \beta_1 LRGDP_{i,t-1} + \beta_2 LWage_{i,t-1} + \beta_3 Infrastructure_{i,t} + \beta_4 Inflation_{i,t} + \beta_5 TradeOpenness_{i,t} + \beta_6 NaturalResources_{i,t} + \beta_7 GoodGovernance_{i,t-1} + \gamma_1 CrisisDummy_i + \varepsilon_{i,t} \quad (5)$$

Where,

$LRGDP_{i,t-1}$ is the one-period lagged value of the logarithm of Gross Domestic Product for country i at time t and is the measure of market size.

$LWage_{i,t-1}$ is the one-period lagged value of the logarithm of Wage for country i at time t.

$GoodGovernance_{i,t-1}$ is the one-period lagged value of the logarithm of good governance for country i at time t.

Fixed Effect Model 3:

Similar to Model 2, we introduced more lagged variables in Model 3. The lags of infrastructure and FDI are introduced based on the conjecture that an increase in GDP, wage, good governance, infrastructure, and FDI at time *t-1* result in higher FDI at time *t*. Consequently, the model can be expressed as:

$$LFDIinflows_{i,t} = \alpha_i + \beta_1 LRGDP_{i,t-1} + \beta_2 LWage_{i,t-1} + \beta_3 LFDIinflows_{i,t-1} + \beta_4 Infrastructure_{i,t-1} + \beta_4 Inflation_{i,t} + \beta_5 TradeOpenness_{i,t} + \beta_6 NaturalResources_{i,t} + \beta_7 GoodGovernance_{i,t-1} + \gamma_1 CrisisDummy_i + \varepsilon_{i,t} \quad (6)$$

Where,

$Infrastructure_{i,t-1}$ is the one-period lagged value of the infrastructure for country i at time t.

$LFDIinflow_{i,t-1}$ is the one-period lagged of the logarithm of FDI inflows for country i at time t.

Based on the hypotheses in section 3, we conjecture the following signs for the coefficients: According to the previous literature (Lankes and Venables, 1996; Tintin, 2013), we expect $LRGDP_{i,t}$ to be positively related to $LFDIinflow_{i,t}$. Since market size is a precursor to FDI inflows to the host country. However, we are unsure about the result of $TradeOpenness_{i,t}$ because a higher level of trade openness leads to fewer opportunities for foreign investors. A high rate of free trade will attract a large number of new investors to the market, which will increase competition and lead to decreasing in opportunity for the foreign investors to gain from trade. However, previous literature (Lankes & Venables, 1996) finds that trade openness has a positive effect on $LFDIinflow_{i,t}$. Thus, we expect the trade openness has a positive effect on the FDI inflows. Furthermore, we expect that $Inflation_{i,t}$ has a negative effect on $LFDIinflow_{i,t}$. Since it is an indicator of higher cost of inputs, higher production costs and overall economic instability, all of which have negative effects on the FDI inflows of a country. $Infrastructure_{i,t}$ should have a positive effect on FDI inflows. This is contingent on previous studies which show that (Rehman, 2011; Kaur, Khatua and Yadav, 2016) infrastructure is considered a public good and therefore infrastructure growth reduces operational costs and maximizes productivity especially for private firms by reducing transportation costs and increasing accessibility within an economy. As public goods, infrastructure further reduces the cost of doing business particularly among foreign firms, resulting in higher earnings and conversely increased level of investment.

While Akpan et al., (2014) found that there is no relationship between good governance and FDI inflow. $GoodGovernance_{i,}$ is anticipated to be positively related to $LFDIinflow_{i,}$ since it is an assurance to foreign investors of a stable regulatory framework that protects their interests as well as the well-being of consumers. This implies that economies that maintain high institutional governance standards attract foreign investors due to the impartial business policies within the host country. Moreover, we expect that $NaturalResources_{i,t}$ has a negative effect on FDI inflows. We believe the exports of minerals, gas and oil increases the

amount of foreign currency, which increases the value of the local currency. Consequently, existing business opportunities will be less attractive to foreign investors due to high investment costs, as well as costs of running businesses. Moreover, we expect $LWage_{i,t}$ has a negative impact on FDI inflows given that high labor costs drive companies to develop production facilities in foreign countries where they can access affordable human resources. Lastly, the crisis dummy variable is expected to have a negative relationship with FDI inflows. This is contingent on the fact that the occurrence of a financial crisis is indicative of economic instability evidenced by decreased consumption and high unemployment. A financial crisis will also trigger a decline in the circular flow of income as a result of a decline in the aggregated disposable income in the economy. Therefore, foreign investors are less likely to be attracted to countries with uncertain economic conditions since they do not present sufficient opportunities for growth in investment.

The expected direction of the relationships with FDI is summarized in the table below:

Variables	**Expected sign**
Real GDP	+
Infrastructure	+
Inflation	-
Natural Resources	-
Wage	-
Trade Openness	+
Good Governance	+
CrisisDummy	-

5. Results

Section 5 presents the result of our analysis on relationship between the stated economic indicators and FDI in BRICS economies. The chapter starts with the investigation whether the variables that are included in the analysis are stationary based on panel unit root test. A panel cointegration test is then considered. Finally, the regression results of the panel data are discussed.

5.1 Panel Unit Root Test

The stationarities of LRGDP (the logarithm of Real GDP) and LWage (the logarithm of wage) are tested based on the panel unit root test. Variables need to be stationary to eliminate possible spurious relationship between the predictor and predicted variables (Hill et al., 2011). Agrawal (2015) notes that panel unit root test is effective to test whether a variable is stationary. If the variables are non-stationary then take the first differences and repeat the test. To ease economic interpretation of the investigated variables, we have taken the natural logarithm of some variables. Doing so, non-stationary issue should not arise. These two variables were nevertheless tested using the Augmented Dickey Fuller (ADF) test.

Table 2 Unit root test

Variables	Statistic	Prob	Obs
LRGDP	3.1654	0.9773	123
LWage	11.9714	0.2870	121

Table 2 shows the result of the unit root test. LRGDP and LWage are non-stationary at zero order and therefore first-order differencing is applied to make these variables stationary. First-order differencing was done by computing the differences between successive observations, with the aim of stabilizing the variance and the mean of the time series by eliminating level changes resulting from trends, non-periodic cycles and seasonality. The ADF test was then run on the transformed data and the results indicate that these series are stationary at the 5% level of significance (Table 3).

Table 3 Stationary variables

Variables	T-stat	P-value	No. of Panel	Stationary
DLRGDP	27.2622*	0.0024	5	YES
DLWage	67.7091*	0.0000	5	YES

*Note: * indicates significance level at 1% level.*

Furthermore, we check whether all other variables are stationary. Table 4 provides the results of the tests. The results indicate no non-stationary issues. This implies that these variables have constant means and variances and that their time series tend towards equilibrium.

Table 4 Unit root test on all variables

Variables	Statistic	Prob	Obs	Stationarity
LFDIinflows	34.1743*	0.0002	122	YES

DLRGDP	27.2622*	0.0024	118	YES
DLWage	67.7091*	0.0000	116	YES
Infrastructure	21.3925**	0.0185	110	YES
Inflation	42.4110*	0.0000	122	YES
TradeOpenness	26.3155*	0.0033	123	YES
NaturalResources	65.8877*	0.0000	120	YES
GoodGovernance	18.9040**	0.0415	65	YES
CrisisDummy	21.1225**	0.0203	125	YES

*Note: * denotes significance level of 1%; ** denotes significance level of 5%.*

5.2 Panel Cointegration Test

Cointegration is a statistical property of time series variables whereby two or more time series are considered to be cointegrated if they share a common stochastic drift (Agrawal, 2015). When two or more non-stationary time series, such as LRGDP and LWage, become stationary after being differenced ($I(1)$), it might be that their linear combination in levels is stationary ($I(0)$) and might therefore be cointegrated based on a *long-run equilibrium* relationship. Economic time series are generally comprised of long-term trends and therefore cointegration testing involves quantitatively measuring the sensitivity of two or more variables to a similar mean over a period of time. Consequently, cointegration is essentially a measure of the distance between two variables over time, which if not present, can indicate a spurious regression analysis results, as shown by the high R^2 and low Durbin-Watson statistic. The panel data was tested for cointegration to determine whether there are common long run relationships among variables. Pedroni (1999) identifies seven different statistical tests for analyzing unit roots in the residuals of postulated long-run relationships. The first four tests, namely: Panel v-statistic, Panel rho-statistic, Panel PP-statistic and Panel ADF-statistic refer to panel cointegration test statistics, while the last three, namely; Group rho-statistic, Group PP-statistic and Group ADF-statistic are known as group mean panel cointegration test statistics.

Table 5 Constructing Cointegration variable

Variable	**Coefficient**
LWage	0.4459*
	(0.0394)
Constant	17.6901*
	(0.8545)
No of Countries	5
No of Observations	131

R-squared	0.5032

*Note: * denotes significance level of 1%; ** denotes significance level of 5%; *** denotes significance level of 10%*

Firstly, we have to make sure that real GDP and wage variables are cointegrated. The method that we used in this study to prove that real GDP variable is cointegrated with wage variable is 2-steps Engle-Granger Cointegration test with OLS. The first step of the procedure is to test the log of real GDP and the log of wage using OLS regression. In the second step, the stationarity of the residuals of the regression model in step 1 is tested using an ADF test.

Table 5 shows that the regression results for the log of GDP and the log of wage. The log of wage is statistically significant and has a positive relationship to the log of GDP. The model has an R^2 of .50. Furthermore, the unit root test is performed on the residual of the regression model. The results are shown in Table 6. All tests have statistically significant results at the 5% level, implying cointegration between GDP and wage. It is not surprising that GDP and wage are cointegrated given that GDP as a measure of national income accounts for wages and salaries, along with rent, interest, and profit. Consequently, an increase or decrease in GDP value is also reflected in wages, indicating a long-run linear equilibrium in the relationship of these variables.

Table 6 Root test on residual of regression Table 5

Method	Statistic	Prob	No of Panel	obs
Im, Pesaran and Shin W-stat	-0.07829**	0.0468	5	121
ADF - Fisher Chi-Square	11.8013**	0.0298	5	121
PP - Fisher Chi-square	11.2272**	0.0341	5	126

*Note: Panel ADF test on residual of regression Table 6; * indicates significance level at 1% level*

5.3 Results

In this section, the Hausman test and all the regression models are discussed.

5.3.1 Hausman Test

Hausman test is performed to determine which models are the most appropriate for the analysis. Table 7 shows the result of the Hausman test. The result suggests that the fixed effects model is appropriate for modeling the relationship of FDI inflows and the explanatory variables ($chi^2 = 106$, $p < .01$). The results are in line with previous study using fixed effect model to capture unique characteristics of individual entities (Brealey, Myers, & Allen, 2011; Gujarati, 2003).

Table 7 Hausman Test

Variables	Coefficients			
	(b)	(B)	(b - B)	sqrt(diag(V_b - V_B)
	FE	RE	Difference	S.E.
DLRGDP	-1.2986	-0.3619	-0.9366	-
DLWage	-0.5889	-0.7247	0.1358	-
Infrastructure	0.0007	-0.00007	0.0008	0.0001
Inflation	-0.0757	-0.1326	0.0569	-
NaturalResources	0.0006	0.0002	0.0004	-
TradeOpenness	0.0040	-0.0017	0.0057	0.0007
GoodGovernance	-1.8266	-2.6527	0.8260	1.1284

Note:
Chi2(6) = 106.00
Prob>chi2 = 0.0000
Now we can continue to the regression results.

5.3.2 Regression Results

The result of the fixed-effects model 1, model 2, and model 3 is shown in Table 8. The results of model 1 show that only infrastructure, inflation, trade openness, and cointegration term are significant predictors for FDI inflows in BRICS. The lag of GDP, wage, FDI inflows, infrastructure, and good governance are used to eliminate potential autocorrelation within the variables in model 2 and 3.

Table 8 Regression Results

Dep. Var: LFDI Inflows	Fixed Effects Method		
	1	2	3
DLRGDP	-0.8220		
	(0.5983)		
DLWage	-0.3118		
	(0.1783)		
Infrastructure	0.0005*	0.0004*	
	(0.0001)	(0.0002)	
Inflation	-0.0529**	-0.0276**	-0.0156
	(0.0138)	(0.0104)	(0.0104)
TradeOpenness	0.0033*	0.0035*	0.0024***
	(0.0011)	(0.0014)	0.0014
NaturalResources	0.0007	0.0005	0.0007
	(0.0003)	(0.0004)	(0.0004)
GoodGovernance	-1.1742		
	(1.0733)		

CrisisDummy	0.1973	0.3706**	
	(0.1464)	(0.1677)	
Cointegration term	1.4559*	1.3355*	1.0051*
	(0.2565)	(0.2915)	(0.3022)
DLRGDP1		-0.9800	-0.5600
		(0.7052)	(0.6801)
DLWage1		0.3084	0.1907
		(0.1869)	(0.1838)
LFDIinflows1			0.2661*
			(0.1078)
Infrastructure1			0.0002*
			(0.0001)
GoodGovernance1		0.6961	1.1893
		(1.2056)	(1.0451)
Constant	20.9250*	20.7059*	15.4115*
	(0.6835)	(0.8647)	(0.9619)
No of Countries	5	5	5
No of Observations	80	75	80
R-squared	0.8539	0.8758	0.8883
F-stat	42.41	33.10	36.93
Prob (F-stat)	0.0000	0.0000	0.0000
Country FE	YES	YES	YES
Year FE	YES	YES	YES

*Note: * denotes significance level of 1%; ** denotes significance level of 5%; *** denotes significance level of 10%*

The result in model 2 shows that infrastructure, inflation, trade openness, and crisis dummy have significant influence on FDI inflows in BRICS. Moreover, the lagged FDI inflows and the lagged infrastructure have significant influence on FDI inflows in BRICS, as shown in model 3. The R^2 for model 1, 2, and 3 are 85%, 87%, and 88% respectively.

Table 9 Correlation Matrix Model 1

	DLRGDP	DLWAGE	INFR	INFL	TO	NR	GG	CD	Coint
DLRGDP	1.00								
DLWAGE	0.20	1.00							
INFR	-0.02	0.03	1.00						
INFL	-0.21	-0.03	0.26	1.00					
TO	0.04	0.14	0.48	0.11	1.00				
NR	0.24	0.08	0.74	0.35	0.48	1.00			
GG	-0.17	-0.07	-0.12	-0.21	-0.17	-0.49	1.00		

CD	-0.16	-0.17	-0.02	0.04	-0.07	-0.01	0.01	1.00	
Coint	-0.10	-0.22	0.49	0.11	0.03	0.11	0.14	0.06	1.00

Note:
DLRGDP: The difference of real GDP
DLWage: The first difference of Wage
INFR: Infrastructure
INFL: Inflation
TO: Trade Openness
NR: Natural Resources
GG: Good governance
CD: Crisis dummy
Coint: Cointegration term

Table 10 Correlation Matrix Model 2

	DLRGDP1	DLWAGE1	INFR	INFL	TO	NR	GG1	CD	Coint
DLRGDP1	1.00								
DLWAGE1	0.20	1.00							
INFR	0.02	0.03	1.00						
INFL	-0.40	0.08	0.22	1.00					
TO	-0.01	0.15	0.46	0.26	1.00				
NR	0.25	0.13	0.76	0.32	0.47	1.00			
GG1	-0.19	-0.05	-0.13	-0.20	-0.17	-0.50	1.00		
CD	-0.25	-0.12	-0.07	0.17	-0.17	-0.08	0.02	1.00	
Coint	-0.06	-0.25	0.51	0.02	0.02	0.12	0.17	0.10	1.00

Note:
DLRGDP1: lagged T-1 difference logarithm real GDP
DLWage1: lagged T-1 difference logarithm Wage
INFR: Infrastructure
INFL: Inflation
TO: Trade Openness
NR: Natural Resources
GG1: lagged T-1 Good governance
CD: Crisis dummy
Coint: Cointegration term

Table 11 Correlation Matrix model 3

	DLRGDP1	DLWAGE1	LFDIINFLOWS1	INFR1	INFL	TO	NR	GG1	CD	Coint
DLRGDP1	1.00									
DLWAGE1	0.20	1.00								
LFDIINFLOWS1	0.20	0.01	1.00							
INFR1	-0.02	0.03	-0.20	1.00						
INFL	-0.40	0.08	-0.19	0.23	1.00					
TO	-0.01	0.14	-0.20	0.45	0.25	1.00				
NR	0.24	0.12	-0.02	0.73	0.33	0.47	1.00			
GG1	-0.17	-0.07	-0.52	-0.12	-0.21	-0.15	-0.49	1.00		

CD	-0.20	-0.12	-0.09	-0.07	0.17	-0.16	-0.04	0.02	1.00	
Coint	-0.07	-0.24	-0.08	0.50	0.03	0.02	0.13	0.19	0.11	1.0

Note:
DLRGDP1: lagged T-1 difference logarithm real GDP
DLWage1: lagged T-1 difference logarithm Wage
LFDIinflows1: lagged T-1 logarithm of FDI inflows
INFR1: lagged T-1 Infrastructure
INFL: Inflation
TO: Trade Openness
NR: Natural Resources
GG1: lagged T-1 Good governance
CD: Crisis dummy
Coint: Cointegration term

To check the appropriateness of the model, correlation analysis is done to check for high correlation among variables. Table 9, 10, and 11 indicate that infrastructure and natural resources are highly correlated with correlation coefficients of 0.75 in model 1, 0.77 in model 2, and 0.73 in model 3. Natural resources are omitted from the model to account for potential high correlation with other variables. as we can see, after we omitted the natural resources variable, the remaining variables have low correlation coefficients as shown in Appendix 2, 3, and 4. The high positive correlation coefficients between infrastructure and natural resources might be due to the fact that natural resources serve as a gateway for foreign capital flows and increased exports. Obviously, the cash flows from natural resources enable BRICS countries to increase public expenditure and investment in critical infrastructure.

Table 12 Regression Results

Dep. Var: LFDI Inflows	Fixed Effects Method		
	1	2	3
DLRGDP	-0.2718		
	(0.5228)		
DLWage	0.3040		
	(0.1812)		
Infrastructure	0.0007*	0.0007*	
	(0.0001)	(0.0001)	
Inflation	-0.0570*	-0.0298*	-0.0180***
	(0.0138)	(0.0103)	(0.0111)
TradeOpenness	0.0044*	0.0050*	0.0037*
	(0.0010)	(0.0010)	(0.0011)
GoodGovernance	-1.2532		
	(1.0902)		
CrisisDummy	0.2547	0.1589	0.3455
	(0.1452)	(0.1589)	(0.1553)

Cointegration term	1.4284*	1.2920*	0.9908*
	(0.2606)	(0.2895)	(0.3058)
DLRGDP1		-0.5696	0.0419
		(0.6047)	(0.5764)
DLWage1		0.3206	0.2146
		(0.1870)	(0.1854)
LFDIinflows1			0.2722*
			(0.1091)
Infrastructure1			0.0002*
			(0.0001)
GoodGovernance1		0.4898	1.1547
		(1.1068)	(1.0576)
Constant	20.6209*	20.3353*	14.9437*
	(0.6733)	(0.8012)	(0.8747)
Country Dummies	**FE**		
2 (China)	-1.3086***	-0.3291	0.2300
	(0.7273)	(0.6318)	(0.6736)
3 (India)	-0.8414***	-0.4068	-0.0042
	(0.4964)	(0.5131)	(0.4471)
4 (Russia)	-6.7045*	-5.3710*	-2.5365**
	(1.1123)	(0.8755)	(1.2553)
5 (South Africa)	-5.7490*	-7.5047*	-4.0514*
	(0.7638)	(0.7150)	(0.9675)
No of Countries	5	5	5
No of Observations	80	75	80
R-squared	0.8828	0.8732	0.8890
F-stat	44.20	35.61	38.62
Prob (F-stat)	0.0000	0.0000	0.0000
Country FE	YES	YES	YES
Year FE	YES	YES	YES

*Note: * denotes significance level of 1%; ** denotes significance level of 5%; *** denotes significance level of 10%*

A model without natural resources variable can be found in Table 12. We omitted the natural resources variable because of high correlation with the infrastructure variable as the correlation matrix shown above. As we can see in Table 12 column 2, infrastructure, inflation, trade openness, and cointegration term are significant influence for FDI inflows. The regression results show that (Country 1 = Brazil; which by default has the constant term at 20.6209, on average) China, India, Russia, and South Africa received significantly less FDI as compared to Brazil. The regression results in model 2 also show that infrastructure,

inflation, trade openness, and cointegration term have significant influence on FDI inflows in BRICS. The country fixed effects indicate that Russia and South Africa receive significantly less FDI as compared to Brazil. No significant difference of fixed effect dummy of China and India on FDI.

Moreover, the regression results in model 3 (see Table 12 column 4) shows that the lagged FDI inflows, the lagged infrastructure, inflation, and trade openness have significant influence on FDI inflows. No significant results are observed for the rest of the variables. There is a positive, but insignificant relationship between the market size and FDI inflows. This finding contradicts the proposed hypothesis 3.1 and also findings from previous studies (Lankes & Venables, 1996; Tintin, 2013). This suggests that the consumption behavior does not have influence on FDI inflows in BRICS countries. The findings might be due to the fact that the variable specifically refers to lagged first differences of the real GDP which implies that it takes time for the market to have a significant impact on the FDI inflows in the BRICS countries. Furthermore, the findings do not provide evidence on the influence of labor market on FDI inflows. The result shows that wage has a positive, but insignificant, influence on FDI inflows, contrary to our hypothesis. There are several factors that prevented FDI from entering into a country with cheap labor. For instance, a company with differentiated products may prefer quality over quantity workers and thus establish operations in a country with high wage rates (Dunning, 2008).

Furthermore, the LFDIinflows1 has a positive and significant influence on FDI inflows (c = .2722, p-value < 0.01). An increase in the logarithm FDI inflows in previous year can be associated to an increase in FDI inflows in the current year by 0.27%. This finding indicates that foreign investors invest in BRICS countries based on the previous year economics condition and the general quality of the business climate in these countries (Kinoshita & Mody, 1997). Moreover, there is evidence that the lagged infrastructure can be associated to the FDI inflows. This relationship is positive and statistically significant (c = .0002, p-value < 0.01). This suggests that countries with well development infrastructure are more likely to attract FDI, in line with the hypothesis. One unit increase in infrastructure leads to a 0.02% increase in FDI inflows. The relationship between FDI inflows and lagged infrastructure is well documented in previous studies. For instance, Ranjan and Agrawal (2011) indicated that investing in infrastructure reduces the costs of doing business, and thus provides opportunities for MNEs to increase their productivity and profitability. Infrastructure is also

deemed important for long-term business success as it enables global firms to utilize modern technology to gain competitive edge. Moreover, economic stability can affect FDI inflows, as shown by the significant negative relationship between inflation and FDI inflows (c = -.0180, p-value < 1%). An increase in one unit of inflation leads to a decrease in FDI inflows by 2%. A high inflation rate in a country makes the country unattractive for foreign investors to invest in (Brooks, 2008). In addition, inflation can be a strong indicator of stagnated economic growth in the future. This can reduce the confidence of foreign investors and their willingness to invest more capital into an economy.

Trade openness is a significant factor influencing FDI inflows in BRICS countries. There is a positive and significant influence of trade openness on FDI inflows, which is in line with the hypothesis (c = .0037, p-value < 0.01). A unit increase in trade openness can be associated to a 3.7% change in FDI inflows. The significant positive links between FDI inflows and trade openness have been previously investigated (e.g. Resmini, 2000). For example, liberal policies have been known to promote not only exports, but also imports (Schutter et al., 2013; Lee et al., 2010). China is a prominent example in which a decision to open trade leads the country to be one of the leading import and export countries in the world. Countries need to maintain high trade openness to allow their trade partners to build trust in them which will lead to an increase in FDI inflows.

Moreover, good governance is also known to have significant influence on FDI inflows (Rodrik & Subramanian, 2004). However, the results contradict the initial hypothesis that good governance is positively related to FDI inflows. The non-significance finding seems to suggest that good governance is not a necessary and sufficient condition for attracting FDI and government needs to do more than merely relying on good governance to attract more investors (Gugler & Brunner, 2007). This could be in a form of the establishment of critical infrastructure to support businesses and the implementation of effective macroeconomic policies in order to promote the all-important economic stability (Verbeek, 2008). However, it is important to note that the findings do not mean that BRICS countries should adopt unethical business processes. The insignificant result might be due to the sample size and the missing data.

Additionally, there is an insignificant association between FDI inflows and the crisis dummy. Economic crises do not seem to affect the ability of the BRICS countries to attract foreign

investors. While this argument rather counterintuitive, the results might be driven by the fact that BRICS countries were not negatively affected by the recent global financial crisis. These countries might have managed to develop and adopt effective measures to deal with the problem by, for instance, limiting access to risky credits and establishing elaborate regulatory frameworks to prevent and control unethical practices of money laundering and speculation. Moreover, the fact that these economies share virtually similar characteristics, such as high growth rates and growing consumer market, can potentially explain the reason for the insignificance result. Furthermore, the cointegration term variable shows that there is a positive significant association between these variables and FDI. Increases in the cointegration term of GDP & Wage lead to an increase to FDI inflows. The cointegration term variable is for controlling the national income.

According to the country fixed effects in Table 12 column 4, the regression of FDI inflow on country dummies (Country 1 = Brazil; which by default has the constant term at 14.9437, on average) shows that Russia and South Africa received significantly lower FDI as compared to Brazil. India also received lower FDI while China received higher FDI as compared to Brazil, but the results are not statistically significant.

Moreover, the results indicate that the third model has the highest model fit as compared to other models. The R^2 of model 3 is 89% (see Table 12 column 4), which is higher than in Model 2 (87%) and in Model 1 (88%). R^2 indicates the goodness of fit of a model and therefore the higher R^2 shows a strong model fit.

6. Conclusion

Since the year of 2000, the BRICS economies have increasingly attracted FDI inflows while developed economies have witnessed a gradual decline in FDI during the same period. Despite the high volume of unskilled labor, technological gaps and inadequate infrastructure compared to developed countries, the BRICS are projected to increase their FDI growth rate to match or surpass the developed countries. Based on these facts, this study set out to examine the determinants of FDI inflows in BRICS from the period 1990 – 2016 using the panel data with fixed effects method.

The analysis of the BRICS was based on a theoretical framework based on four main FDI theories, namely, the Ricardian model, the H-O-S model, NTT and the OLI paradigm.

According to the theories, the BRICS have been attractive to international investors due to their low wage rate, low production costs, favorable international trade policies and technological gaps which offer significant potential benefits to MNEs. As a result, the theoretical perception of FDI is incorporation and movement of capital, technology, and management skills.

Our study found that lagged FDI inflows, infrastructure, stable macroeconomic condition, and trade openness are significant motives to FDI in BRICS countries. In contrast, we found that market size, wage (labor costs), good governance and financial crisis are insignificant motives for FDI in BRICS countries. The implication of the empirical results seems consistent with the different perceptions held by global investors on investment attributes of BRICS countries. BRICS countries need to maintain macroeconomic stability and improve the infrastructure development in order to remain competitive in international trade. Moreover, the BRICS need to improve their trade openness by eliminating trade barriers though measures such as tax incentives and deductions for trading goods.

The main challenge for the BRICS countries in sustaining their performance in FDI inflows is the implementation of liberal trade policies and the optimization of institutional governance quality to attract additional FDI agents in future. The BRICS countries retain promising prospects for FDI inflows due to their economic growth and stability, and therefore good infrastructure and trade openness will remain as the key determinants in future.

It is important to note that a limitation in this study is the scarcity of data particularly relating to good governance. The limited availability of the data implies that conclusive inferences could not be drawn on the relationship between good governance and FDI inflows. It is therefore recommended that future studies focusing on a similar scope should address this limitation by either encompassing a larger time series and/or cross-sectional sample. In addition, the correlation analysis in Table 9, Table 10, and Table 11 presents an interesting finding pertaining to the high correlation (> 70%) between infrastructure and natural resources. Future studies on BRICS should consider exploring this relationship since extant literature does not effectively justify the reason behind the correlation.

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8. Appendix

Appendix 1 Descriptive Statistics

Variables	N	Mean	Median	Min	Max
LFDIInflows	132	9.113	9.4769	1.254	11.8175
DLRGDP	128	0.0680	0.0688	-0.426	0.4148
DLWage	126	0.0962	0.1041	-3.3143	1.5638
Infrastructure	125	2874.25	2325.927	273.0466	6673.179
Inflation	132	81.9985	6.8598	-1.4078	2947.733
Natural Resources	135	576.0963	410.6926	106.3014	2175.355
Trade Openness	133	416.7254	444.0506	156.5035	1038.423
GoodGovernance	90	-0.2350	-0.2482	-0.8564	0.4698
Crisis Dummy	135	0.2962	0	0	1

Appendix 2 Correlation Matrix Model 1

	DLRGDP	DLWAGE	INFR	INFL	TO	GG	CD	Coint
DLRGDP	1.00							
DLWAGE	0.20	1.00						
INFR	-0.02	0.03	1.00					
INFL	-0.21	-0.03	0.26	1.00				
TO	0.04	0.14	0.48	0.11	1.00			
GG	-0.17	-0.07	-0.12	-0.21	-0.17	1.00		
CD	-0.16	-0.17	-0.02	0.04	-0.07	0.01	1.00	
Coint	-0.10	-0.22	0.49	0.11	0.03	0.14	0.06	1.00

Note:
DLRGDP: The difference of real GDP
DLWage: The first difference of Wage
INFR: Infrastructure
INFL: Inflation
TO: Trade Openness
GG: Good governance
CD: Crisis dummy
Coint: Cointegration term

Appendix 3 Correlation Matrix Model 2

	DLRGDP1	DLWAGE1	INFR	INFL	TO	GG1	CD	Coint
DLRGDP1	1.00							
DLWAGE1	0.20	1.00						
INFR	0.02	0.03	1.00					
INFL	-0.40	0.08	0.22	1.00				
TO	-0.01	0.15	0.46	0.26	1.00			
GG1	-0.19	-0.05	-0.13	-0.20	-0.17	1.00		
CD	-0.25	-0.12	-0.07	0.17	-0.17	0.02	1.00	
Coint	-0.06	-0.25	0.51	0.02	0.02	0.17	0.10	1.00

Note:
DLRGDP1: lagged T-1 difference logarithm real GDP
DLWage1: lagged T-1 difference logarithm Wage
INFR: Infrastructure
INFL: Inflation
TO: Trade Openness
NR: Natural Resources
GG1: lagged T-1 Good governance
CD: Crisis dummy
Coint: Cointegration term

Appendix 4 Correlation Matrix Model 3

	DLRGDP1	DLWAGE1	LFDII1	INFR1	INFL	TO	GG1	CD	Coint
DLRGDP1	1.00								
DLWAGE1	0.20	1.00							
LFDII1	0.20	0.01	1.00						
INFR1	-0.02	0.03	-0.20	1.00					
INFL	-0.40	0.08	-0.19	0.23	1.00				
TO	-0.01	0.14	-0.20	0.45	0.25	1.00			
GG1	-0.17	-0.07	-0.52	-0.12	-0.21	-0.15	1.00		
CD	-0.20	-0.12	-0.09	-0.07	0.17	-0.16	0.02	1.00	
Coint	-0.07	-0.24	-0.08	0.50	0.03	0.02	0.19	0.11	1.00

Note:
DLRGDP1: lagged T-1 difference logarithm real GDP
DLWage1: lagged T-1 difference logarithm Wage
LFDII11: lagged T-1 logarithm of FDI inflows
INFR1: lagged T-1 Infrastructure
INFL: Inflation
TO: Trade Openness
GG1: lagged T-1 Good governance
CD: Crisis dummy
Coint: Cointegration term