The Relevance of Human Capital in Attracting FDI: Evidence from BRICS Countries

By

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Abstract

This study investigates the relevance of human capital proxied by the gross secondary school enrolment in attracting FDI into BRICS countries, which include: Brazil, Russia, India, China and South Africa for the period 1980-2013. After controlling for heterogeneity, endogeneity, and spatial effects, aggregate results from different panel techniques indicate that human capital is a significant and relevant factor in attracting FDI into BRICS countries.

However, gross public expenditure on education and health care are found to be negatively related to FDI. This implies that wholesale public expenditure is undesirable, but rather a more prudent targeted sectorial public expenditure can produce the desired outcomes. The spatial effects analysis indicates that there is cross sectional dependency amongst BRICS countries. Consistently, country level results indicate that human capital is significant in attracting FDI in almost all the BRICS countries.

Furthermore, all the models are checked for robustness by using different diagnostic tests in order to ascertain that the results are accurate and reliable. The results are consistent with prevailing economic theory except for the outcomes of public expenditure on education and health care. Thus, the study concludes that human capital has a positive effect on FDI in BRICS countries and that policy makers are justified in seeking synergies between educational and FDI policies in order to propel future economic growth rates.

Declaration

I, Bheki Musa Ndlovu hereby declare that this study project is my own original work and that all sources have been accurately reported and acknowledged, and that this document has not previously, in its entirety or part, been submitted at any university in order to obtain an academic qualification.

…… September 2016

Ndlovu B.M

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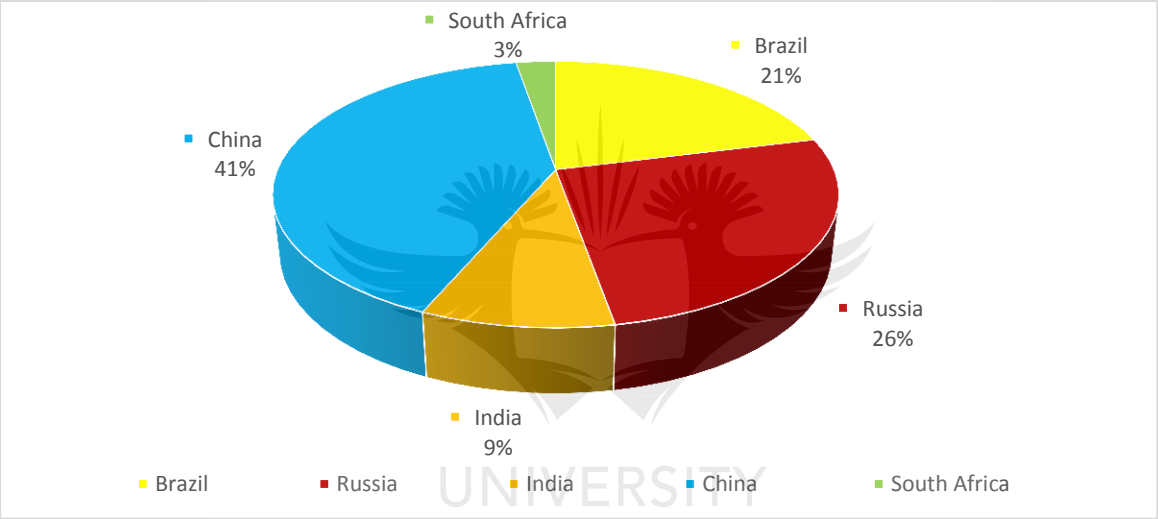
Abbreviations and Acronyms

BRICS	Brazil- Russia- India- China- South Africa
DIFF-FMM	Differenced Generalized Method of Moments
DTI	Department of Trade and Industry
ECM	Error Component Model
ELIDZ	East London Industrial Development Zone
FEM	Fixed Effects Model
FGLS	Feasible Generalized Least Squares
GDP	Gross Domestic Product
GDPPC	Gross Domestic Product Per Capita
GLS	Generalized Least Squares
GMM	Generalized Method of Moments
FDI	Foreign Direct Investment
OLI	Ownership - Locational - Internalization
OLS	Ordinary Least Squares
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNCTAD	United Nations Conference on Trade and Development
IMF	International Monetary Fund
REM	Random Effects Model
SUR	Seemingly Unrelated Regressions
SYS-GMM	System Generalized Method of Moments
WDI	World Investment Indicators

CHAPTER ONE: INTRODUCTION

Recently, BRICS (Brazil, Russia, India, China and South Africa) countries have increased their inward foreign direct investment share by 22%, which is double the growth compared to other regions (UNCTAD, 2013:8). The total inflows to five BRICS countries totalled US$322 billion in 2013, which is 22% higher than in 2012 (The BRICS Post, 2013:1). South Africa outperformed other countries in terms of foreign direct investment growth, with total inflows rising by 126%. Furthermore, as depicted in (Figure 1) below, China received a major share of the foreign direct investment at a staggering 41% of the US$322 billion in 2013.

Figure 1: Foreign direct investment inflows 2013 (UNCTAD, 2013)



Source: *Author's calculation based on the data from UNCTAD (2013:3)*

And similarly, these countries have increased their production output to a total gross domestic product (GDP) of U$ 21.2 trillion which represents 26.4% of global GDP (Gusarova, 2013:874). Equally important, South Africa is the smallest country in terms of gross domestic product (GDP) growth, but spends a higher percentage of GDP on education in comparison to other BRICS countries; this might be directly attributed to the perceived accrual benefits of increasing inwards foreign direct investment by having a highly educated population (Gusarova, 2013:877).

It is, therefore, clear that the governments of these countries have an obligation to advance the foreign direct investment policies in order to improve the basic needs of their citizens. Besides this economic imperative, there is also a political imperative from this economic block to stabilise these levels of foreign direct investment, especially in view of the

deepening financial crisis coupled with the rise in global unemployment and inequality. As such, policymakers in the region remain resolute in attracting foreign direct investment; thus propelling the BRICS countries into prosperity (UNCTAD, 2013:45).

According to the BRICS Report (2012:5), there are major economic synergies between BRICS countries; considering the substantial resources demand market in China and the large resource base in South Africa, conducting intra-trade could improve the economic growth and subsequently enhance human development in these countries. Al Sakka (2014:1) expressed that human capital is composed of education and skills learned in trade. Conversely, Noorbakhsh *et al.* (2001:1610), suggested that a country should have labour with a certain level of skill and education that fosters employment; so as to improve the attractiveness as a foreign direct investment destination.

However, in real terms BRICS countries are still competing for the same foreign direct investment, hence, it is imperative to have high-quality human capital skills. Human capital development is a key pillar in attracting foreign direct investment, as most of these economies depend on it for growth and economic development. Furthermore, development is a multi-faceted approach, which requires good institution, economic growth, good tax laws and a modern financial system (Noorbakhsh *et al.*, 2001:1610), as economic growth and development of all these countries depend on good quality human capital skills.

Currently, the factors that drive inwards foreign direct investment attraction in the region remain less explored, despite the growing percentage of FDI in the BRICS economic block. Hence, this study contributes to this body of knowledge and informs policy makers, multinationals companies, human capital resource managers and international trade policy researchers about the factors responsible for such advancement in foreign direct investment. In essence, by conducting this research, BRICS countries will be better informed as to the adequate level of human capital necessary in attracting sufficient foreign direct investment. Furthermore, Coyne & Boettke (2006:52), asserts that such an enquiry is significant in helping the region to further maximise the growth potential and advance competitiveness in developing countries.

1.1. Background to Research

According to International Monetary Fund (IMF) (1993:5), Foreign Direct Investment (FDI) is defined as the long-term investment in physical assets in another country, not home to the investing firm. In an annual review by UNCTAD (2013:22), the evidence is provided showing that there seems to be a surge in FDI flowing to countries with structural weak economies. Particularly, BRICS countries suffer from weak economic structures; at the core is the lack of technology, low economic growth rates, and high unemployment rates. That given, there has been a surge in FDI into BRICS countries and this has been attributed to abundance in human capital. But on close inspection, China receives more FDI than other member countries at 41% (UNCTAD, 2013:45). Moreover, in a study by Fung *et al*. (2002:307), it is found that the increase in FDI flowing to China is influenced by both the quality and quantity of the labour force.

China has benefited immensely from globalisation; similarly, other BRICS countries have been able to acquire the latest technology, due to the easy of communication and transportation mechanisms in recent years. (Karodia *et al*., 2014:26). Thus, all BRICS countries have more or less the same technological capabilities at their disposal. Devi (2013:1932), noted that BRICS countries have seen the importance of attracting FDI into their countries; hence, there has been an increase in programs aimed at attracting FDI. In South Africa through the Department of Trade and Industry (DTI) there is a trade and investment division, which specifically focuses on FDI promotion. In a study by Broadman & Sun (1997:348), they asserted that China has a labour cost specific policy that inhibits wages from rising above a certain threshold, in order to have an attractive labour cost advantage over other suitable investment countries. Further studies by Hou & Liang (2012:25), showed that China aimed at standardising educational policies so as to minimise the exponential costs of training new workers.

However, BRICS countries have different education policies and economic policies, but most of the education policies are aimed at increasing the educational capabilities and attracting the appropriate FDI (Sheng-Jun, 2011:192). According to a report by BRICS5 (2013b:1), there are plans in place to interconnect the economic policies as seen by the recent formation of the BRICS developmental bank. However, it is noted that these countries have little in common in terms of economic policies except for similar growth potential and high-interest rates, hence, convergence in economic policy is proving to be difficult; this can be traced

back to a history of disintegrated world economies. Furthermore, Ali & Guo (2005:25), cited political tensions in the region as one of the main factors that can deter potential investors.

Given the current political tension between Russia and Ukraine, it poses a threat of decreasing FDI in the region for the immediate future. India also has ongoing tribal tensions, but they are mostly in rural areas, therefore, there is a limited threat to FDI. Furthermore, in a report by UNESCO (2014:14), South Africa and Brazil are cited as having high levels of poverty and inequality, thereby posing a threat to democracy. Given the political environment outlined above, it is likely to increase the cost of doing business, and discourage future FDI in the region. Furthermore, several studies have found that human capital is expensive in developed countries, due to high cost of education and insufficient economic growth rate levels; hence, there is an increase in demand for this factor in cheaper markets. Human capital importance has been a primary factor since the 1990s when multinationals started moving factories to developing countries in order to save on production costs (Harrison, 2011:4). Several studies have found that education is a good starting base, but complementary relevant skills are also important in being competitive in the labour market (Coyne & Boettke, 2006:52).

The relationship between human capital and FDI seems to illustrate a positive relationship according to the UNCTAD (2011:1), this implies that having good human capital base saves as a good FDI host attribute. According to the BRICS Report (2012:33), the industrial and services sectors are the major sectors that receive most of the FDI; this suggests that a combination of high-quality education and technical skills are of paramount importance since in these industries high technical expertise is significant. Lack of access to quality education places South Africa at a disadvantage, because of poor educational capabilities when compared to other BRICS countries (UNESCO, 2014:12).

Furthermore, HIV/AIDS has had a negative impact on South Africa's labour force productive capacity, leading to constrained economic growth rates over the years (Simtowe & Kinkingninhoun-Medagbe, 2011:2124). China, India, and Russia seem to be better placed because they have lower HIV/AIDS rates and their education and technology is of high quality because they have been harnessing education and technological expertise for more than twenty years (Tremblay *et al*., 2012:18). Furthermore, Fedderke & Romm (2006:742), indicated that to fully exploit the benefits of FDI, there needs to be a ready market for new technology and demand for goods in the host country.

1.2. Research Problem and Question

Since the early 1990s, most BRICS countries have enhanced their trade policies and reduced trade barriers in order to attract FDI. The liberalisation of trade is aimed at enhancing international competitiveness and attracting FDI. These measures have been achieved through a number of mechanisms, which includes lowering tariffs, abolishing exchange controls, privatisation and reforming the regulatory environment (Basu *et al*., 2003:512). But some critics of these reforms point to the fact that opening the economy when the country is still developing, leaves the economy vulnerable to foreign economy shocks, as was the case in 2008 financial crisis (BRICS5, 2013b:1).

Despite all these mechanisms, FDI is still disproportionally allocated within BRICS countries. In all these countries, there are skills training programs in place to combat unemployment as it is one of the major problems facing the BRICS countries. Thus, it makes it even more challenging because the FDI has also to address the imbalance of unemployment amongst the youth population (UNCTAD, 2013:56). Furthermore, emigration of professional has contributed to the skills shortages in Brazil and South Africa. South Africa in particular, at the dawn of democracy in 1994, many skilled people left the country fearing a change in government, which left many industries without the necessary skills needed for growth (Crush & Dodson, 2007:454). However, Samuel (2013:6), cautioned that prioritising FDI policies is likely to result in countries neglecting other development appropriate policies for local industry growth opportunities.

In the literature, studies have emerged looking at factors responsible for FDI attraction. Nevertheless, these studies have been mainly biased towards the developed regions, with a few isolated studies done in developing economies. Overall, these studies claim that FDI attraction is mainly driven by government effort to advance domestic education (Blomstrom & Kokko 2003:10). Hence, human capital advancement is positively linked with growth in FDI. Some papers are of the view that health expenditure and skills development are significant drivers of FDI attraction (Pouris & Inglesi-Lotz 2014:1). However, other studies hold a different perception, showing that human capital advancement is not significant in attracting FDI (Root & Ahmed 1979:767; Kumar 1990:463; and Narula 1996:130).

This shows some inconsistencies in this branch of literature, prompting a need to further investigate this topic. Also, the differences in economic dynamics of countries might introduce biasness in the estimations giving rise to some inconsistencies especially in the panel data set up. Hence, a combination of both panel analyses together with spatial analysis is keen in the investigation of this topic in order to make a compelling argument. To add further insight to literature, this study seeks to investigate the relevance of human capital in attracting FDI into BRICS countries. And to the best of my knowledge, there is no study that focuses on the relevance of human capital in attracting FDI into BRICS countries. Moreover, no study has embraced both analyses concurrently in order to account for any possible discrepancies.

In light of the aforementioned, this study seeks to conduct an empirical analysis with the intent of answering the following question: What is the relevance of human capital in attracting FDI into BRICS countries?

Moreover, undertaking this research will add value to existing literature on international trade and investment regarding the relevance of human capital in attracting FDI into BRICS countries.

1.3. Research Aim and Objectives

This research aims to understand the relevance of human capital in attracting FDI into BRICS countries. Furthermore, the study investigates the human capital proponents that are significant in attracting FDI.

Particularly, the following objectives will guide this study:

- Review the literature on human capital and FDI dynamics in BRICS countries.
- Establish the different elements that make up human capital and their relationship to FDI.
- Determine human capital's relevance in attracting FDI into BRICS countries.
- Future implications on educational policies and FDI strategies.

1.4. Significance of Research

This study aims to contribute relevant knowledge for policy makers, multinationals companies, human capital resource managers and international trade policy researchers. In essence conducting this research, BRICS countries will be better informed as to the adequate level of human capital necessary in attracting sufficient foreign direct investment. Furthermore, FDI programs by the Department of Trade and Industry (DTI) and similar organisations in other BRICS countries, will be better informed as to what type of FDI is necessary for the relevant human capital capabilities of that particular country. The ultimate goal is for BRICS countries to be better placed in the world so that they can receive a fair share of FDI from mainly developed countries because it is imperative for future economic growth prospects.

1.5. Methodology of the Study

The qualitative literature review is based on secondary knowledge from previous literature. The intention is to understand and assess the role of human capital in various theories as early as the 1950s to current prevailing theories that inform FDI policies. The conceptual framework is to determine the role of human capital in trade and development theories. The main resources for knowledge will be books, academic journals and conference speeches. However, the shortcomings of previous literature entreat the use of secondary panel data for statistical estimation; the end goal is to assess if actual data concurs with theoretical literature.

Furthermore, most papers control for heterogeneity and endogeneity but omit to control for spatiality (Sanfilippo, 2015:666). This approach is limiting because spatial analysis is known to assist in placing the results in geographical context. Hence, this study opts to be more specific and explore the relationship between human capital and FDI in BRICS countries focusing on both static and dynamic models. The study uses Fixed Effects Model (FEM), Random Effects Model (REM), System Generalised Method of Moments (SYS-GMM) model and Seemingly Unrelated Regression (SUR) model to understand the relationship between human capital and FDI in BRICS countries more robustly and broadly.

The attraction to using panel data is that it allows controlling for important econometric issues including unobserved heterogeneity, endogeneity and spatial effects. This comprehensive modelling approach will not only review the current understanding about human capital and FDI but also contribute in pushing the streams of this literature a step further. A more detailed explanation of the econometric modelling will be presented in chapter three.

1.6. Delimitations

Countries selected are from the BRICS group and the choice of using data from 1980-2013 is based on the lack of systematic data prior to this sample period. Furthermore, due to limited availability of data, it is not possible to control for all determinants of human capital. Country data is reported in aggregates; and data sources are mostly from international organisations, which include World Bank's World Development Indicators (WDI) open dataset, United Nations Organization for Education, Science and Culture (UNESCO) database and the United Nations Conference on Trade and Development (UNCTAD) dataset.

1.7. Conclusion (Chapter Outline)

Having introduced the research topic, the rest of the study is outlined as follows: Chapter Two: Presents the review of the neoclassical growth theory, endogenous growth theory, human capital theory, human capital as a locational advantage, internalization and eclectic theories on FDI, dynamics of human capital and FDI growth in BRICS countries, human capital and FDI: an empirical literature review and the conclusion. Chapter Three: Presents in more depth the research methodology, model specification, heterogeneity, endogeneity, spatial effects and finally the conclusion. Chapter Four: Presents the data description, panel unit root test, empirical analysis and the estimation results which include the results of the Fixed Effects Model (FEM), Random Effects Model (REM), System Generalised Method of Moments (SYS-GMM) and Seemingly Unrelated Regression (SUR) models and the conclusion. Chapter Five: Presents the study concluding remarks, policy implications, the study recommendations and the final conclusion.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The importance of FDI in developing countries has grown significantly over the years and the growth has come with a refinement of theories pertaining to FDI. According to Blomstrom & Kokko (2003:10), human capital and FDI are positively related, but the intensity depends on the absorptive capacity of the host country. In an attempt to understand the relationship between human capital and FDI, this section will focus on human capital from the perspective of the neoclassical growth theory, the role of human capital in endogenous growth theory and human capital theory. In essence, if human capital is a significant variable in determining FDI one could infer that it offers locational advantages, hence this study will also review locational advantages theories in the context of FDI. And finally, there will be a review of previous studies on human capital and FDI.

2.2. The Role of Human Capital and FDI in the Neoclassical Growth Theory

In the early 1900s, investment was only thought to be necessary for capital equipment, and humans were only thought of as aiding the production process in producing the required output (Coleman, 1988:100). This was the industrialisation era, during which huge machinery and equipment had increased production substantially and little attention was paid to investment in the labour force. According to Goldin (1999:94), it was after the great depression that governments started looking at the possibility of investing in human capital. The investment embodied compulsory schooling in many countries for girls and boys of school going age (Mincer, 1958:302).

According to Schultz (1961:17), human capital is generally defined as the schooling (primary and high school) and skills acquired at the workplace that make a worker better at performing his/her job. However, With many technical skilled workers and depressed home markets, there was a need to diversify to other markets and intuitively many companies started exporting their home country skills to developing economies, in order to help start up production processes in new markets. It was the infancy of FDI as it is known today. And many multinational companies of that era are still at the forefront of FDI around the world today.

Much human capital and FDI fundamental theories of the time were based on the neoclassical growth theory. The basis of the theory is that if labour, capital and technology are efficiently combined production would eventually reach a steady state of growth. Labour and capital are seen as endogenous and technology is seen as exogenous; the initial proponents of the neoclassical growth theory are Solow (1956:66); Schultz (1961:17) and Becker (1964:160). The production function in the Solow model (1956:66) is formally represented by the following equation 2.1 below:

$$Y_t = \int [K_t, A_t L_t] \qquad (2.1)$$

In the above equation (2.1), the production function is assumed to be a function of physical capital (K_t), technology (A_t) increase is assumed to spare on growth and finally human capital (L_t) is the catalyst in making sure that production goes efficiently and smoothly.

Solow (1956:67) asserted that the capital, labour and technology are the major contributors to economic growth and the more the technology is employed in the production process, it will eventually lead to more labour being better skilled and hence more output produced than before. And when the economy reaches a steady state, technological progress will ensure increased output due to skilled workers, resulting in an increased steady state. Furthermore, Finlay (1978:16) asserted that the free movement of human capital would increase technological transfer rapidly through FDI transmission mechanism.

However, the final destination of FDI would be influenced by the necessary skills needed to assimilate the technological transfer through FDI in the host country. In the further expansion of Solow's work, Finlay (1978:16), documented that an increase in technology coupled with efficiency in human capital would increase FDI. In addition, it is envisaged that an increase of capital in developed markets would increase the capital accumulation in developing countries through FDI transfer.

On the other hand, Schultz (1961:17), emphasised the importance of human capital in the production process; by inquiring that most people are shy to talk about investment in human capital because of societal issues with viewing human beings as a commodity for sale.

Furthermore, Coleman (1988:100), asserted that investment was thought to be necessary only in machinery and tools, while humans only served as aides to the production process. Schultz (1961:17) postulated that human capital could be enhanced by increasing the quality and the quantity of high school graduates, and well-organized on the job training programs. Furthermore, it was emphasised that human capital is a dynamic factor of production because it is envisaged that a productive worker not only should have skills but must be healthy and have a social life which adds to the wellbeing.

Social capital is the environment, relationships and class that workers have to contend with; and it is the interaction of these that make human beings be at their optimal at work (Serageldin, 2000:217). Many developing countries have a highly mobile and youthful educated population, but there are still high levels of unemployment. According to Spence (1973:355), education is not the end goal but acts as a signal to the labour market that a prospective employee may have the skills that may be necessary for the production process. However, asymmetries in the labour market may be the cause of mismatch of educated people looking for work where their skills are not required. Schultz (1961:17), noted that government can improve the human capital capacity in the country by providing training schemes and education loans to students; so as to avoid having idle educated people, which can only deteriorate human capital capabilities of a country.

Expanding on the ideas of Solow (1956:67), Becker (1964:160) developed the human capital augmentation theory. The theory asserts that people save and invest in education and training for rational benefits, which they hope to recoup in the future. These benefits include the increase in income and social status and these would be the return on investment. According to Pouris & Inglesi-Lotz (2014:1), the government is better placed to promote education and skills development, because it increases economic prosperity, economic opportunity and in turn there can be better social cohesion. This is grounded in the work of Becker (1964:160), which emphasised that human capital is a combination of education, job training and opportunity cost. The model is formally presented as follows:

Initial model: $$V(\gamma) = \sum_{j=0}^{n} \frac{\gamma_i}{[1+i]^{"} i+1} \qquad (2.2)$$

In the equation (2.2), it is assumed that parents invest in primary, high school as well tertiary education of a schoolchild. And in an ideal world when you eventually start working, employers also invest in an employee through job training programs and all these variables are represented by (Y_i). At the same time, an employee must invest in good health care and food, amongst other things, so that an employee can perform optimally and be competitive. And (*i*) in the equation (2.2), is the market rate of return for a skill. But depending on the industry, different aspects of the job can dominate the rate of return for the employee.

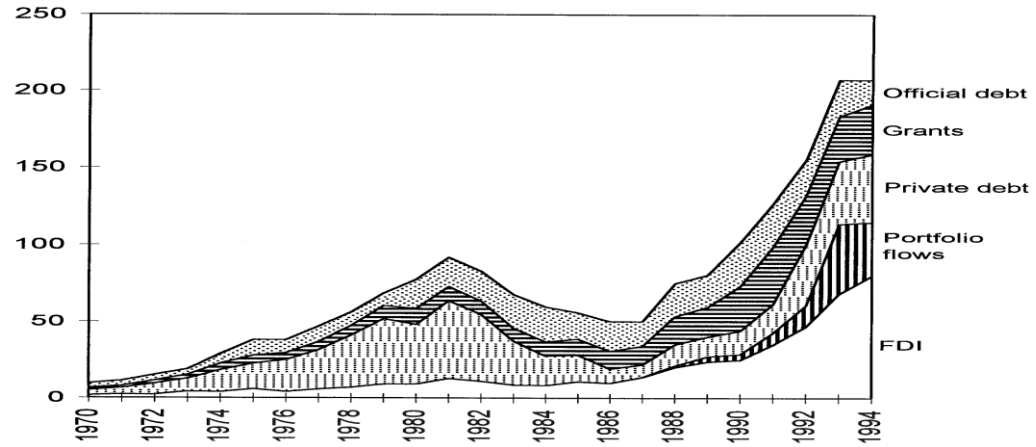
In reality, there are normally a lot of opportunity costs facing an employee to make rational choices. In an expanded model where an employee is forced to make a decision, opportunity costs are included in equation (2.3). It is formally presented as follows:

Second model; $d = V(\gamma) - V(\chi) = \sum_{j=0}^{n} \frac{\gamma_i}{(1+i)''i+1}$ *(2.3)*

The equation (2.3) is similar to equation (2.2), but the main difference is the variable $V(\chi)$, which is the opportunity cost you forsake when you invest in education, food and healthcare. In these models, the assumption is that human beings are rational and they make choices which are well informed given the available knowledge in the economy.

The neoclassical theory had been the foundation of the prevailing knowledge in the 1960s and 1970s, and FDI was increasing steadily upwards and so were the other forms of capital injection in developing economies as seen in (Figure 2) below. In (Figure 2) below, most developing countries during the period from 1970-1990, had an abundance of human capital but failed to attract substantial FDI inflows. One of the reasons cited by Lucas (1990:96) is that there is a multitude of factors responsible for attracting FDI; hence, the governments must have a holistic approach. Furthermore, Zebregs (1998:7), highlighted that the neoclassical theory does not distinguish between Greenfield FDI and portfolio investment, the difference being that portfolio investment is the investment of liquid capital in mergers and acquisitions, while on the other hand, Greenfield FDI is the investment in physical capital and machinery necessary for factories to run and manufacture goods. This is illustrated in (Figure 2) below which shows that Greenfield FDI and portfolio investment were the major contributing form of FDI in developing countries.

Figure 2: Net FDI inflows for developing countries from 1970-1994 in US$b at current market prices.



Source: *Zebregs, (1998:6)*

2.3. The Role of Human Capital and FDI in the Endogenous Growth Theory

The shortcomings of the neoclassical growth theory are that it does not account for income and geographical differences on the impact of human capital and FDI on growth. According to Ferrara *et al.* (2013:4254), the main limitation of the neoclassical growth model is that it relied on technological progress which was thought to be exogenous. The model lacked clarity on the source of technological progress as human capital was thought to be an aid to production. In response to this, the endogenous growth theory was developed by Rosen (1976:567), Romer (1986:1037), and Lucas (1988:42).

According to Rosen (1976:567), investment in human capital through education and training is critical, in the sense that once acquired it can be passed on to the future generation perpetually. Once the skills are attained and there is sufficient reward, humans can focus on technological progress, as a result, technological progress becomes endogenous in the model. Romer (1986:1037), in the model treated human capital as a catalyst which increases technological progress. Rather than seeing human capital as an input in the production function, it was seen as the centre of economic growth and innovation. On the other hand, Lucas (1988:42), envisaged human capital as a factor that provides non-decreasing returns to scale and has a positive impact on the internal growth process.

In the endogenous growth theory, the assumption was that growth rates amongst countries should be different due to differences in educational system and FDI absorptive rates of countries. But empirical evidence by Barro & Sala-i-Martin (1992:224), showed that growth rates are actually similar for all countries in the long run. They argued that even though developing countries are behind technologically and in terms of innovation, as soon as they receive the appropriate technology, they will quickly catch up with developed countries in economic growth path over time through FDI transmission mechanisms. And the process repeats every time there is a new technology. Moreover, Howitt (2000:832), noted that due to FDI expansion, technological spillovers are able to flow to developing countries and it is up to the absorptive capacity of a country to make sure the technology is turned into economic growth over time.

At the centre of FDI expansion are multinational companies that distribute their operations around the world in order to minimise costs in production. According to UNCTAD (1992:52), technological innovation can be assimilated in the host country directly or indirectly. Directly it is done through ownership, control and dispersing of the relevant technology in the host country and indirectly it is when other local firms in the value chain learn the technology and filter it down into the economy. However, Dunning (1994:25), asserted that not all FDI is positive because at times multinational companies limit competition in host countries and they pay less tax which is detrimental to growth prospects of developing countries.

On the other hand, according to Egbo (2011:4), the direct benefits of FDI inflows seem to outweigh the negative externalities; hence, many developing countries promote FDI investment programs because in most cases the local markets are stagnant. In empirical evidence through panel data analysis, De Mello (1999:142), found that it is difficult to assimilate new technology with human capital in developing countries than in developed countries. Furthermore, it was revealed that multinational companies set up their new production facilities, according to country-specific characteristics that favour human capital absorptive capacity.

In essence, human capital and FDI are at the core of the endogenous growth theory, although many studies are not clear as to what level of human capital is necessary for absorptive threshold level. In an empirical study of developed countries and 69 developing countries done by Borensztein *et al.* (1998:127), during the period from 1979-1989, it is found that a

threshold level of 0.52-1.13 years post-secondary schooling is necessary for developing countries and for developed countries the thresholds are much higher due to the high cutting edge technology employed. Furthermore, it is found that in countries with high levels of human capital, FDI tends to grow on average of 4.3%. The catch-up gap seems to be closing up quicker than before, because according to IMF (2013:1), developing economies account for more than half of the world GDP on the basis of purchasing power parity. And most of the increase in GDP is predominantly from FDI.

2.4. Human Capital Theory

Ochoa (1996:174) criticises both the neoclassical and endogenous growth theories for being based on the notion of a steady state economy, where labour is treated as a commodity that assists in achieving equilibrium. Firstly, the worker-employer relationship is seen as merely an exchange of labour force for wages. Secondly, schooling is seen as a formal way to teach cultural norms that can help workers to be better obedient to social norms in the workplace (Bowles & Gintis, 1978:360). Thirdly, labour is assumed to be homogeneous, meaning that each individual brings in the same set of skills to the labour market. And it is posited that these similarities in human capital appeal to all types of FDI and multinational companies invest where they get the best returns given the investment.

However, according to Cohen & Soto (2007:115), the human capital theory asserts that there are human capital differences amongst individuals. These differences are found in the innate ability of individuals, schooling, training and the non-schooling investments. Human beings supply their labour skills to the marketplace and consequently the supply must be matched by an equal demand by employers. But in reality in most BRICS countries there is a high level of unemployment, and this might be attributed to the lack of productive skills and lack of effective demand from producers.

Bowles & Gintis (1975:74) highlighted the problem of workers being treated as commodities in the labour market, their argument is that if workers are valued in the labour market, productivity can increase and profits for the investing multinationals will also increase, at the same time enhancing human development goals for the host countries. According to Bowles & Gintis (1975:74), labour power is the actual commodity which can be exchanged for wages, but actually, labour is the heterogeneous skill which cannot be exchanged for wages

because it is a skill that resides with the individual. Interestingly in emerging markets, labour power is often in the hands of labour unions, who bargain on behalf of workers.

According to Oman (2000:64), labour unions often act as a deterrent to FDI, because they are seen to impose exorbitant wage demands against prevailing negative economic conditions. Nevertheless, multinationals seem to invest regardless of labour unions activities , as seen with high union activity in some developed countries, but they still receive a fair share of FDI. Bhorat *et al*. (2007:9) asserted that individual workers are not at a level of dealing with multinational companies, but they can be more effective if labour unions can harness the bargaining power so that more benefits can accrue to the workers.

Moreover, it has been seen that improved productivity seem to favour the multinational companies rather than the workers. To combat this, Moyo (2009:49), highlights that it is the job of governments in emerging markets to put up institutions that see to it that workers are not exploited. But due to the lack of effective institutions, this causes three types of wage disparities in the labour market. Firstly, there seem to be compensation differentials amongst workers of the same skill; secondly, because of labour market imperfection, workers often don't know where their skills are required at the same time multinational companies do not readily know in which country can their production be best optimized; and thirdly, worker discrimination is still a problem in developing countries, mostly based on race, sex, age and gender (Sianesi, 2008:372). Of particular interest in countries like Brazil and South Africa; is that FDI is a desirable investment but some multinationals have been known to flout labour laws, tax laws and exchange controls. According to the BRICS Report (2012:2), China has been accused of human abuse in their factories, due to long working hours and inhumane working conditions. These are some of the cited disadvantages of high economic growth rates in a short space of time.

The recent literature suggests that economic growth and effective demand seem to be emanating from emerging markets (Stiglitz, 2003:507). Given this fact, it is surprising that FDI is still flowing to developed countries, where there is no substantial economic growth. The aforementioned information provides some evidence that human capital alone may not increase FDI in a country. But rather a composite of factors including country historic relationships and previous experiences by multinationals will predict where they want to invest in the future.

However, in BRICS countries in general, and particularly in South Africa, there seems to be reluctance in changing the educational system to suit current economic conditions. Some researchers have attributed the dichotomy in policy to scant returns in sectoral education, and if there is a negative turn in that particular sector of the economy workers are retrenched and remain unemployed for longer periods. This was evident in Russia when they tried to change from closed economy to an open economy; which left many industries in dire economic conditions leading to massive unemployment (Kotz, 1998:28). In other similar emerging countries like Singapore, the education system is geared to the type of investment that is more prominent in the economy (Abeysinghe, 1998:15). Hence, they have been more successful as a major destination for textile and clothing FDI.

In developing countries, labour markets merely react to the prevailing economic conditions of the world economy, since most world products are priced in developed countries. BRICS countries in most cases are used as cheap production places that offer incentives that are not available in developed countries. It is up to the countries to harness their locational advantages, which can empower the workers at the same time increase economic growth, eventually leading to the industrialisation of the same level as in developed countries. According to Bowles & Gintis (1975:74), innovation mostly stems from schooling hence it is imperative that resources are allocated to research and development institutions so that new technologies can be invented thereby sparing future FDI. The contribution of human capital theory to literature is found in that human labour and labour power are for the first time separated. And in so doing human beings can be paid wages according to their abilities and skills. But in reality, more work still needs to be done to value workers in the production process.

2.5. Human Capital as a Locational Advantage in Attracting FDI

According to Fransman (1984:10), an absorptive capacity theory is based on the ability of a country to assimilate the technology from FDI into tangible effects that can lead to economic growth. FDI is distributed around the world through global value chains owned by multinational companies. In order for the host country to reap the benefits of FDI, there must be an initial internal investment in the economy that makes it necessary for attracting new technology brought in by multinational companies. Narula (2003:16), asserted that the absorptive capacity of a country can be accumulated by investing in infrastructure, education, healthcare, research and development.

Education being one of the major components that make up human capital, it is critical that there is a well-equipped and educated labour force that can easily attract the new technology into the host country environment. In a report of BRICS countries by UNESCO (2014:21), education was determined to be a significant factor in absorptive capacity, however, they alluded to difficulties faced by investors in using education as a proxy because of different educational systems adopted in different BRICS countries.

Hermes & Lensink (2003:8), found that education is important but to fully exploit the benefits of FDI there must be at the same time a functional financial market system, technology development and institutional development. According to Naudé *et al.* (2013:12), dynamic technology has pioneered the evolution of the manufacturing sector in recent times. Hence, the sector has become one of the major contributors to employment and global value chain of FDI. In (Table 1) below it can be seen that China is the only country that increased the share of the manufacturing sector; this is due to their cheap labour costs and their ability to absorb and stimulate new technology quickly into the economy. Over a period of twenty years, they have managed to be a leader in attracting manufacturing based FDI amongst BRICS countries. India also slightly capitalised on their skills absorptive capacity, hence, they increased their manufacturing sector by 1.5%, while Brazil, Russia and South Africa all decreased their manufacturing sector, and this can be attributed to de-industrialization and the prominence of the services sector.

Absorptive capacity is not only about being able to assimilate incoming technologies and innovation, but also having a fertile ground where new technology can grow and be matured (Belderbos *et al.,* 2015:495). According to Narula & Marin (2003:28), Education and skills are a core feature in retaining and expanding technology spillovers. High-performance technology is not potent for economic growth if there are no proper skills set to help absorb the technology. An enabling environment through which government can support with infrastructure and guaranteed property rights system is critical. Farole & Winkle (2012:35), did a cross-sectional study of 25,000 manufacturing firms in 78 low and middle-income countries and found that a country's expenditure on education is directly correlated to high productivity in the country. Moreover, Hale & Long (2011:136), further asserts that the regulation and labour laws of countries are critical in determining FDI final destination for developing countries.

Table 1: Sectoral shares of value added (at constant prices). BRICS Countries, 1980-2008 (in%)

	Brazil		Russia		India		China		South Africa	
	1980	2008	1995	2008	1980	2008	1987	2008	1980	2008
Agriculture	4.9%	6.4%	7.2%	4.2%	37.4%	16.3%	29.9%	9.2%	3.5%	2.6%
Mining	0.5%	1.0%	6.3%	5.0%	1.9%	1.8%	4.5%	3.2%	13.8%	6.1%
Manufacturing	21.0%	19.4%	19.6%	16.6%	14.9%	16.4%	22.2%	44.7%	21.9%	18.4%
Utilities	1.4%	2.5%	4.2%	2.5%	1.8%	2.2%	2.6%	2.7%	1.8%	2.1%
Construction	7.6%	4.8%	6.6%	7.2%	5.8%	6.3%	6.4%	5.0%	4.1%	3.3%
Services	64.5%	65.9%	56.1%	64.5%	38.2%	57.1%	34.3%	35.1%	60.8%	67.5%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: *Naudé et al. (2013:11)*

2.6. Internalization Theory and the Eclectic Theory

In order to understand why FDI has grown significantly over the past 20 years, besides the host country attributes, it is also important to understand the factors that push multinational companies to invest around the world through FDI. Internalisation theory developed by Buckley & Casson (1976:102) and further expanded by Dunning (1980:31), postulated that the reason why multinational companies invest in other countries is because they want to exploit internal advantages found in host countries: it can be technology, special labour skill or organisational structure. The internalisation of markets across the boundaries of national markets creates multinational companies. Knowledge and expertise are the important factors in imperfect markets, hence the need for the right skills in the receiving country to take advantage of these imperfect markets.

Further studies on the internalisation theory led to Dunning (1993:51) developing the Eclectic theory or otherwise known as the OLI paradigm. (O) Ownership factors, (L) locational factors and (I) internalization theory paradigm, which is based on the assumption that multinational companies engage in FDI because they have ownership advantages; it is more beneficial to internalize these advantages and henceforth locational advantages prompt a multinational company to invest in a country where they can reap the benefits. In a study by Qiu (2003:385), it is asserted that in order for FDI in a foreign country to be beneficial, there must be some sort of comparative advantage within the country which is not available in any other country or as well as differential costs benefits as compared to other countries.

Locational specific advantages can be cheap labour, a skilled labour force or good public infrastructure which a multinational company can derive greater benefit in establishing a foreign branch in that country. Market internalisation advantages stem from a transnational company establishing a local branch rather than being involved in a licensing agreement or franchising. According to Li Sun *et al*. (2012:5), this theory explains why a multinational company would invest in China rather than other BRICS countries, reasons including the better availability of skills, cheap labour and access to markets than in other member countries.

2.7. Dynamics of Human Capital and FDI Growth in BRICS Countries

According to the BRICS Report (2012:1), BRICS countries makeup 40% of the world population and producing 25% of total world output. Given this abundance of human capital, BRICS countries have increased their contribution to global economic growth by 50% (UNCTAD, 2013:3). This is as a result of prudent economic policies that were implemented in the past decade across the region, but some countries are still suffering from the triple challenge of poverty, unemployment and inequality. With this in mind, Brazil with a population of 196 million has managed to increase their GDP to $2,246 trillion in recent years (UNCTAD, 2013:4). But, sluggish economic growth rates in the past three years have meant that unemployment and inequality have increased leading to the recent tense political environment.

Comparatively, Russia with a population of 141.9 million is one of the world biggest economies with a GDP of $2,096 trillion, mainly bolstered by exports in oil and gas (WIR, 2014:10). But, due to the Europe debt crisis, the economy has slowed down with economic growth rate forecasted to grow at 3.7% (WIR, 2014:10). On the other hand, India has one of the world largest population reported to be 1.24 billion, given their population they have a huge human capital base with a GDP of $1,726 trillion (BRICS5, 2013b:2). Furthermore, they have one of the highest economic growth rates estimated to be at 5%, but the main challenge is educating the population with the necessary skills so that they are not left behind in economic development. In the same breath, China is the world largest economy in terms of the population currently stands at 1.34 billion, and they are also the second biggest economy with a GDP of $9,185 trillion (BRICS5, 2013b:3). The economy is mainly driven by exports in the manufacturing sector leading to the low unemployment rate of only 4%, driven by a thriving informal sector and a growing manufacturing sector.

And lastly, South Africa is the smallest country in the BRICS group of countries with a population of 52.9 million (UNCTAD, 2013:3). Granted that South Africa's GDP is only $382 billion; nevertheless the country's geographical location makes it appealing for multinational companies with an appetite to invest in Africa. However, South Africa has a different set of challenges including high unemployment, poverty and inequality; these are as a result of poor economic planning and falling economic growth rates following the global financial downturn in 2008. Admittedly, all BRICS countries have different educational, fiscal and monetary policies, but there seem to be an understanding in BRICS policy discussion documents that a growing economy, high educational levels and skills enrichment are essential to reducing unemployment levels. Hence, a country like South Africa spends a high percentage of GDP on education (The BRICS Report, 2012:5).

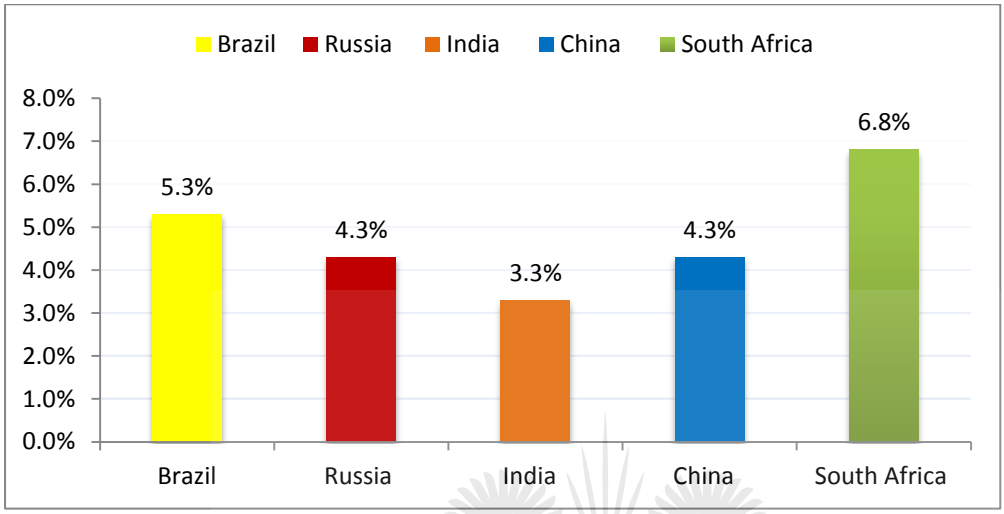
Education is one of the key components that make up human capital and there have been strides to increase school enrolment levels in BRICS countries. According to UNESCO (2014:2), education is one of the attributes that can assist in alleviating unemployment levels and poverty. As per (Figure 3a) below, South Africa has been one of the leading countries in the BRICS countries who spend a higher percentage of GDP on education at (6.8%) and most of the countries are not far behind except for India with the smallest share of public expenditure on education as a percentage of GDP at (3.3%).

It is also shown in (Figure 3b) below that South Africa has a lower GDP in the BRICS region and while China has the highest GDP in the BRICS region, this country is still lagging behind South Africa a country with the smallest GDP in terms of education expenditure; this may be attributed to their relatively large population who mostly live in isolated rural areas. Moreover, most of the educational expenditure is still at the basic educational level and there needs to be a concerted effort to increase secondary and tertiary school enrolment as well as skills training programs so that it can increase employment prospects and knowledge creation capabilities.

One of the advantages BRICS countries have is a large population comprised mostly of young people who can be a source of the labour force, which can assist with economic development goals of BRICS countries. FDI has been a major contributor to economic development and the creation of employment opportunities and according to UNCTAD (2013:1), BRICS countries have recovered from the financial crisis of 2008 and FDI is at levels higher than they were pre-2008 financial meltdown. And the growth in FDI has been

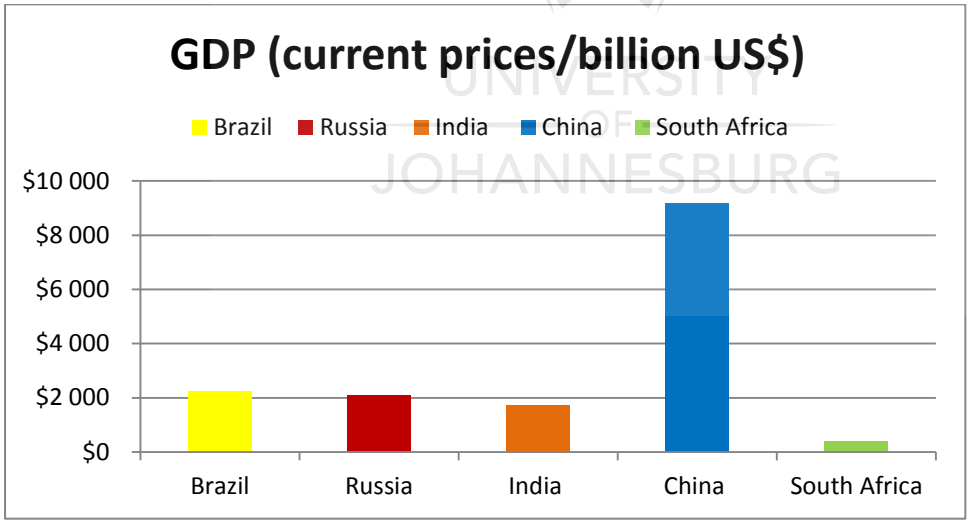
attributed to durable domestic demand, liberalised financial markets and well-growing investment in public infrastructure (Gelb, 2014:16).

Figure 3a: Share of public expenditure on education as a percentage of GDP within BRICS countries



Source: *Own construction based on the UNTACD (2013:3) figures*

Figure 3b: BRICS countries GDP (current prices/billion US$)



Source: *Own construction based on the UNTACD (2013:3) figures*

The future growth prospects in the BRICS countries is in doing intra-trade amongst countries and exchanging skills and innovations so as to enhance the countries absorptive capacities in attracting FDI from other regions (World Investment Report, 2014:13). However, inequality, poverty and unemployment are still a critical challenge in developing countries and one way to overcome these challenges is to increase the economic base through goal-oriented development plans that involve clear educational policies; skills training and enhancing the locational advantages in order to attract FDI.

2.8. Human Capital and FDI: An Empirical Literature Review

There are a number of existing studies on the relationship between human capital and FDI. Their conclusions seem to give evidence that human capital has a positive influence on FDI inflows, the only area that seems to be of concern is the quantitative relevance of human capital in attracting FDI.

The empirical literature on FDI attraction relies either on a panel analysis, or individual country specific analysis. Borensztein *et al.* (1998:1), did a cross-country regression of developed countries from 1970-1989. And the study gave evidence to the fact that FDI has a positive impact on economic growth and further iterated that economic growth is dependent on human capital capacity in the host country. As such, countries with better educational attainment are shown to receive more FDI than countries with less educational attainment. The conclusion drawn by these authors is that certain educational threshold is necessary in order to attract sufficient FDI, which would increase economic growth.

Tøndel (2001:1), investigated the FDI determinants in Eastern Europe and the former Soviet Union countries during the transition period, and the resultant impact on FDI inflows. Fixed effects method was employed on a panel of former Soviet countries. The period of study was from 1989-1998, and the results showed that FDI depends on GDP, GDP per capita, lagged FDI, general secondary enrolment rate, tertiary gross enrolment rate as well as lower wages. But most interestingly secondary school enrolment and tertiary school enrolment were observed to be robust in the model.

The evidence is also provided, which shows that small firms are prone to failure in a business unfriendly environment. And of particular importance, resource seeking FDI is not sensitive to high levels of corruption or period of uncertainty. South Africa can relate to being in a transition period of uncertainty in the early 1990s, hence, not only it is imperative to invest in education but also by creating a business-friendly environment, through making easy to do business and sticking to one policy which is clear and progressive.

Bhaumik & Dimova (2013:559), investigated if human capital endowment matters for FDI in developing countries. These two authors used a cross-sectional firm-level study, based on a translog production function. Not only did they find that education is important, but that quality of education is more important. Thus, they proposed that multinational companies must rather focus on job-specific educational training. They concluded that job specific training is important for developing countries in the textile and garments industry.

Broadman & Sun (1997:339), did a geography study in China to find out the determinants of the geographical distribution of FDI in China. By using a log-linear ordinary least squares model, the findings showed that distribution of FDI within china is determined by gross national product (GNP), infrastructure development as well as the level of general education. The skewness in the distribution was further increased by other regions having access to the ocean and regions in the interior were disadvantaged in this aspect. Of particular interest in a country like China, investors were less interested in the literacy rates, hence, it was less significant. China is known for low wages; hence many investors would be attracted by lower wages more than they are attracted by educational levels.

Some studies found that more stringent labour standards do not support FDI (Cooke, 1997:17; Cooke & Noble, 1998:609). However, others do not (Traxler & Woitechm, 2000:141). Bognanno *et al.* (2005:172) instead find mixed results depending on how labour standards are measured. Instead of analysing the relationship between labour standards and FDI entries, Lafontaine & Sivadasan (2009:88) find that strict rules of hiring and firing delay the entry of FDI in 48 countries in the period from 2000-2003.

Naudé & Krugell (2003:2), used cross-sectional data from 1970-1990 to examine whether geography and institutions matter in deciding the destination for FDI in Africa. They concluded that FDI is attracted by good policy instruments on education, trade and international relations. Furthermore, a good policy must be monitored by good quality institutions. They found that geography is not of any significance in Africa; at least for

international investors as they viewed Africa as one investment destination rather than different investment destinations. The results concurred with Morisset (1999:167), that FDI flows to the country that is endowed with natural resources and have invested heavily in policy instruments that attract FDI.

In contrast to the prevailing view above, Root & Ahmed (1979:767), Kumar (1990:463), and Narula (1996:130) reached inconclusive results as to the relevance of human capital in attracting FDI. The findings of these studies were from the 1970s, 1980s and early 1990s. Human capital at that time was not an important factor in driving FDI as it is today, judging from the mainstream papers. Hence, it is important to understand the evolution of human capital as a driver of attracting FDI .Consequently; this study is revisiting the relevance of human capital theory in the attraction FDI in the modern BRICS economies.

In light of such discussion, it is possible to assume that early Internalisation strategies of FDI characterise a lack of experience in a diverse economic and cultural region. This partly explains the poor results in the short term. But such negative performance does not deter FDI. As such, the literature still needs to discover the main factors and channels that keep FDI persistently over a long period. Institutional factors like educational system and the dynamism of a country's economy might explain such phenomenon. Hence, this paper seeks to test the hypothesis that human capital is a relevant factor in FDI attraction in BRICS countries.

2.9. Conclusion

The chapter provided an overview of current prevailing human capital and FDI literature. There seems to be an agreement that human capital has a positive effect on FDI and furthermore, FDI contributes to economic development in developing countries. The neoclassical and endogenous growth theories set the foundation for FDI policies, currently being implemented in most developing countries. But the human capital theory has introduced a new way of looking at labour. Moreover, there is more that needs to be done, in order to avoid negative macroeconomic events that have caused slow economic growth in developed countries. BRICS countries are at an advantage because there is currently positive sentiment towards investing in developing countries. Hence, having the right locational advantages can improve the attractiveness to foreign investors.

There exist many studies on FDI attraction, but only a few focuses on the relevance of human capital in general and particularly BRICS countries, as a fast growing grouping of developing economies, hence, this study intends to use both static and dynamic models, in order to understand the relationship between human capital and FDI. By so doing shifting the macroeconomic focus of policy makers, to the need to improve and enhance human capital capacity. Details on the methodology are provided in the next chapter.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1. Introduction

This study seeks to investigate the relevance of human capital in attracting FDI into BRICS countries. To this end, this study uses different panel techniques in order to control for heterogeneity, endogeneity and spatial effects. Particularly, the following models are discussed and explained: Fixed Effects Model (FEM), Random Effects Model (REM), Generalised Method of Moments (GMM), System Generalised Method of Moments (SYS-GMM) and Seemingly Unrelated Regression (SUR) models.

3.2. Model Specification

The inclination to using panel data methodologies is found in the ability to mitigate against crucial econometric issues such as heterogeneity, endogeneity and spatial effects, which cannot be addressed in pure cross-sectional or pure time series models. Accounting for each of these issues implies using different estimation techniques. More specifically the baseline model is given as:

$$IFDIUSB_{it} = \alpha_i + \beta \quad ISECSENROL_{tt} + \delta' \chi_{it} + \varepsilon_{it} \qquad (3.1)$$

i =1,.., N; t = 1,..,T (time)

Where α_i is country fixed effects; $ISECSENROL_{tt}$ is the log proxy for human capital; χ_{it} is a vector of control variables which includes logs of $IEDUSPEND_{it}$, $ILIT_{it}$, $IHEL_{it}$, $IGDPPCUS_{it}$ and ε_{it} is the error term.

3.3.1. Heterogeneity

In the field of development economics many studies tend to treat BRICS countries as a homogeneous grouping, but on close inspection, BRICS countries offer different attributes as FDI host countries. In particular, Heckman (2001:674), affirmed that country differences should be considered in developing a proper understanding of economic structure, asset allocation and production capacity of a country. The sources of heterogeneity stem from the following: Firstly BRICS countries have different educational systems, level of development and it would be ill-considered for a foreign investor to assume that an engineer educated in

South Africa has the same capabilities as an engineer educated in Russia. Secondly, the economic framework of BRICS countries are vastly different, while most of the countries have steadily moved from agriculture to a more services-oriented economy; but China has advanced and scaled up on the industrialisation process more than the other countries (Garibaldi *et al*., 2002:47). And thirdly all the countries independently set monetary and fiscal policy, labour market conditions and policies, which entails that interest rates and tax rates vary differently across the countries. And according to Levy-yeyati *et al*. (2002:3), interest rates and tax rates have a high bearing on FDI allocation in BRICS countries.

In addition, since all the countries are in different continents, it presents different challenges, because of different cultural norms, political climate and geographic landscape. Furthermore, Azzimonti & Sarte (2007:293) argued that investors decide on where they want to invest taking into cognizance different country-specific attributes. In particular, political instability is a major deterrent to FDI, and it is up to the different governments to avoid unnecessary political interference in the economy, which tends to drive out private investment. Therefore, given the aforementioned, it is important to control for heterogeneity, in cross-country analysis of the relationship between human capital and FDI.

In panel data modelling, the most commonly used models designed to control for heterogeneity are the FEM and the REM. According to Hsiao (2003:8), the FEM assists in controlling for unobserved country-specific differences, but any intercept and independent variable that remain constant over time may drop out of the model. Furthermore, it assumes that each individual fixed effect varies over time. Moreover, Umar & Tanveer (2010:27), asserted that the major attraction to FEM is that it only estimates within effects, thereby eliminating heterogeneity bias. However, Wooldridge (2002:252), highlights that in the presence of multicollinearity, this specification may reduce the statistical power of the parameters as a result of increasing standard errors. But fundamentally, in the FEM independent variables are correlated with α_i, hence, the REM may be more appropriate.

Hsiao (2003:41), noted that the REM also called an Error Component Model (ECM) assumes that α_i is randomly distributed, entailing that α_i is uncorrelated with independent variables and α_i is independently distributed from all explanatory variables. The REM can efficiently estimate β_{it} using the Generalized Least Squares (GLS), and results would be consistent and efficient if α_i is independently distributed of all independent variables. And if α_i is correlated with independent variables the results would be inconsistent and inefficient.

In order to choose the most efficient model Baltagi (2005:19), recommended the use of the Hausman test. The Hausman specification test evaluates whether the effects are uncorrelated with independent variables. The test compares the random effects against the fixed effects model under the following hypothesis:

H_0: α_i *is independently distributed of* χ_i (Random Effects)

H_1: α_i *is correlated with* χ_i (Fixed Effects)

If the p-value < 0.05 the null hypothesis is rejected, and the fixed effects are chosen, but if the p-value is > 0.05 the null hypothesis is not rejected; meaning random effects are more consistent and efficient (Amini *et al*., 2012:485). Despite the above, in this study FDI and human capital are also simultaneously determined, which introduces the issue of endogeneity. This can be addressed by using the SYS-GMM technique presented below.

3.3.2. Endogeneity

According to Woodridge (2013:50), endogeneity arises as a result of the independent variables being correlated with the error term. More specifically endogeneity arises from three sources namely: simultaneity, omitted variables and measurement error (Andersen, 2013:24). Firstly, simultaneity also known as dual causality occurs when it can be envisaged that an upsurge in FDI causes human capital to increase; simultaneously an increase in human capital can also cause an upsurge in FDI. Secondly, Woodridge (2013:50), put forward that omitted variables can be the cause of endogeneity; because some variables that help explain FDI might not be included in the model due to lack of consistent data.

For example, in this study tertiary education enrolment is not included in the model due to lack of consistent data availability for BRICS countries. However, the omitted variable bias can be mitigated by finding a proxy or by controlling for it in the model estimation. And thirdly, endogeneity can arise as a result of measurement error of the independent variables; this is more common in survey studies, where there can be recall bias from participates. As previously stated in this study, the proxy for human capital is gross enrolment for secondary schools (ISECSENROL), and the independent variable is simultaneously determined with FDI, hence endogeneity is controlled for by using the SYS-GMM model through an instrument variable technique.

In literature it has been established that a country that previously received FDI tends to receive more FDI in the future, Meaning FDI has a lag effect. However, including the lag dependent variable as an additional covariate causes the independent variables to be correlated with the error term. Given the bi-directional causality between FDI and gross enrolment for secondary schools (ISECSENROL) the model is likely to suffer from simultaneity bias. And according to Blundell & Bond (1998:116), Generalised Method of Moments (GMM) allows circumventing the model from endogeneity. More specifically the model is presented as follows:

$$IFDIUSB_{lt} = \alpha_i + \beta\ ISECSENROL_{lt} + \delta^{'}\chi_{it} + \lambda IFDIUSB_{l(t-1)} + \varepsilon_{it} \qquad (3.2)$$

i =1,.., N; t = 1,..,T (time)

Where α_i is country fixed effects; $ISECSENROL_{lt}$ is the log proxy for human capital; χ_{it} is a vector of control variables which includes logs of $IEDUSPEND_{lt}$, $ILIT_{it}$, $IHEL_{it}$, $IGDPPCUS_{it}$, $IFDIUSB_{l(t-1)}$ is a lag of the logged dependent variable and ε_{it} is the error term.

However, according to Blundell & Bond (1998:19), the lagged independent variable is correlated with ε_{it} because they are simultaneously determined. A commonly used estimation technique to estimate the parameters in a dynamic panel model, with unobserved individual-specific heterogeneity is to transform the model into first differences. By so doing the individual effects of α_i are eliminated. The system is called first differencing transformation (DIFF-GMM):

$$\Delta IFDIUSB_{lt} = \alpha\ \Delta ISECSENROL_{lt} + \delta\Delta^{'}\chi_{it} + \lambda\Delta IFDIUSB_{l(t-1)} + \Delta\varepsilon_{it} \qquad (3.3)$$

i =1,.., N; t = 1,..,T (time)

Where α_i is country fixed effects; $ISECSENROL_{lt}$ is the log proxy for human capital; χ_{it} is a vector of control variables which includes logs of $IEDUSPEND_{lt}$, $ILIT_{it}$, $IHEL_{it}$, $IGDPPCUS_{it}$; $IFDIUSB_{l(t-1)}$ is a lag of the logged dependent variable and ε_{it} is the error term.

By removing the individual effects α_i , the model still suffers from the effects of endogeneity, because $\lambda\Delta IFDIUSD_{l(t-1)}$ is correlated with ε_{it} . Wooldridge (2002:412), recommended using instrument variable technique, with the lagged dependent variable as instruments. Mathematically presented as follows: ($\Delta IFDIUSD_{l(t-1)}, \Delta IFDIUSD_{l(t-2)}.....\Delta IFDIUSD_{l(t-n)}$). As a

result Wooldridge (2002:412), thus recommended using more lags of the endogenous variable as instruments, this ensures instrument relevance. Moreover, Blundell & Bond (1998:118), did an empirical study exploiting additional moments conditions based on a similar first-differenced transformation and found the estimates to be more consistent and efficient.

The method exploits all possible instruments using the GMM estimators, which are obtained using the generated lagged variable of the dependent variable. According to Arellano & Bond (1991:293), estimates obtained using this system is unbiased and more efficient. However, in some situation when the independent variable is time invariant, there is cause to modify the GMM with $\Delta IFDIUSD_{i(t-1)}$ instead of $IFDIUSD_{i(t-1)}$. The estimates obtained this way are called SYS-GMM. According to Roodman (2006:15), the advantage of the SYS-GMM is that it allows the inclusion of time-invariant variables like gender or country.

When instruments are used, there is normally one source of finite sample bias in the use of too many instruments relative to the sample size (N). If all the available lagged instruments are used, the number of instruments grows rapidly with the time dimension of the panel. However, in this study $T > N$, hence, there is a danger of overfitting. Arellano & Bond (1991:293), proposed two tests for the accuracy of the SYS-GMM. First, a Sargan test of overidentifying restrictions, which tests the null hypothesis of no correlation between the instruments and the residuals. Secondly, second-order serial correlation can be tested in the residuals. If this test rejects the null hypothesis of no second-order autocorrelation in the regression, then the lagged endogenous variables are valid instruments.

3.3.3. Spatial Effects

Seemingly Unrelated Regression (SUR) proposed by Zellner (1962:348), has the ability to analyse multiple equations with correlated disturbances. According to Anselin (1988a:2), SUR model has the ability to control for spatial errors. Spatial effects models account for both spatial dependence and heterogeneity, the assumption being that the individual country regressions are correlated through their error terms. In fact, Anselin & Hudak (1992:511), highlighted that panel data with a locational component raises the issue of spatial dependency. Hence, although BRICS countries are on different continents they are interlinked as a result of trade agreements and liquid financial markets so that a shock from one of these countries is likely to spill over into other member countries.

Recall, that BRICS countries have different legal, economic and political environments, but it is worth noting that a monetary policy action in one country has the likelihood of affecting other countries in the group positively or negatively. Recently, the devaluation of the Chinese Yuan has had a negative impact on the commodity exporting economies like South Africa and Russia (Fin24, 2015:1); this shows the direct dependence of these economies with one another. However, Pesaran & Smith (1995:82), emphasised the differences amongst countries because it cannot be assumed that education in China is measured the same way as education in South Africa. Furthermore, there are more peculiar differences in these countries; of particular interest the education system, culture, population size, labour market conditions, language and health care systems. Given the importance of heterogeneity in the spatial distribution of FDI, it is important to control for country differences in the distribution of FDI amongst BRICS countries.

Following a study by Agosin & Mayer (2000:13), estimating using the SUR approach, in order to control for country-specific spatial effects, ensures that the estimation results are without bias, but reliable, consistent at the same time controlling for country-specific locational advantages. Generally, SUR is estimated using the Feasible Generalized Least Squares (FGLS) regression model, proposed by Zellner (1962:349). The equation is formally represented as follows:

$$IFDIUSB_i = \delta' Z_i \beta_i + \varepsilon_i \qquad i = 1, 2, \ldots, 5 \qquad (3.4)$$

Where $IFDIUSD_i$ is the i^{th} equation's dependent variable and Z_i is a vector matrix of independent variables for the i^{th} equation, on which there are T observations. And the error term $\varepsilon = [\varepsilon_1', \varepsilon_2', \ldots\ldots, \varepsilon_N']'$ is assumed to have an expectation of zero and covariance matrix of Ω.

3.4. Conclusion

This chapter sets out to explain the research methodology used in the study. As previously stated the reason for using panel data methodologies is informed by the nature of the data in this study. Moreover, different methodologies are employed in order to control for different econometric issues such as heterogeneity, endogeneity and spatial effects. That given, the next chapter will delve into the empirical analysis based on different techniques discussed in this chapter.

CHAPTER FOUR: EMPIRICAL ANALYSIS

4.1. Introduction

This chapter starts from the preliminary analysis, including data description analysis, and panel unit root test in order to avoid the issue of spurious regression and the related wrong influence thereof. Furthermore, the study reports on the major findings, with regards to the relevance of human capital in determining FDI in BRICS countries, for the period 1980-2013. Each estimation specification will be considered together with the relevant diagnostic tests.

4.2. Preliminary Data Analysis

This study uses secondary data obtained from the World Bank's World Development Indicators (WDI), United Nations Organization for Education, Science and Culture (UNESCO) and the United Nations Conference on Trade and Development (UNCTAD) open database. The frequency of the data is annually collected over a period of 1980-2013, for all BRICS countries, which include Brazil, Russia, India, China and South Africa (i.e., $T = 33$ and $N = 5$).

The study uses six annual time series; the dependent variable is the foreign direct investment, net inflows (**IFDIUSB**); the independent variable is human capital and it is proxied by gross secondary school enrolment as a percentage of the population (**ISECSENROL**). Furthermore, the study controls for gross spending on education as a percentage of GDP (**IEDUSPEND**), percentage of persons aged 15 and over who can read and write (**ILIT**), gross health expenditure as a percentage of GDP (**IHEL**) and a measure of average income per person in a country (**IGDPPCUS**).

The initial inspection in (Figure 4) below shows that there is a positive correlation between gross secondary school enrolment (ISECSENROL) and FDI. This is further confirmed by the pairwise correlation coefficient of 48.09% provided in (Table 2 Panel B) below. Given the correlation, it is the purpose of this study to determine the real relationship between these variables. Possibly suggesting that the increase in gross secondary school enrolment is associated with the surge in FDI across BRICS countries.

Table 2: Summary statistics

Panel A	**Descriptive Statistics**				
	MEAN	***N***	***STD. DEV.***	***MINIMUM***	***MAXIMUM***
VARIABLES					
IFDIUSB (B)	*22.74*	*34*	*1.57*	*19.66*	*25.06*
IFDIUSB (R)	*22.90*	*22*	*1.56*	*20.35*	*25.01*
IFDIUSB (I)	*20.10*	*34*	*2.48*	*15.55*	*24.49*
IFDIUSB (C)	*23.56*	*34*	*2.21*	*18.46*	*26.53*
IFDIUSB (SA)	*20.55*	*28*	*2.00*	*15.02*	*23.01*
ISECSENROL (B)	*4.43*	*34*	*0.31*	*3.90*	*4.70*
ISECSENROL (R)	*4.52*	*34*	*0.06*	*4.41*	*4.60*
ISECSENROL (I)	*3.82*	*34*	*0.24*	*3.35*	*4.23*
ISECSENROL (C)	*3.94*	*34*	*0.33*	*3.43*	*4.49*
ISECSENROL (SA)	*4.31*	*34*	*0.26*	*3.70*	*4.71*

Panel B	**Pairwise Correlation Matrix**				
VARIABLES					
IFDIUSB					
ISECSENROL	*0.4809*				
IEDUSPEND	*0.1628*	*0.7271*			
ILIT	*0.6380*	*0.6057*	*0.4843*		
IHEL	*-0.1858*	*0.1745*	*0.0100*	*0.0397*	
IGDPPCUS	*0.3524*	*0.8292*	*0.8197*	*0.5937*	*0.2276*

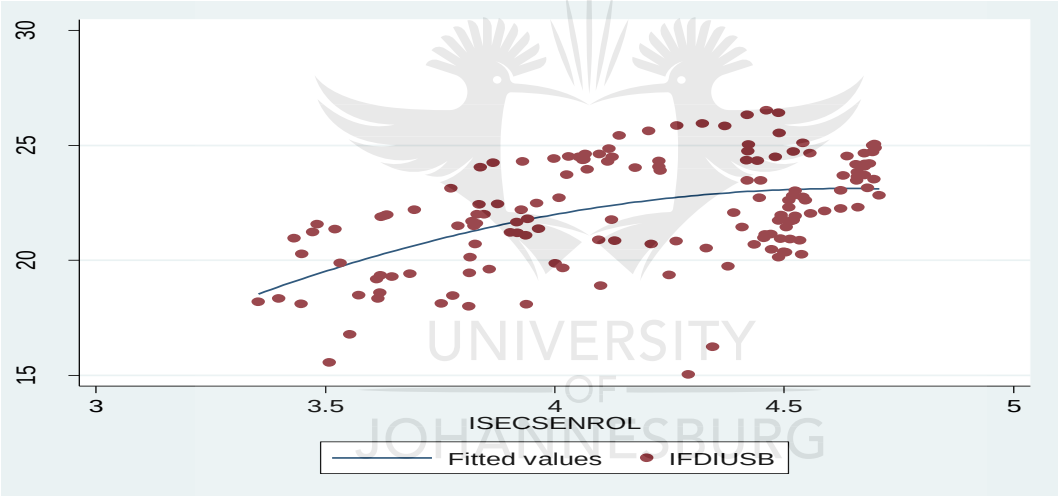
Notes: This table shows in (Panel A), the summary statistics for the five BRICS countries and (Panel B), depicts their pairwise correlation matrix.

Descriptive statistics presented in (Table 2 Panel A) illustrates the data for the dependent variable (IFDIUSB) and the proxy for human capital (ISECSENROL) for all BRICS countries. It shows the mean, standard deviation, range, as well as the number of observations included in the model. From (Table 2 Panel A) it is observed that China (C) has the highest mean of FDI, and India (I) has the lowest mean of FDI; the results are consistent with the results initial found in (Figure 1). Moreover, India (I) has the highest standard deviation of FDI, entailing that FDI in India has been more volatile than in other BRICS countries. However, Russia (R) has the highest mean for gross secondary school enrolment at (4.52), it could be discerned that an increase in gross secondary school enrolment could be related to the increase in FDI. While on the other hand, India (I) has the lowest gross secondary schools

enrolment with a minimum of (3.35) and a maximum of (4.23), it is interesting to note that India also has the lowest FDI given the mean of (20.10) over the sample period.

Table 2 (Panel B), further shows that gross secondary school enrolment (ISECSENROL) and FDI (IFDIUSB) have a positive correlation with a correlation coefficient of (48.09%). Moreover, it reveals that literacy rates have the strongest correlation of (63.80%), GDP per capita at a lower positive correlation of (35.24%), gross expenditure on education at a lower correlation of (16.28%). But unexpectedly gross health care expenditure and FDI seem to be negatively correlated at (-18.58%). However, the pairwise correlation matrix cannot inform any conclusive judgments as further tests need to be done in order to ascertain the true nature of the relationship.

Figure 4: Scatter plot for gross secondary School Enrolment (ISECSENROL) and FDI (IFDIUSB)



Source: *World Bank development indicators (WDI) and United Nations Conference on Trade and Development (UNCTAD), Stata plot statistical program*

4.3. Panel Unit Root Test

In the presence of panel time series that is, (T=33 and N=5), as is the case in this study it is important to ascertain the stationarity properties of variables in order to avoid the issue of spurious regression. A stationary variable has a mean, a variance and autocorrelation which are constant over time, meaning that short-term shock to that particular variable has no long-term impact on the economy. On the other hand, a non-stationary variable has an unpredictable non-constant mean and variance; meaning that a shock to that particular variable is expected to have a long-term impact on the economy (Harris & Sollis, 2005:29).

Different unit root testing procedures have been proposed in the literature including by Levin & Lin (1992:2), Im *et al*. (1997:3), Harris & Tzavalis (1999:201), Madala & Wu (1999:631), Choi (1999:17), Hadri (1999:201), and Levin *et al*. (2002:2). However, unlike other panel unit root alternatives which are multiple variables panel unit root tests, the fisher type test relies on individual panel unit root test. And it appears to be less restrictive as it allows the coefficient to vary across cross-sectional units.

Moreover, fisher type test offers the following advantages (Baltagi, 2005:242): (1) the cross-sectional dimension N can be either finite or infinite, (2) each group can have different types of non-stochastic and stochastic components, and (3) it allows for individual heterogeneity. However, the main disadvantage is that the results of the Fisher type test are biassed for small sample sizes. Formally the fisher type test is given as follows:

$$p = -2\sum_{i=0}^{n} Inpi \qquad (3.5)$$

It combines the p-value from unit root tests for each cross-section (i) *to* test for a unit root in panel data. (p) is distributed as (χ^2), with ($2N$) degrees of freedom as $T_i > \infty$ for all N .

Table 3: Fisher unit root test results

Variables	***IFDIUSB***	***ISECSENROL***	***IEDUSPEND***	***ILIT***	***IHEL***	***IGDPPCUS***
Statistic	55.84	41.39	21.25	48.98	35.36	20.72
P-value	0.00	0.00	0.01	0.00	0.00	0.02

Formally, the fisher test has the following hypothesis:

H_0 : p = 0 for all i: (All series in the panel have a unit root)

H_1 : p < 0 for at least one i: (At least, one series in the panel does not have a unit root)

If a p-value < 0.05, the null hypothesis is rejected. In (Table 3) above, the unit root tests are presented for all the variables included are the t-statistic and p-values. All the p-values are < 0.05 hence all the variables are all stationary; suggesting no transformation is required for all variables.

4.4.1. Fixed Effects versus Random Effects Model Results

This section presents results for both the FEM and the REM, in order to control for individual heterogeneity due to country specific effects. The overall performance of the models estimated in (Table 4) appears satisfactory. This is inferred from the F-test and the Wald test's p-values of 0.000 and 0.000, respectively. With respect to the FEM, the within R-Squared value shows that the variation is FDI in BRICS countries is 75% explained by human capital when the country specific effects are not taken into account. But when the country specific effects are taken into account, the overall R-Squared value is 33%.

However, to test for the most efficient and consistent model, the Hausman test is the appropriate tool to differentiate the models. Recall that, the Hausman test determines whether the fixed effects (α_i) are correlated with independent variables. If the country specific fixed effects are correlated, it implies the FEM is efficient. Otherwise, if the country specific fixed effects are uncorrelated, it implies that REM is efficient and consistent. The null hypothesis and the alternative are formally presented below:

H_0: *α_i is independently distributed of* χ_i

H_1: *α_i is correlated with* χ_i

If the p-value < 0.05 the null hypothesis is rejected, in this case, given that the resulting p-value = 0.7537, the null hypothesis is not rejected; hence the REM is systematically consistent and represents the appropriate specification to control for heterogeneity.

Since the REM is found to be consistent and efficient, the results are reported and discussed below. The REM is estimated using the random coefficient model. It is observed in Table 4 below that gross enrolment in secondary schools (ISECSENROL) is a significant determinant of FDI, indicated by the p-value of 0.008. Consequently, a 1% increase in gross secondary school enrolment (ISECSENROL) tends to increase FDI inflows across BRICS countries by 3.184%. However, all the control variables appear to be insignificant in REM, indicated by p-values > 0.05. That given, the overall results findings are supported by similar findings by Pouris & Inglesi-Lotz (2014:1), which concluded that there is a positive relation between human capital and FDI.

4.4.2. System Generalised Method of Moments (SYS-GMM) Results

However, because of potential simultaneity between the level of FDI and the quality of education, which raises the issue of endogeneity; hence, further estimation technique is used namely: The SYS-GMM model. This technique is considered to mitigate the possibility of endogeneity related bias.

Table 4: Regression estimates results

MODEL	***FEM***	***REM***	***SYS-GMM***
VARIABLES			
ISECSENROL	***(3.095)***	***(3.184)***	***(0.770)***
	0.000	*0.008*	*0.038*
IEDUSPEND	***(-0.717)***	***(-1.780)***	***(-1.260)***
	0.241	*0.381*	*0.001*
ILIT	***(3.380)***	***(-0.072)***	***(0.719)***
	0.000	*0.958*	*0.000*
IHEL	***(-0.749)***	***(0.251)***	***(-0.658)***
	0.007	*0.863*	*0.000*
IGDPPCUS	***(0.987)***	***(1.456)***	***(0.393)***
	0.000	*0.060*	*0.006*
$IFDIUSD_{t-1}$			***(0.683)***
			0.000
R-Squared (Within)	*0.754*		
R-Squared (Overall)	*0.338*		
F-Test	*P > F = 0.000*		
Wald Test		$P > \chi^2 = 0.000$	$P > \chi^2 = 0.000$
Sargan Test			$P > \chi^2 = 0.3112$
Arellano-Bond Test			*P > Z = 0.5355*

Notes: This table shows three different model's coefficients, p-values and diagnostic checks tests results, as FDI is regressed on *ISECSENROL*, *IEDUSPEND*, *ILIT*, *IHEL*, *IGDPPCUS* and including lagged dependent variable $IFDIUSD_{t-1}$ to account for the dynamic property of FDI.

In (Table 4) above, the SYS-GMM results show that when endogeneity is taken into account, gross enrolment in secondary schools (ISECSENROL) is a significant determinant indicated by a p-value of 0.038. The result indicates that a 1% increase in gross secondary school enrolment (ISECSENROL) tends to increase FDI inflows across BRICS countries by 0.770%. All the control variables are significant with p-values < 0.05. Furthermore, since the SYS-GMM estimation results cater for data with dynamic properties, the coefficient of the lagged dependent variable ($IFDIUSD_{t-1}$) is significant (p-value 0.000). This provides evidence to the notion that countries that previously received FDI will mostly receive more

FDI in the future. This is in line with a study by Giuliani *et al.* (2014:680), which found that FDI growth is determined by past relationships in the short term investment horizon.

But it is interesting to note that gross health expenditure (IHEL) and gross expenditure on education (IEDUCSPEND) are negatively related to FDI. The results suggest that public expenditure has a crowding out effect on private investments. In previous literature, similar findings were reached by Amassoma *et al*. (2011:230), and the suggestion was that a systematic public investment in education and health care is needed rather than wholesale investment in education and health care. Furthermore, there was a suggestion of reversal of unplanned budgeting for these sectors and redirect the excessive expenditure to pivotal sectors that will help attract FDI.

Furthermore, when presenting the SYS-GMM result it important to show that the model is not over-identified**.** To control for over-identification this study used the Sargan test and below the Sargan test's null hypothesis and the alternative are formally presented:

H_0*: Over-identification restrictions are valid*

H_1*: Over- identification restrictions are not valid*

If the p-value is < 0.05, the null is rejected. In this model, the p-value is 0.3112, which means the null hypothesis is not rejected and the model over-identification restrictions are valid. Furthermore, the SYS-GMM model provides robust results that are reliable, because Arellano-Bond Test with a p^2 -value 0.5355, does not reject the higher order moment conditions proving that the model is correctly specified and moments conditions are valid.

4.4.3. Seemingly Unrelated Regression (SUR) Model Results

And finally, the relevant diagnostic test for SUR model is presented in order to account for spatial effects of each country in the BRICS grouping. And below the SUR estimates are presented and discussed. Table 5 (Panel A) below provides evidence that gross secondary schools enrolment (ISECSENROL) is positively related to FDI allocation in all countries except for South Africa. The reason it is not significant for South Africa might be explained by the fact that investors do not view South Africa as a country with high skills level rather a resources based economy. Furthermore, South Africa comes from a low skills base when compared to other BRICS countries. That given, particularly, a 1% increase in gross secondary school enrolment tends to lead to 6.88%, 2.65%, 5.48% and 3.30% increase in FDI

for Brazil, Russia, India and China, respectively. In terms of the control variables gross expenditure on education (IEDUSPEND), exhibit a significant factor for Brazil, Russia and India only with p-values of 0.003, 0.000 and 0.000, respectively. But China and South Africa exhibits insignificant p-values despite the relatively high percentage of investment in this sector. It may be attributed to expenditure in education, not materially similar to educational output. The result is consistent with findings from a study by Spaull (2013:20), which reported that South Africa education expenditure for primary children is 49% higher than that of other developing countries, but the output is that children cannot read and write at the end of Grade four. Similarly, Qian & Smyth (2005:3), noted that even though China's expenditure on education is high, but due to the large population and region spatial differences, the education received is not the same in all the regions.

Literacy rates are a significant determinant in Brazil and China only with p-values of 0.008 and 0.000, respectively. China has harnessed the technological spillovers from FDI over the years; hence, their literacy rates (ILIT) are a significant factor in determining FDI. Evidently, China has been a high destination for high technological FDI, which demands highly literate people. On the other hand, in Russia, India and South Africa literacy rates (ILIT) are insignificant. But in recent years, they have been playing catch up with other BRICS member countries and increasing to be at the same level as other BRICS countries (Lin *et al*., 2013:59).

Gross health care expenditure (IHEL), is a significant factor in Russia, China and South Africa with their respective p-values of 0.000, 0.001 and 0.000. This might be attributed to transition economies that come from previously closed economies; hence, investors deem the health care of workers to be paramount. Evidently, the FDI allocated to these regions are mostly high intensive work which demands good physical health from workers. On the other hand, Brazil and India rank lower on health care; hence, it is not a significant factor in FDI allocation. GDP per capita (IGDPPCUS) is a significant factor for FDI allocation in Brazil and Russia only with p-values of 0.000 and 0.000, respectively. This can be attributed to superior technological expertise in these economies fuelled by high consumption levels. Multinational companies that thrive on consumption prefer investing in these countries because there are high returns for their investments. India, China, and South Africa are burdened with high unemployment levels, hence GDP per capita are marginally lower. Therefore, GDP per capita (IGDPPCUS) turns out to be is insignificant in explaining FDI in these countries; this can be attributed to lower wages in these countries.

Table 5 (Panel B) below indicates the correlation matrix across BRICS countries and it provides an appropriate measure of each country's correlation with another country in the BRICS group. If the correlation coefficient is above 50%, in absolute value there is a strong correlation and if it is negative it suggests that there is a negative correlation between countries. That given, a shock originating from a monetary or fiscal policy in Russian is likely to have a positive impact on the South Africa and Indian economies; given their correlation of 49% and 56%, respectively. However, a change in monetary or fiscal policy in Brazil is likely to have a negative impact in China and South Africa, because they are negatively correlated at (-33%) and (-23%) respectively.

Table 5: Seemingly unrelated regression (SUR) estimates results

COUNTRY	*Brazil*	*Russia*	*India*	*China*	*South Africa*
Panel A : Regression Estimates					
VARIABLES					
ISECSENROL	***(6.884)***	***(2.647)***	***(5.482)***	***(3.299)***	***(1.597)***
	0.021	*0.000*	*0.001*	*0.007*	*0.741*
IEDUSPEND	***(-9.774)***	***(2.868)***	***(1.860)***	***(-0.026)***	***(-5.016)***
	0.003	*0.000*	*0.000*	*0.947*	*0.066*
ILIT	***(6.826)***	***(0.417)***	***(-0.603)***	***(2.694)***	***(4.854)***
	0.008	*0.600*	*0.260*	*0.000*	*0.295*
IHEL	***(-0.225)***	***(-2.799)***	***(-0.314)***	***(-0.563)***	***(11.029)***
	0.831	*0.000*	*0.220*	*0.001*	*0.000*
IGDPPCUS	***(4.390)***	***(1.093)***	***(0.204)***	***(-0.024)***	***(-1.520)***
	0.000	*0.000*	*0.777*	*0.949*	*0.090*
Breusch-Pagan test of independence χ^2 (10) = 18.997, P = 0.0403					
Panel B : Correction Matrix of Residuals					
COUNTRY					
Brazil					
Russia	*0.0998*				
India	*0.2260*	*0.5607*			
China	*-0.3309*	*0.1390*	*0.0785*		
South Africa	*-0.2358*	*0.4917*	*0.2060*	*0.1154*	

Notes: Panel A reports the summary of Seemingly Unrelated Regressions (SUR) estimates for each country's coefficients, p-values and the Breusch-Pagan test. Whereas Panel B shows the Correction matrix of residuals.

Following the estimation of the SUR model, the Breusch-Pagan test shows a p-value of 0.0403 as seen in Table 5 above. The null hypothesis and the alternative hypothesis presented as follows:

H_0 : *Cross-sectional independence*

H_1 : *Cross-sectional dependence*

Since the p-value < 0.05, the null hypothesis is rejected. The result suggests that there is cross-sectional dependence amongst BRICS countries. This is to be expected since BRICS countries are all emerging market countries that share trade agreements and common trade markets.

4.5. Conclusion

The results show that investment in gross secondary schooling improves literacy rates in a country, and in turn educated people go on to gain skills which will enable them to earn higher wages. And it is these aspects that make human capital attract FDI in the overall BRICS economies. Furthermore, it was observed that FDI has a lagged effect on the economy; meaning that countries that previously received FDI tends to attract more future investments.

It was also observed that the impact of human capital differs from country to country; however, the general economic picture is that human capital has a significant impact on FDI especially in Brazil, Russia, India and China. This evidence is seen especially with China which has gained more FDI in recent years (BRICS5, 2013b:12); As soon as China opened the economy to international trade, FDI rapidly increased resulting in increased economic growth.

Nevertheless, the robustness of the human capital theory seems to be slightly disjointed especially regarding education spending and FDI attraction. Caution should always be exercised in the interpretation of panel results. This analysis has the potential of masking the findings giving rise to incorrect results. As such, the scope to investigate other channels and thresholds responsible for FDI remains open beyond this investigation. And based on the above results, the last chapter will discuss policy implications and conclusions of the study.

CHAPTER FIVE: CONCLUDING REMARKS AND POLICY IMPLICATIONS

5.1. Introduction

This study set out to investigate the relevance of human capital in attracting FDI into BRICS countries. In order to gain an understanding of the subject, the neoclassical and endogenous growth theories were reviewed, but due to their shortcomings in internalising human capital; it was necessary to review the human capital theory as well. Furthermore, in order to discern the FDI dynamics in BRICS countries, the static and dynamic model paradigm was used to understanding the role of human capital in attracting FDI into BRICS countries.

Therefore, different statistical methodologies are employed in order to control for heterogeneity, endogeneity and spatial effects. These include FEM, REM, SYS-GMM and SUR model. This study was necessitated by the gap in knowledge regarding the relevance of human capital in attracting FDI into BRICS countries.

5.2. Empirical Findings

Overall results from different techniques considered are favourable to human capital as a relevant factor in attracting FDI across BRICS countries. The main findings of this study are in the literature review, REM, SYS-GMM and SUR model. In literature, most of the research is conclusive in asserting that human capital is a relevant factor in determining FDI in developing countries. And consequently, this study finds similar results regarding the relationship between human capital and FDI in BRICS countries. The estimation results of REM and the SYS-GMM, found human capital to be a relevant factor in attracting FDI in BRICS countries.

The conclusion is reached because the proxy variable which is the gross secondary school enrolment (ISECSENROL) is found to be significant at a 5% level of significance. However, gross expenditure on health care and education are found to be negatively related to FDI. This unexpected finding implies that there must be systematic gross public expenditure not wholesale public expenditure without targeted outcomes. The results of the SUR model indicate the presence of cross-sectional dependence between BRICS countries. With the exception of South Africa, controlling for spatial dependence leads the gross secondary school enrolment to be positively related to FDI. This exception might suggest that there still

needs to be a concerted effort in building the schooling system so that it can be at the same level as that of other BRICS countries.

Furthermore, gross healthcare expenditure results in the SYS-GMM model estimation results; concur with the results found in the SUR model. Were gross healthcare expenditure is found to be negatively related to FDI in Brazil, Russia, India and China. However, for South Africa, there seems to be a positive relationship at the same time a significant determinant. In Brazil and Russia, GDP per capita is found to be positively related to FDI, The results are similar to the finding by Demirhan & Masca (2008:365), which found GDP per capita to be positively related to FDI in developing countries.

In South Africa, gross public expenditure in health care is the only significant variable in determining FDI. It shows that gross public expenditure on gross health care expenditure reduces mortality rates and poor families can increase their expenditure on education as it was similarly found by Kearney & Odusola (2011:61). The other variables are insignificant in determining FDI in South Africa; this is surprising given that South Africa has increased their literacy rates over the past twenty years. But this can be attributed to foreign investors viewing South Africa as a natural resources hub, rather than a place where there are high technical skills. However in the future in order to attract high skilled and technological intensive FDI, the government, through the department of education must make it compulsory for mathematics and science in secondary schools, so that there can be a high intake in technical programmes at university as it is currently practised in China and Russia.

5.3. Policy Implications and Recommendations

In terms of development policies, Brazil has been implementing consistent policies in order to effectively deal with poverty, and the result has seen moving of 40 million people out of poverty. According to Hall (2008:804), the Bolsa Familia social welfare program has increased the human capital capabilities of Brazil by offering conditional incentives and money transfers to poor families. The output performance of the program is seen by improved GDP per capita and education output in Brazil over time.

Although most of the adult population in Russia has secondary schooling, there still needs to be a comprehensive policy that includes education to the adult population which can increase the literacy rates in that country (UNESCO, 2014:7). Economic growth rate in India have been increasing steadily, but due to the widely scattered population, the impact is not felt on

the ground. In order to attract sufficient FDI, there needs to be a concerted effort at specific educational policies that cater for educational needs in accordance with regional differences and circumstances.

China has increased literacy rates over the years significantly; this was achieved through the implementation of the National Development and Reform Commission (NDRC) plan, which has policies that are aimed at developing China to be a more market-oriented economy that includes attractive FDI at the same time improving the human capital skills of the country (Garnaut *et al*., 2010:40). However, there needs to be a reduction in wholesale public expenditure, rather implement sectoral public expenditure in accordance with the different regional needs of the country. South Africa development goals are embedded in the National Development Plan (NDP), similarly to the China's National Development and Reform Commission (NDRC), the problem remains that the development plan is not specific in nature (Van Wyk, 2015:11).

With particular attention to the South Africa National Development Plan (NDP), it lacks action plans when it comes to implementation viability (Nyoka & Lefko-Everett, 2011:3). Hence, the results still show that the gross secondary school enrolment is still not a significant factor in determining FDI. In order to attract more FDI in the future, there need to be sector specific economic development zones that are geared towards FDI that is specific to the region. According to Todes (2013:12), economic development zones in Rosslyn Pretoria and East London Industrial Development Zone (ELIDZ) can be used as case studies for other developments in other regions. According to Scheepers (2012:84), these economic development zones, in order for them to be successful, should have a complete value chain in the vicinity; which includes education training centres and secondary industries in order to reap the full benefits of FDI. But in the broader perspective, to improve the impact of BRICS countries in the world economy, more countries should be added to the grouping; as there are cross country attributes that can be of benefit to the economic growth of member countries.

5.4. Conclusion

In accordance with previous literature on FDI, human capital is found to be a relevant factor in attracting FDI in BRICS countries. But in order to attract more FDI, there need to be developmental policies in place; that are targeted at attracting and retaining the FDI already in the country. It can be done through job training initiatives, reduction in public expenditure and focus on specific expenditure that has direct accrual benefits to communities and a change of the education curriculum to be in touch with current economic conditions is also important. This study has shown that human capital capacity of a country is relevant in attracting FDI. Since economic growth and FDI growth are interlinked for BRICS countries, it is imperative that human capital capacity is enhanced through concerted development policies.

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APPENDICES

Appendix A: BRICS countries FDI inflows in US$B, (2013)

Year	2013
Brazil	$64,045
Russia	$79,262
India	$28,199
China	$123,911
South Africa	$8,187

Appendix B: Sectoral shares of value added (at constant prices) BRICS countries, 1980-2008 (in %)

Brazil

Sectoral distribution of FDI based on "Investimento estrangeiro direto - Tabelas - Censo 1995 e ingressos 1996 a 2000"
http://www.bcb.gov.br/rex/IED/Port/ingressos/htms/index1.asp?idpai=I NVEDIR

Russia

Sectoral distribution of FDI based on Federal State Statistics Service: "Russia in Figures. Table 23.11", various issues.
http://www.gks.ru/wps/wcm/connect/rosstat/rosstatsite/main/publishing/catalog/statisticCollections/doc_1135075100641

India

Sectoral distribution of FDI based on SIA Newsletter, January edition for the years: 2006 to 2011 *(http://dipp.gov.in/English/Archive/Archive.aspx)*

China

Sectoral distribution of FDI based on shares published in the China Statistical Yearbook (CSY), various issues. *http://www.stats.gov.cn/english/statisticaldata/yearlydata/*

South Africa

Sectoral distribution of FDI based on South African Reserve Bank, Quarterly Bulletin, December Edition for the years 2004 to 2011
http://www.resbank.co.za/Publications/QuarterlyBulletins/Pages/QuarterlyBulletin.aspx

Appendix C: Table C: Public expenditure as a percentage of GDP and GDP for BRICS countries at current prices (US$B)

Year (2013)	Country	Share of public expenditure on education as % of GDP	GDP(current prices/billion US$)
	Brazil	5.3%	$2,246
	Russia	4.3%	$2,096
	India	3.3%	$1,726
	China	4.3%	$9,185
	South Africa	6.8%	$382

Appendix D: Variables and expected signs

Table D: Variables and expected signs

Name	Description	Previous Studies	Expected Sign
ISECSENROL	Gross enrolment in secondary schools as a % of the population	Noorbakhsh *et al.*, (2001), Root & Ahmed (1979)	Positive (+)
IEDUSPEND	Gross spend on education as a % of GDP	Ekanayake & Kornecki (2011)	Positive (+)
ILIT	% of persons aged 15 and over who can read and write.	WDR (1991), Schneider & Frey (1985) and Hanson (1996)	Positive (+)
IHEL	Health expenditure as % of GDP	WDR (1991)	Positive (+)
IGDPPC	Measure of average income per person in a country(current US$)	Barro (1996) and Bils & Klenow (1998)	Positive (+)
$IFDIUSD_{t-1}$	Lagged variable of Foreign direct investment, net inflows (current US$)	Quazi (2007) and Noorbakhsh *et al.*, (2001)	Positive (+)

Dependent Variable

Foreign direct investment (FDI): Foreign Direct Investment (FDI) is measured as net inflows in the form of Greenfield investments. Data on FDI was obtained from United Nations Conference on Trade and Development (UNCTAD) dataset. According to UNCTAD (2012:208), FDI is defined as a net investment in acquiring lasting management interest in an enterprise operating in another country. The explanation is in line with the definition in the following literature: (Root & Ahmed (1979:767); Schneider & Frey (1985:162); Hanson (1996:86); Quazi (2007:1); Ekanayake & Kornecki (2011:95) and Noorbakhsh *et al.* (2001:1610), in the above papers FDI is used as a dependent variable.

Independent Variable

Human capital is comprised of different factors contribution to the skill and ability of an individual to work efficiently. The variables are chosen on the basis of their contribution to human capital development and as a locational advantage for FDI. The independent variable

and the control variables are as follows: $IFDIUSD_{t-1}$; ISECSENROL; IEDUSPEND; ILIT; IHel and IGDPPC. And below is an in-depth explanation of the variables:

Gross enrolment in secondary schools as a percentage of the population (ISECSENROL): Gross secondary school enrolment is highly recognized as a good start to preparing people for the workplace (World Bank, 1999:25). In most developing countries, most people in developing countries end their schooling career in secondary school; hence it is important that at least most people go through this phase. Countries with policies that raise the secondary education enrolment tend to have a high supply of skilled labour force according to Noorbakhsh *et al.* (2001:1610). And furthermore, it has been proved by many studies that secondary education teaches the critical skills necessary for technical jobs in the economy (Root & Ahmed, 1979:767) and Schneider & Frey (1985:162).

Gross spend on education as a percentage of GDP (IEDUSPEND): Gross expenditure on education by the government is supposed to improve the skills of workers in the country. It is normally measured by the high output of skilled workers from universities (Ekanayake & Kornecki 2011:95). In a paper by MoFED (2002:5), when the Ethiopia government increased expenditure to almost 20%, they saw an increase in investment by Chinese firms.

Literacy rate (ILIT): In a paper by Mathur and Singh (2003:991), they concluded that countries with high levels of literacy tend to receive a high level of FDI. The literacy rate is a measure of human capital stock in a country and it is strongly correlated with GDP per capita (Harms & Ursprung, 2001:651). Hence, it is only fitting to use this variable as a control variable for human capital.

Gross health expenditure as a percentage of GDP (IHEL): Public expenditure on health care as a percentage of GDP is a proxy for health care for a country's labour force. A good health care system should have a positive impact on FDI, because health workers are bound to be more productive. As La Porta *et al.* (1999:79) pointed out; delivering of good health facilities and medicines provides many positive externalities into the economy. Beyond the attraction of FDI, it also improves economic growth of a country indirectly, but in the short term the expenditure might constrain FDI inflows depending on the country-specific dynamics.

GDP per capita (IGDPPC): GDP per capita in current US$, at purchasing power parity was taken from World Bank's World Development Indicators (WDI). In this case GDP per capita

represents the earning potential of human capital in a particular country. GDP per capita can also be used as a proxy for market size in an economy, According to Artige & Nicolini (2005:2), companies like to invest in countries where they know there is increasing demand for their goods. With high-income, a family can also invest in personal education which will enhance their human capital capabilities as well.

Lagged FDI ($IFDIUSD_{t-1}$ **):** Many investors invest in countries that they are familiar with, and after success on the initial investment they are likely to reinvest in that country again. Moreover, FDI has a lagged impact on the economy, due to an assimilation of technology or availability of skills. In a study by Noorbakhsh *et al.* (2001:1610), they provided evidence to show that FDI responds positives to retrospective investments in the economy.