Infrastructure and Foreign Direct Investment in Kenya: A Time Series Analysis 1980-2015

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INFRASTRUCTURE AND FOREIGN DIRECT INVESTMENT IN KENYA: A TIME SERIES ANALYSIS 1980-2015

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DEDICATION

I dedicate this project to God Almighty my creator, my strong pillar, my source of inspiration, wisdom, knowledge and understanding. He has been faithful to me in all the achievements.

Special dedication to my dad Joash Kidake Senelwa for the encouragement in achieving this far.

Finally special dedication to my friends for the moral support. My love for you all cannot be measured. God Bless you.

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May the Almighty God who sees in the secret and hears when we call bless you all. AMEN.

ABSTRACT

Provision of infrastructure is one of the key roles of governments and is mostly associated with the level of economic growth and development of the respective country. However, with the limitation in budgetary resources, infrastructure development cannot be achieved through budgetary allocations alone without some other external financing sources. However, Multinational Corporation considers the domestic characteristics of the host countries before making investment decisions. Such characteristics include infrastructural development, ease of doing business, economic growth rate, and real effective exchange rate. This paper sought to empirically analyze the long-run and short-run associations between infrastructural and FDI stocks in Kenya. The study used the principal component analysis (PCA) to generate infrastructure component. It is generated from the three main measure of infrastructure which includes electricity generation in kilowatts, Mobile cellular subscription (per 100 people), and the total expenditure on transport infrastructure (Road, air, water, and Rail). The study used annual Time series data for the period 1980- 2015, which will be obtained from the World Bank database and the Kenya Bureau of Statistics(KNBS) publications. The study results indicated that FDI and infrastructural development are related in the long run. Further, the study indicated that FDI affected the infrastructure in the short run significantly. Infrastructural development had a positive significant effect on the FDI in the short run. Granger causality results indicated a unidirectional causality running from FDI to infrastructural development. From the study findings, this study proposed measures to be put in place to facilitate infrastructure development with aim of attracting FDI inflows, and on the other hand, the study proposed policies to be put in place to increase FDI inflows with main aim of facilitating infrastructure development in Kenya.

LIST OF ABBREVIATION AND ACRONYMS

AFDB	African Development Bank
AIBUMA	Annual International Business and Management
AR	Auto regressive
ARDL	Autoregressive Distributed Lag
EAC	East African Community
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
ICT	Information Communication Technology
IDEP	Institute of Economic Development and Planning
IRENA	International Renewable Energy Agency
KNBS	Kenya National Bureau of Statistics
KSH	Kenya shillings
MNC	Multinational Corporation
OECD	Organization for Economic Cooperation and Development
REER	Real Effective Exchange Rate
SSA	Sub Saharan Africa

UNCTAD	United Nations Center for Trade and Development
VAR	Vector Autoregressive
VECM	Vector Error Correction Model
WBG	World Bank Group
WDI	World Development Indicators

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CHAPTER ONE

INTRODUCTION

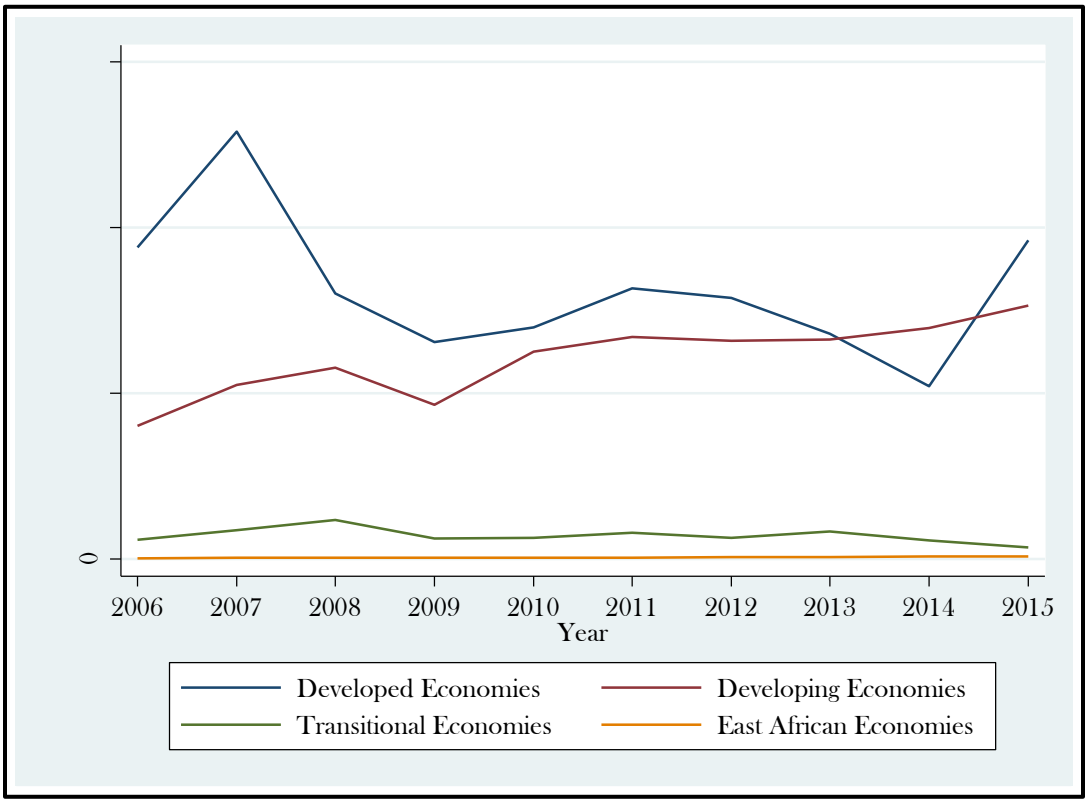
1.1 Background

Foreign Direct Investment, is defined as the kind of investment that involves a long-term relationship with a reflection of a lasting interest and the control of resident entity in one economy in an enterprise other than that of foreign direct investor (UNCTAD, World Investment Report, 2016). In Kenya , FDI is defined as investment in foreign assets, such as foreign currency, rights, credits, benefits or property, which is undertaken by a foreign national for the purposes of production of goods and services which are to be sold either domestically or exported overseas (Investment Promotion Centre Act, Chapter 518). According to the Organization for Economic Cooperation and Development (OECD), FDI is an investment in a business by an investor from another country for which the foreign investor has control over the company purchased. According to (laungani & Razin, 1999), the distinguishing feature of FDI from any other external investment is the control over the management policy and decision-making. This study will use the definition by UNCTAD, World investment report as given above.

There was a global rise in FDI inflows in 2015 by about 40 percent, this was the highest level since the worldwide economic and financial crisis set about in 2008. The Inward Foreign Direct investment inflows to developed countries doubled to USD 962 billion in 2015 from the preceding year. On the other hand, FDI inflows to growing economies recorded a new level of USD 765 billion, which 9 % higher than in 2014. Developing Asia still dominates as the pre-eminent FDI inflows recipient region in the world. The trend of FDI inflows by the group, that is, world total

inflows, Developed economies, developing economies, and Transitional economies are shown in figure one below.

Figure 1 Global FDI inflow by group 2006-2015



Source: World Bank (2017)

From figure 1 above, developed countries experienced fall in FDI inflows by 28%. This could be attributed to the large fluctuations in the intracompany lends which condensed to the lowest level since 2007. FDI inflows to the transitional countries increased by 4 % which can be accounted for by the rise in the interregional mergers and acquisitions sales. On the other hand, FDI stock in the developing economies has maintained a constant rise from the year 2009.This could be attributed to the Greenfield investment projects. This is continued rise is expected to maintain up to the year

2030. As indicated by the World investment report (2015), to experience economic diversification, more efforts are needed to harness financing.

In 2015, 495 firms directed investments to Sub-Saharan Africa as compared to 469 companies in 2014. For the period 2007 to 2013, FDI inflows to SSA grew steadily. Coming to the year 2014, FDI inflows fell to USD 49.4 billion but raised to USD 57.5 billion in 2015, IMF (2015). According to FDI markets (2016), Egypt persistent to be the main recipient of FDI inflows in Sub-Sahara Africa in the year 2015, with USD 14.5 Billion in investments. In terms FDI inflows directed to projects, South Africa remained as the leader with 118 projects. Kenya experienced a rise in the number of projects from 49 % to 85 %, while Uganda increased its projects by 67 %, similar to Tanzania. Among the top 10 countries, Mozambique and Ethiopia were the only countries which showed a reduction in FDI inflows directed towards projects in 2015.

According to African Development Bank (2008), African nations attracted investments from developed nations such the UK, France, and the US, and more so from other upcoming economies India and China. These investments were mainly channeled to countries which are rich in natural resources while business activities related to infrastructure development such as Electricity, information and communication, Construction, and Internet infrastructure covered for 13% percent of all projects directed to Sub-Saharan Africa. In particular, Electricity accounted for a 49 % increase in invested capital and a 91 % improvement in the number of projects.

According to FDI markets (2015) statistics, Business activities such as manufacturing, sales, and marketing appeared to be the main drivers of FDI projects to Africa in 2015. Among the studies done on FDI, some researchers have recognized the role of infrastructure on FDI inflow. For instance, Wheeler and Mody(1992), Asiedu (2002, 2006) and Loree and Gusinger (1995)

acknowledged that most of the investors search for markets where they can maximize the profits and lower the costs of production which can only be achieved if the infrastructures and good in the host country.

Infrastructural development takes many forms, which includes Economic infrastructure and social infrastructure. Economic infrastructure includes the basic facilities and services which directly impact the process of production and distribution of goods and services in an economy. Such facilities are Irrigation, power generation, transport infrastructure (road, water, rail, and air) and communication infrastructure. More specifically, Infrastructure takes the forms of basic physical systems of businesses, transportation modes, communications, sewerage, water and electricity systems. A country with good physical infrastructures such as communication, ports, highways, and bridges is more likely to attract high FDI. This is in line with Coughlin *et al* (1991) who analyzed the factors that affect FDI inflows in the US for the period 1981-1983 and found out that high FDI inflows were associated with extensive transport infrastructures.

1.1.1 Evolution of Foreign Direct Investment in Kenya (1970-2015)

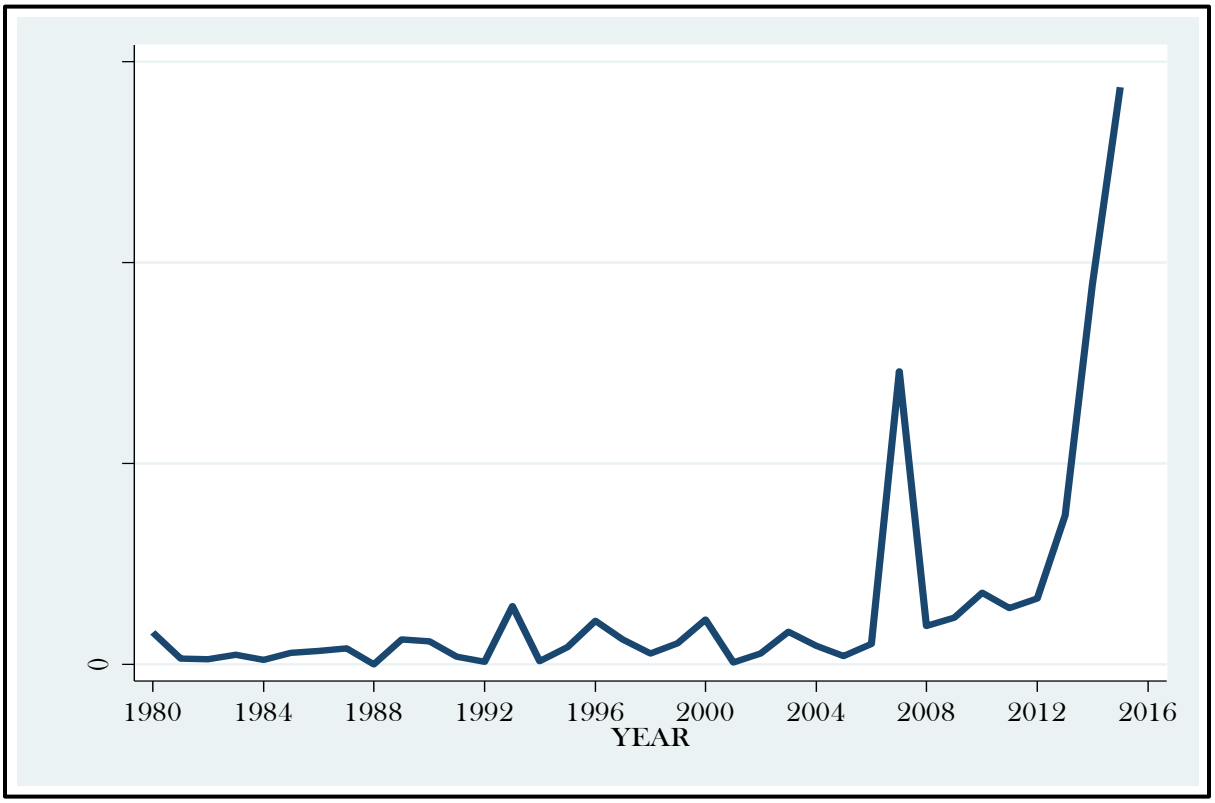
From independence in 1963 and into the 1970s, investors sought Kenya to establish their presence in Eastern and Central Africa. Kenya FDI inflows were as low as USD 10 million a year in the period of 1970s before increasing to USD 60 million by 1979-80 (FDI Markets, 2015). Expansionary fiscal and monetary policies, enlargement in the agricultural sector as well as sustainable budgetary deficit resulted into huge capital inflows in Kenya. This involved overvalued exchange rates, import tariffs, quantitative restrictions and import licensing (Ikiara *et al*, 2003). Other factors included large and favorable regional markets from the original East African

Community (EAC) which attracted FDI into the country (World Bank, 2010), which later collapsed in 1977 hence causing changes in FDI inflows in a later period.

In the period 1980- 90s, Kenya experienced a general slump in foreign direct investment inflows which was majorly caused by the challenges in governance. Studies have also established that among other factors that facilitated the fall in FDI inflows were macroeconomic instability, corruption, and bad governance. Other possible factors were economic policies, poor public service, and poor infrastructure. These studies also found that the size of the market, low economic growth and lack of policy transparency and the rising costs of electricity and labor. The studies include Kinaro, 2006; Opolot *et al*, 2008 and UNCTAD, 2005. According to Abala (2014), the deterioration of Kenya's infrastructure, especially during major advancement in infrastructure globally induced many foreign investors who were established in the manufacturing industry to move their operations out of Kenya.

For the period 2010-15, FDI net inflows in Kenya grew from Ksh. 92 billion in 2014 to Ksh. 107 billion in 2015(Economic Survey, 2016). This can be explained majorly by the massive investments in infrastructural development, institutional changes among other factors. Upon the launch the Vision 2030 with the objective of achieving global competitiveness in terms of FDI inflows and Economic growth, the country intends to draw in at least ten largest strategic investors in the Agro-processing industries and ascent its position in the regional market from 7% to 15 b% by the year 2012 (Abala, 2014). The major source of Kenyan FDI and Africa at large includes China, Europe, and the United States. Other countries like India and Japan are sources of FDI inflows to Kenya but to a small extent. Figure 2 below shows FDI inflows trend for the period 1980-2015.

Figure 2 FDI inflow in Kenya 1980-2015



Source: World Bank (2017)

As seen in figure 2 above, there has been a substantial increase in FDI inflows since 2010. This was mainly due to the renewed confidence and interests in the countries business environments by the investors (AfDB, 2015). The main business partners were China in the Mining and Hydrocarbon sectors.

There are various motives behind these FDI channeling. According to Castro, Fernandes & Campos (2013), the first motive is the resource-seeking FDI. This comes about due to the non-existence of natural resources in the home country of the foreign investor. The main focus of such investment is to gain access to specific natural resources, cheap labor, and skills such as other markets, operation, and technology. Market seeking FDI is the second motive for FDI flows. This

is where Multinational cooperation (MNC) enters a new market in search of clients and markets. According to Kinda (2010), market seeking investors invest in countries that have a rapid growth in domestic markets. The third type is the efficiency-seeking FDI. This is a kind of investment which is driven by an urge to reduce production costs by using new technologies with the main idea of taking advantage of economies of scale, scope, risk management and quality of infrastructure.

In developing nations such as Kenya, FDI inflows facilitate public investments in areas such as health sector, education, transport and technological infrastructure and communication. FDI directed towards technological advancement assists in industrial upgrading, which enables the country in addressing global economic challenges. Additionally, FDI facilitates in training diffusion in educating unskilled labor forces. Focusing solely on raw materials availability and availability of local cheap labor, international firms may assist in developing the hosting country's comparative advantages. On such grounds, negative consequences of FDI can be managed with good business and labor regulation (Ngugi and Mwega, 2006; Kinuthia 2010). Despite these advantages, it has been argued that FDI may not necessarily promote growth in the host country because it may depress or supplant the domestic savings and investment, grounding out domestic investments in the host countries and even suppressing the expansion of indigenous firms' thereby limiting growth (UNCTAD, 2016).

1.1.2 Evolution of Infrastructure in Kenya (1970-2015)

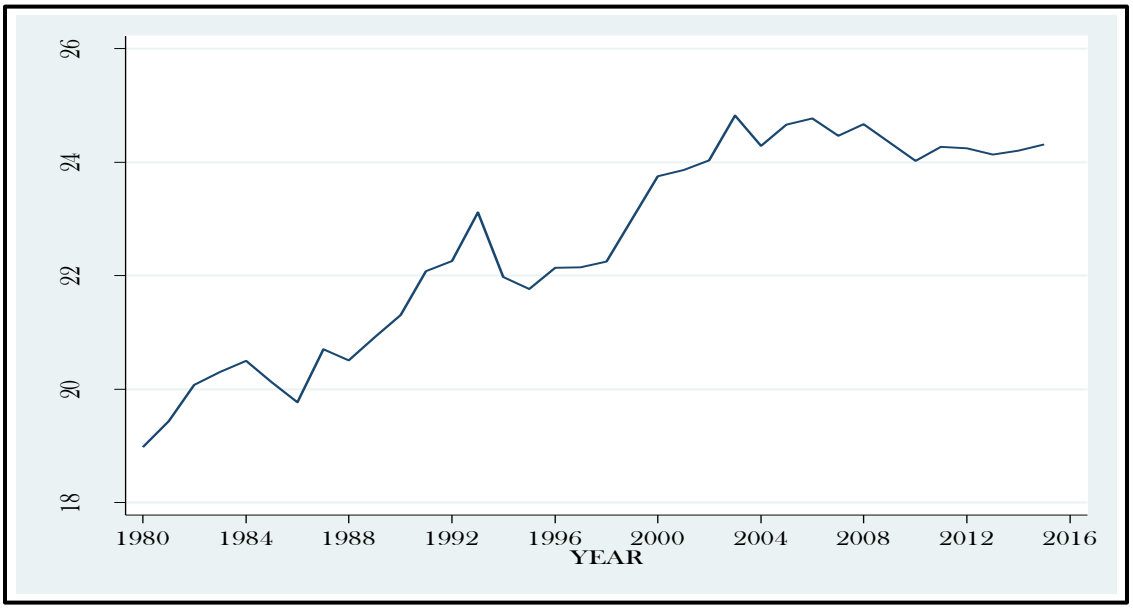
Upon attaining independence in the year 1963, the government of Kenya embarked on course of coming up with policies aimed at enhancing economic growth. During this period, employment creation and provision of infrastructure were considered as the main ways of improving national

welfare. However, due to demand for huge investment in infrastructure, and the inherent risk associated with it, foreign investors were not attracted especially due to the small size of the domestic markets (Wasike, 2015). In the subsequent period, Kenya experienced various policy transformations mainly in Transport infrastructure, telecommunications, and ICT infrastructure.

In the year 1977, telecommunication services were introduced under the management of a regional network with the neighboring countries which included Uganda and Tanzania. During the same year, East African Community collapsed which resulted in the establishment of Telecommunications cooperation in Kenya with the main role of operating the service. In 1977, they issued a telecommunication vision which will oversee telecommunication development up to the year 2015. Under this vision, the government reevaluated the roles of policymaking, dispute resolution, the operation of services and market regulation among other factors in the ICT sector. The growth in the ICT sector in Kenya has been influenced by the global trends which are evaluated in terms of the number of computers and services, Internet Service Providers, the number of fixed and mobile telephone lines, and the market share of each of them.

According to Sustainable Development report (2012), 240,000 people subscribed to a fixed telephone line and 2.8 million people subscribed cellular mobile while Internet subscriptions elevated from 7.7 to 8.5 million in June 2012. The total number of Internet users stood at 13.5 million, which almost doubled the number of the previous year. Mobile Internet dominated the Internet market with more than 98% of total Internet data subscriptions. Figure 3 below shows the trends in Telecommunications since independence.

Figure 3 Mobile cellular subscription (1980-2016)



Source: World Bank (2017)

From the Figure 3 above, upon issuing licenses by the Communication Authority of Kenya to Safaricom and Celtel (currently Airtel), there was an increase in mobile cellular subscriptions in the year 2000. The telecommunications continued to become popular to consumers, registering an annual growth of over 60%, with 16,233,833 million subscribers at the end of 2008. The growth rate rose to 106% in the year 2005 but started falling from 2006 to December 2011. The difference in mobile subscribers in the years 2008 and 2007 can be attributed to the introduction of the other two mobile operators (Oteri, Kibet and Ndung'u, 2015).

In the view of transport infrastructure, since independence, Kenya has experienced rapid growth in transport infrastructure which demonstrated an essential role not only for the domestic economy but also for Eastern Africa landlocked countries. Nevertheless, the transport infrastructure network worsened in the past decade owing to the suspension of donor funding to Kenya. To

address these hitches, the Kenyan government identified transport infrastructure as one of the basic pillars to achieving development hence it came up with Integrated National Transport Policy Programme. The main aim of the program was to improve the transport sector in an integrated manner.

For the period 1998-2002, road transport played a significant role in national economy. During this period, road transport averaged to 5% of the total output. This amounts to 80% of the total passenger traffic and internal freight (Economic Survey, 2005. With the vision 2030, the republic of Kenya aimed at seeing the country interconnected through quality roads, railway system, ports waterways, telecommunication network as well as provision of sustainable energy. The government through the Economic Recovery Strategy (2003-2007) acknowledged transport system as the main catalyst towards achieving the above mentioned interconnections.

The Economic Survey (2016) indicates that the construction sector in Kenya posted a growth rate of 13.6 percent in 2015.This growth was facilitated mainly by the developments in the transport infrastructure. An example of such is the Standard Gauge Railway. Others include the road network development, the enhancement, and rehabilitation of the airports and port facilities to enhance efficiency in operations. The construction industry also gained from the implementation of mega energy projects in line with the flagship projects of the Vision 2030. These include Olkaria 1V (unit 1 &2) and Olkaria 1(unit 4 &5) and wellhead Geothermal projects. Social infrastructure has gained growth in demand for both residential and non-residential structures to house the fast-growing urban populations and provision of sufficient office space has positively impacted on the performance of the sector in 2015.

The Kenyan government has made the key investment in resource allocation towards development programs in infrastructure, health, agriculture, security, education, social protection and youth empowerment; aimed at enhancing sustainable and equitable growth and job creation. Total expenditure increased by 26.7 % from Ksh 32.6 billion in period 2014/15 to Ksh 41.3 billion in period 2015/16 (Economic Survey, 2016). The most recent in infrastructure development is the construction of the Standard Gauge Railway which was commissioned in the year 2013. The multi-billion railway from Mombasa to Nairobi is eventually expected to stretch from the port of Mombasa to Kigali in Rwanda and further to Juba in South Sudan. The main aim of the project is to develop and maintain an integrated safe and efficient transport network and provide a baseline of infrastructure facilities and above all provide global acceptable performance in enhancing customer satisfaction.

1.1.3 FDI and Infrastructure linkage

Investment in infrastructural development accelerates economic growth through job provision and vital service delivery. It is estimated that for a single dollar spent on projects such as energy, waste management, telecommunication and flood defense, 5% to 25 % economic return is generated (World Economic Forum, 2015). That effect explains the fast economic growth of emerging economies that have prioritized infrastructure spending.

According to (UNCTAD, World Investment Report, 2016) report, developing countries require a general investment in amounts between USD 3.3 and USD 4.5 trillion which should be directed toward infrastructure, particularly in power generation, transport, water, and telecommunications. This will allow for private investment and also public investments, and it comes as a result of

contributions from Multinational corporations through FDI inflows. The report also indicates that the current infrastructure development attracts smaller amounts of FDI inflows

Domestic investors play a key role by providing a signal to foreign investors since they have a better understanding of the investment environment locally. In the environs where there exist information dissymmetry between the domestic and foreign investors, the kind of domestic investment will tend to signal foreign investors on how to invest. Domestic investments also affect foreign investments since the same elements that facilitate local investments similarly affect the FDI inflows. Investments in public infrastructure in a given country lower the costs of business transactions more likely causes increases in the private investments returns as well as FDI inflows.

1.2 Statement of the Problem

Traditionally, developed economies such as the European Union countries and the United States have been shown to be the main recipients of FDI inflows. For example, developed countries share of FDI inflows rose from 52% in 2012 to 54% in 2013(UN, 2014). Furthermore, according to the United Nations report (2013), in the year 2012, developing countries took the lead for the first time in history by absorbing more FDI inflows than developed economies. This raises the question interesting question as to why some countries attract FDI inflows more than the others.

Various studies have been done on the relationship between the characteristics of the recipient countries and FDI inflows. On the benefits of FDI to the recipient countries, factors such as access to international markets, transfer of technology and managerial skills, increased competitiveness of the host countries, job creation, economic development and developing import and export networks have been identified as important (Kinda, 2010). These benefits of FDI analyzed more

critically gives the reasons as to why developing countries should aim at formulating policies that aim at attracting FDI inflows.

Among the factors that have been identified to influence the location decisions of multinational cooperation is the availability and quality infrastructure in the host country ((Donaubaur *et al*, 2014, Rungpu, 2014, Abala, 2014, Kinda, 2010 and Bakar *et al*, 2012). Despite this, few empirical studies have given focus on the role of infrastructure in stimulating FDI inflows (Khadaroo & Seetah, 2010). Furthermore, very few studies have explored and acknowledged the impact of infrastructure on FDI inflows. A lot of the studies done on the relationship between FDI and Infrastructure were mainly concentrated in other nations such as China and Malaysia (Bakar *et al*, 2012 & Akram *et al* 2010). This is further acknowledged by Asiedu (2002) who found out that Infrastructural development is key in determining FDI inflows in non-SSA countries, and not in SSA countries. Asiedu (2006) further notes that most of the studies done only considered infrastructure availability and not the quality of infrastructure. Most of the studies done has also not considered the fact that infrastructure has various sub-indicators which need to be considered.

Considering the fact that infrastructure comprises of various sub-indicators, the study used the Principal Component Analysis (PCA) to come up with a general measure of infrastructure. Its main purpose was to reduce a certain number of original variables (representing the main characteristics of the analyzed phenomenon) into latent variables. The new variables are a linear combination of the old ones and are ordered by decreasing variance. The first new variable, projected on the first axis of the new Cartesian system, shows the higher variance of its component scores. The second variable, orthogonal to the first one, will be projected onto the second axis, and so on. Complexity reduction is reached by analyzing only the principal component (with respect to the variance). In this study, the variables used to construct infrastructure principal component

includes: telecommunication (mobile cellular subscription), electricity power generation (kilowatts), and transport infrastructure (total government expenditure on infrastructure).

To determine what to priotize in when making investment decisions, more specifically between FDI stocks and Infrastructure, we need to have a clear understanding of the nature of association of the phenomenon under study. In this regard, the study sought to empirically analyzes the long-run and short-run associations between infrastructural and FDI stocks in Kenya.

1.3 Research questions

This study was guided by the following research questions:

1. What is the long-run and short-run impact of Infrastructure on FDI stocks in Kenya?
2. What is the long-run and short run impact of FDI stocks on Infrastructure in Kenya?

1.4 Research objectives

1.4.1 Main objective

The main objective of this study was to empirically examine the relationship between infrastructure and FDI stocks in Kenya.

1.4.2 Specific objectives

The specific objectives of this study were to:

I. To determine the long-run and short-run relationship between infrastructure and FDI stocks in Kenya.
II. To draw policy implications from the results of the study

1.5 Relevance of the study

The study sought to provide more insights on the divergent views in the literature concerning the relationship between foreign direct investment and infrastructural development. Additionally, the study aimed at enlightening policy makers and planners on infrastructure developments with the aim of improving FDI in Kenya, and more so in coming up with appropriate policies that encourage infrastructural development and FDI inflows.

On establishing the nature of the causal relationship between infrastructure and FDI stock, the study formulated policies that facilitate increment in FDI inflows and Infrastructure development and furthermore on which variable to prioritize.

1.6 Organization of the study

Following this introduction, the next section discusses the literature review which is divided into three parts, these are theoretical literature review, which looked at mainly the theoretical studies in this area. This is then followed by the empirical literature review which looked at the empirical studies in the area of infrastructure and FDI. The last part of the section presents an overview of the literature pointing out the main knowledge gaps that thus the study sought to fill. The succeeding section of the report looks at the methodology to be applied in this study. In this section, theoretical framework to be employed in the analytical section and giving out the various relationships between the variables used is presented. The variables used are defined in this section, which is then followed by the empirical model to be estimated, stating the hypothesized relationships between the variables.

The second last section presents the data analysis results with a brief discussion of the same. The final section of this report presents the conclusion and policy recommendations and further gives the areas for further study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section comprises of three parts, that is, theoretical literature review, empirical literature review and an overview of the literature.

2.2 Theoretical literature review

Various studies have attempted to give the theoretical aspect of the relationship between FDI and Infrastructure. By giving focus on the specific roles of infrastructure in attracting FDI, factors such as the benefits resulting from economic transactions (qualitative and quantitative factors of production), telecommunications, transport costs, and market size have been identified to affect FDI inflows in the host country (Dunning, 1973, 1980 & 1988). In light of this, Shatz and Venables (2000) give two reasons to locate FDI in a foreign country. The first one is the base expansion also referred to as Horizontal FDI, which involves the costs of transport, the tariffs and the access to a new market, with the mainly enhance the competitiveness of the firm globally. The second reason involves lowering the costs of production in terms of labor, capital and other input costs, which mainly aims at maximizing the profits. This is also referred to as Vertical FDI.

Availability of infrastructure in the host countries promotes both vertical and horizontal types of FDI, with moderately extra effect on vertical FDI due the decreasing operational costs factor. The gains resulting from infrastructure growth are linked with greater accessibility and reduction in the costs of transport (Khadaroo and Seetanah, 2008). Morrison and Schwartz (1996) postulate that public goods have a vital impact on the cost structure and productivity of private firms. Erenberg

(1993) further indicates that when the availability of infrastructure is not extended to MNC's, then they would be functioning inefficiently since they would be required to construct their own infrastructure hence wastage of resources. Efficiency can be achieved through prolonging the liability of infrastructure provision in the management of contracts (Mlambo, 2006).

Poor infrastructure results into increased costs of transaction and limited access to local and international markets hence discouraging FDI inflows to developing countries. Quality of infrastructure facilitates export performance which is a motivational factor for inward FDI for a country as well as trading unions. For instance, 10 % improvement in the quality of infrastructure results in 8 % improvement in export performance in developing economies (Kirkpatrick (2006). Infrastructure can have a different impact on both developed and developing countries. For the case of developing countries, infrastructure has indicated to be significant in attracting FDI inflows more than trade openness and investment environments in the host countries Sekkat & Varoudakis (2007); (Khadaroo & Seetanah, 2010 and Asiedu, 2006). On the other hand, infrastructure has been perceived to be an indicator for FDI inflows rather than a motivator for the case of developed economies (Bae, 2008 and Addison, 2006).

From the above indicated brief theoretical review, it is clear that infrastructure plays a vital role in developing economies with reference to inward FDI flows. Furthermore, literature has also shown the significant impact of infrastructure on the costs of doing business as well as on the return to owners. This study attempts to establish whether or not infrastructure is a significant determinant in attracting FDI inflows in Kenya and further more analyze the importance of FDI in promoting infrastructure development.

2.3 Empirical literature review

Various studies have been conducted to ascertain the relationship between foreign direct investment and infrastructure development. Studies by Bakar and Harun (2012) in Malaysia and Rehman, Ilyas, Alam, & Akram (2010) in Pakistan on the role of Infrastructure in attracting FDI have revealed various outcomes. In Malaysia, infrastructure showed a positive and substantial impact on FDI inflows, similarly to the study done in Pakistan. Using government expenditure and Telephone mainlines in measuring infrastructure component, (Bakar *et al*, 2012 and Akram *et al* 2010) respectively, despite them showing the role of infrastructure on FDI, the studies did not establish the nature of the causal relationship between FDI and Infrastructure.

Availability of transport infrastructure plays a crucial role in attracting FDI in Africa. This is as shown by Khadaroo & Seetanah (2009) who used both the static and dynamic panel data approach in their analysis. A similar study was done by Donaubauer, Meyer & Nunnenkamp (2014) in assessing, the transmission channel with infrastructure index, for Aid, Infrastructure, and FDI. Using, 3SLS estimations, they found fairly strong and robust evidence that targeted aid Promotes FDI indirectly through the infrastructure channel. Both studies did not capture the role of infrastructure in attracting FDI directly and furthermore, Khadaroo & Seetanah (2009) did not capture other forms of infrastructure development in a country but only concentrated on transport infrastructure.

Other studies have also studied the determinant of FDI inflows tend to find that infrastructure is one of the determinants of FDI inflows in various countries. Among these studies are; Asiedu (2002), Demirhan & Masca (2008), and Osei & Acheampong (2014). By analyzing both the developed and developing countries Asiedu (2002) found out that infrastructure had a positive

effect on non- SSA countries but had no substantial impact on SSA countries impact on FDI. Demirhan & Masca (2008) by doing a cross-sectional analysis of the determining factors of foreign direct investment inflows in developing countries for the period 2000 to 2004 found that growth per capita growth rate and telephone main lines have a positive sign and are the statistically important impact on FDI inflows. Similar results were found by Osei and Acheampong (2014) who conducted a study of the potential determinants of FDI inflows in Ghana using time series data for the period 1980-2015. Using econometric methodologies, they found infrastructure development and political stability to have a positive and significant impact on the level of FDI inflows in the long run. Despite this, the studies did not capture the reliability component of infrastructure as noted by Asiedu (2002). Additionally, none of the papers studied the causality component between infrastructure and FDI.

Enhanced infrastructure among other variables such as GDP, improved political stability, a drop in corruption levels and the size of market have facilitated market-seeking FDI inflows in Kenya for the period 1970 to 2010 (Abala, 2014). This study which sought to investigate factors that determine both real GDP growth and FDI inflows in Kenya, falls short since it only investigated availability and not the reliability of infrastructure as noted by Asiedu (2002). Additionally, the study is limited in the scope of measurement of infrastructure development because by using Electricity transmission alone as a proxy for infrastructure is not a representative of infrastructural development since other measures such as ICT, telecommunication, and transport infrastructure was not considered in the study.

The studies reviewed above only considered the role of infrastructure in attracting FDI inflows. Contrary to these studies, some studies have also investigated the role of FDI in promoting infrastructure development in the target countries. In India, FDI has been considered to have a

potential for making contributions to development through the transfer of financial resources, technology and innovative and improved management techniques along with raising productivity and furthermore, it catalyzes the local industrial growth and more so facilitating economic activities through bringing along other scarce productive components such as the technical know-how and management experience, which are necessary for economic development (Tyagi, Vij, & Joshi, 2013). In Ghana, FDI Inflows contributed tremendously to the provision of efficient public infrastructure, services, and growth of the infrastructure sector of the Economy (Aheto, 2014). The study by Aheto (2014) did not present any empirical testing and analysis with the main reason being data unavailability. Furthermore, the study only concentrated on the unidirectional causal relationship of FDI to Infrastructure and did not investigate the impact of Infrastructure on FDI inflows.

An assessment of the relationship between Information communication technology, electricity infrastructure, Transport infrastructure, and FDI inflows on Panel Data using Random effect model for 27 developing Economies for the period 2000-2013 revealed that ICT, electricity and Transport infrastructure facilitated an increase in FDI Inflows (Kirkpatrick, Parke, and Zhang, 2006). Despite using various proxies in measuring infrastructure, the study considered infrastructural availability only and excluded the infrastructural reliability factor and furthermore, they did not establish the possible impact of FDI on infrastructure.

An empirical analysis of the relationship existing between regulatory framework quality, and FDI directed to infrastructure among the middle and lower income growing countries for the years 1990 to 2002 revealed that FDI channeled to infrastructure responded well to an effective domestic regulatory Framework (Kirkpatrick, Parke, and Zhang, 2006). The study did not take into account the causal relationship between FDI and infrastructure.

Further review of studies regarding the determinants of FDI has been conducted and they did not necessarily capture the component of infrastructure development. Using one equation model on China and Hungary data for the period 1978-92, the study found out that FDI inflows are determined by the market size of the host country, capital cost, and the political environment stability. Furthermore, the study revealed that capital seems to be sensitive to the cost of labor and exchange rates in China and for the case of Hungary, investment flows, and real growth rates in OECD countries appeared to be the main determining factor (Swain & Wang, 1995). A similar study done on African Countries showed that market size and trade openness seems to be the main drivers of FDI inflows while improved financial development seems to affect FDI inflows negatively (Anyanwu, 2012).

Studies analyzing the causes of FDI inflows in Kenya found a positive relationship between FDI and the factors such as political instability, exchange rate, and inflation rate, while GDP growth rate deters FDI inflow (Socrates, 2012 and Manyanza, 2012). The study by Manyanza further showed other significant variables in determining FDI inflows as trade balance, wage rate, Savings rate, and openness of the economy and policy incentives. These studies are short-lived in their estimation techniques since they used OLS method in estimation, which when used to estimate time series data may produce spurious results. Furthermore, they did investigate infrastructure development as one of the determinants of FDI inflows.

2.4 Overview of the literature

Review of literature has revealed the various relationship between FDI and Infrastructure development. Most of the studies reviewed had only investigated the unidirectional relationship between FDI and Infrastructure. Among the studies done, characteristics of the recipient country

have been noted as the key factor in determining the FDI inflows in that particular country, Rehman *et al* (2010), Khadaro & Seetah (2009), Nunnenkamp *et al* (2014) and Asiedu(2002).

On the contrary, some studies conducted tried to explain the role of FDI in promoting infrastructure development in the host country. The studies did not give a clear role of FDI in promoting infrastructure since some of the studies did not have a clear view in measuring infrastructure, Aheto(2014), Joshi *et al* (2013), Kirkpatrick *et al* (2006), and Rungpu (2014). Among the studies done, Main telephone lines were the main proxy for measuring infrastructure development, but as noted by Asiedu (2002), a good measure of infrastructure should include both availability and reliability. Additionally, the studies did not capture other sub-indicators of infrastructure such as transport, and energy infrastructure. This implies that further studies need to be done in ascertaining the relationship between FDI and Infrastructure development.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter addresses the theoretical framework, the Empirical model specification, the definition and measurement of variables above all, the data sources and types.

3.2 Theoretical framework

The methodology used in this study starts with a hypothesized relationship between Infrastructure and FDI stock and further, other variables are included as the control variables. The analysis begins as shown in the equation 1 below:

FDI = f (Infrastructure, GDP, Real Effective Exchange rate, Human Capital, Inflation Rate)…….. 1

In analyzing the relationship between Infrastructure and FDI stock in Kenya, GDP, Real Effective exchange rate, Human Capital, and trade Openness will be used as the control variables. These variables are related to FDI stock in the ways discussed below.

Infrastructure, which is the main variable, will be analyzed using; Fixed telephone subscription which is used as a proxy for telecommunication infrastructure, Electricity generation as a proxy for energy infrastructure and Total annual expenditure on Railway transport, Road Transport, water Transport and air transport as a proxy for transport infrastructure. This variable is important because it is assumed to reduce the cost of doing business and hence it remains the dominating element for attracting FDI inflows. This is in line with studies such as Kok & Ersoy (2009),

Khadaroo & Seetanah (2010), Wheeler & Moody (1992) , Root & Ahmad (1979) and Asiedu (2002, 2006), and who all indicated that infrastructure had a positive impact on FDI inflows, although, Quazi (2005) asserted that infrastructure has no significant impact on FDI. In this study, Electricity power generation, Government expenditure and telecommunication (Mobile Cellular subscription) are used as a proxy for infrastructure.

Market size is an essential factor in making FDI location decisions. Most MNC's consider such a factor in determining the horizontal type of FDI inflows mainly aiming at benefiting from the economies of scales, the costs of transaction and transport costs. Market size has a positive effect towards attracting FDI inflows to the host country (Asiedu, 2006; Wheeler & Mody, 1992 and Zhang, 2008) although Li & Park (2006) asserted that it is insignificant in determining FDI inflows to the host country. This study uses GDP in current US Dollars for Kenya as a proxy for market size.

Countries with weak currencies tend to attract FDI from the countries with strong currencies. This is because the investments in this countries enjoy a better purchasing power. On the other hand, (Zheng, 2009) affirmed that the economies with stable currencies discourage FDI inflows. Some studies such as Froot & Stein (1991) and Blonigen & Feenstra (1996), perceived a negative impact of exchange rates on FDI inflows and furthermore, (Kyereboah *et al*., 2008; and Blonigen, 1997) indicated that exchange rate has an insignificant impact on inward FDI. In this study, the Real Effective exchange rate is used as a proxy for the strength of the currency in Kenya.

Trade openness (measured by the ratio of Trade exports plus Trade imports to Gross Domestic Product) facilitates in the increased competitiveness and providing access to markets for finished products, (Balassa, 1978). Furthermore, it enables the importation of raw materials and capital

goods and facilitates access to new technologies and skills. Among the studies done, Abala (2014) and Kinaro (2006) found large export markets encourage inward market-seeking FDI and foreign capital inflows.

The level of human capital measured here by the tertiary institution enrolment rate is expected to have a positive impact on FDI. It can be debated that widespread availability highly skilled and cheap labor force tends to attract private investment (Akinlo, 2004 and Barro and Lee, 1994). Inflation rate measured here by the annual percentage change in consumer price index is a reflection of macroeconomic stability. A low and stable inflation rate implies a more reliable economic environment enabling investors to benefit from existing opportunities (Larrain & Vergara, 1993; Serven and Solimano, 1993).

The study intends to use time series data sets, and mainly annual observations for the period 1980 to 2015 for all the above-mentioned variables. In the view of time series data sets, various diagnostic test which provide information on how data should be modeled will be performed.

3.3 The model

The hypothesis, that developing countries like Kenya with better infrastructure are more attractive to foreign firms, is analyzed by incorporating an appropriate proxy in reduced form specifications for the demand of FDI inflows. The following equation is specified.

$$FDI_t = \alpha_0 + \alpha_1 INFRACOMP_t + \alpha_2 GDP_t + \alpha_3 REER_t + \alpha_4 HC_t + \alpha_5 OPEN_t + \alpha_6 INF_t + e_t \quad \ldots\ldots 2$$

Where, α_1 , α_2, α_3, α_4,α_5, α_6 are the long-run effects of FDI stock with respect to INFRACOMP, GDP, REER, HC, OPEN, and INF respectively. Considering that infrastructure has various sub-

indicators, a principal component for infrastructure will be generated using the Principal component analysis. Mainly, Infrastructure will be represented by the three main variables, telecommunication, electricity power generation and transport Infrastructure.

Any analysis involving empirical testing especially in macroeconomics must consider the conclusions drawn from time series analyses of macroeconomic data, and utilize specifications that are consistent with those results. Macroeconomic time series has been previously demonstrated to likely include an element generated by permanent or closely permanent shocks (Nelson & Plosser, 1982). In such cases, the data series is considered to be integrated, having a unit root, or having a difference stationary. According to Engle & Granger (1987), variables that are driven by permanent shocks are cointegrated if and only if a Vector error correction component of the data series exists. Furthermore, Asteriou & Hall (2007) indicated that cointegration concept and error correction mechanism seem to be closely related because both the long-run effects and the short run dynamics are included in the model.

It is a prominent problem in economics to have models where some variables in a model serve as the explanatory variables for certain dependent variables, but at the same time, they are explained by the dependent variables they are explaining (Asteriou & Hall, 2007). In such scenario, models of simultaneous equations have been developed because it is necessary to clarify the endogenous as well as the exogenous variables in the model. To address such a problem, Sims (1980) brought a different view indicating that, if the cases of simultaneity among a number of variables, then all these variables should be treated in the same way, that is, they should all be considered as endogenous variables. This development led to the introduction of the VAR models. Considering the nature of the variables in this study, which seem to depict such relationships, this study adopted VAR models for analysis. One such model is the Vector Error correction models (VECM). In the

cases where variables in a model are cointegrated, the error correction term has to be included in the VAR model hence it transforms to a VECM. This simply means that in the absence of cointegration, VECM is just a Vector autoregressive model (VAR). If there is a cointegration, then Granger causality in at least one direction exists.

Using variables, FDI stocks (FDI), Infrastructure (INFRACOMP), GDP, inflation (INF) and real effective exchange rate (REER), the following VECM equations were specified.

$$\Delta FDI_t = \sum_{k=1}^{r} \gamma_k \mu_{k,t-1} + \sum_{n}^{p} \alpha_{1,n} \Delta INFRACOMP_{t-1} + \sum_{n}^{p} \alpha_{2,n} \Delta GDP_{t-1} + \sum_{n}^{p} \alpha_{3,n} \Delta REER_{t-1} + \sum_{n}^{p} \alpha_{4,n} \Delta HC_{t-1} + \sum_{n}^{p} \alpha_{5,n} \Delta INF_{t-1} + \varepsilon_{1,t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3$$

$$\Delta INFRACOMP_t = \sum_{k=1}^{r} \gamma_k \mu_{k,t-1} + \sum_{n}^{p} \alpha_{1,n} \Delta FDI_{t-1} + \sum_{n}^{p} \alpha_{2,n} \Delta GDP_{t-1} + \sum_{n}^{p} \alpha_{3,n} \Delta REER_{t-1} + \sum_{n}^{p} \alpha_{4,n} \Delta HC_{t-1} + \sum_{n}^{p} \alpha_{5,n} \Delta INF_{t-1} + \varepsilon_{1,t} \dots\dots\dots 4$$

Where, $\mu_{k,t-1}$ represents residuals from the cointegration equations and γ_k are the adjustment coefficients while r and p are the respective optimal lag lengths and $\varepsilon_{1,t}$ represents the errors assumed to be white noise. Δ is the change (difference) operator.

Vector error correction models are known for a number of advantages. To begin with, they are convenient for computing the adjustment from disequilibrium of the prior period to the present. Secondly, in cases of cointegration, trend is eliminated from the variable since VECM models are

expressed in terms of first difference, this solves the problem of producing spurious results. Finally, VECM originates from disequilibrium error term is a stationary variable, which implies that, for cointegrated variables, there is some automatic adjustment which prevents the errors in the long-run relationship becoming larger and larger. In the models with many variables, more than one co-integrating vector may exist. This implies that the model might result in multiple equilibrium interactions. To establish the number of co-integrating relationships, the Johansen's test is required.

3.4 Definition of variables

Table 1 Definition of variable and expected signs

Variable Name	Notation	Variable Description	Measurement	Expected Sign	Source
Foreign Direct Investment Stock	FDI	Foreign Direct Investment (FDI) stocks measure the total level of direct foreign investment at a given point in time.	It is measured in USD and as a share of GDP.	± Ve	WDI/ KNBS
Real Gross Domestic Product	GDP	GDP in current US$ is used as a proxy for market size for Kenya	US$ million in current prices	± Ve	WDI/ KNBS
Real Effective Exchange Rate	$REER$	This is a measure of the trade-weighted average exchange rate of a currency against a basket of currencies after adjusting for inflation differentials with regard to the countries concerned and expressed as an index number relative to a base year. It is used to measure the strength of currency	US Dollars	± Ve	WDI
Openness to Trade	OPEN	It is measured by the ratio of (Trade exports plus Trade imports) to Gross Domestic Product.	Exports+ Imports / GDP in US$	± Ve WDI	

Variable Name	Notation	Variable Description	Measurement	Expected Sign	Source
Infrastructure Component	INFRACOMP	This is the infrastructure principal component generated from infrastructure sub-indicators which include: telecommunication (mobile cellular subscription), electricity power generation (kilowatts), and transport infrastructure (total government expenditure on infrastructure	This is an index resulting from the summation of individual weights of the three infrastructure indicators as generated from the PCA. The Index is calculated as $I = \sum_{i=1}^{N=3} w_i\left(\prod_{q=1}^{10} x_q^w\ q, i\right)$ Where X_q represents the normalized values of the indicators.	± Ve	WDI
Human Capital	HC	This is the tertiary institution enrolment rate	Number of people enrolled in Tertiary institution annually.	± Ve	WDI
Inflation Rate	INF	This is the annual percentage change in consumer price index measured in US dollars	US dollars	± Ve	WDI

Source: Author Computation (2017)

3.5 Pre-Estimation Tests

3.5.1 Stationarity test

One collective assumption in many time series techniques is that the variables are stationary. By stationary, it means that the time series is without trend, has a constant variance over time, and a constant autocorrelation structure over time, otherwise it is non-stationary. To test for stationarity for all the variables, an Augmented Dickey-Fuller test for Unit Root test under the Null hypothesis of non-stationarity was carried out.

3.5.2 Cointegration test

Given two non-stationary time series X and Y that become stationary when differenced (sometimes referred to as integrated of order one series), such that the linear combination of variables say X and Y yields stationarity, then the variables are considered to be cointegrated. If two variables have equilibrium relationships, then they are cointegrated. The study performed a Johansen test for cointegration to establish the cointegration relationships between the variables.

3.6 Granger causality test

To establish the bi-directional relationship between Infrastructure and FDI stock in Kenya, Granger causality test will be carried out. Granger defined the following: X is a Granger Cause of Y if the presence of Y can be predicted accurately using past values of X. The simple Granger Bi-variate model is given in the equation below:

$$Y_t = \mu_1 + \sum_{j=1}^{k} \alpha_{11j}\, y_{1-j} + \sum_{j=1}^{k} \alpha_{12j} x_{1-j} + u_{1t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 5$$

Where, μ_1 and μit represents a white noise process and k, the lag length is assumed to be finite and shorter than the given time series. The test was carried under the null hypotheses that Variable X does not Granger cause variable Y. Additionally, α_{ii} is the vector of coefficients of the lagged values of the variables y and x. Similarly, this test is used to test the null hypothesis Variable Y does not Granger cause variable X.

3.7 Data, data types, and sources

The study used time series data, annual observations for the period 1980- 2015 for all the variables. This includes Secondary data from Kenya National Bureau of Statistics (KNBS) publications; Economic Surveys and Statistical Abstracts and WDI data bank.

To analyze the variable for infrastructure, this paper used the Principal Component analysis approach. This is done by generating principal components from telecommunication (mobile cellular subscription), electricity power generation (kilowatts), and transport infrastructure (total government expenditure on infrastructure).

CHAPTER FOUR

EMPIRICAL FINDINGS AND DISCUSSION

4.1 Introduction

This chapter presents the empirical results of the study. Various tests are done and their results discussed here. The researcher commences with the descriptive analysis followed by the pre estimation tests and finally the model estimation.

4.2 Descriptive Statistics

The mean, standard deviation, the minimum and maximum values were determined. The mean is the average value of the particular variables over the period under consideration. The standard deviation measures the dispersion from the mean and it captures the degree of variability. The minimum and maximum shows the minimum values and the maximum values of various variables over a given period under which observations under consideration are spread. The results of the descriptive statistics are presented in table 2 below followed by a discussion of the same.

Table 2: Descriptive Statistics

Variable	Ob	Mean	Std.Dev	Min	Max
FDI	36	1.47e+08	2.81e+08	-1803112	1.22e+09
GDP	36	1.95e+10	1.72e+10	5.75e+09	6.34e+10
REER	36	90.39194	17.24629	58.46	134.92
HC	13	2.062504	1.019996	.91903	4.04682
OPEN	35	56.69457	6.349548	47.68	72.87
INF	36	12.44272	8.75313	1.554328	45.97888
ELECT	36	4.72e+09	2.15e+09	1.63e+09	9.46e+09
TEL	34	1.79e+10	1.95e+10	1.75e+08	6.01e+10
TRANS	36	19657.46	31630.12	44.9684	108664.2

Source: Author (2018)

The first column gives is the observations. It captures the number of the observations for the variables in the study. In the second column, which captures the mean values of the variables under study, electricity generation(Kilowatts) had the highest mean followed by GDP with mean values of 4.72e+09 and 1.95e+10 respectively. The least values of the mean were that of the inflation rate and Human capital with 12.44272 and 2.062504 respectively.

The standard deviation indicates the variation of the observations from the mean of the variables. FDI had the highest standard deviation with 2.81e+08 followed by Telephone main lines (per 1000 people) and GDP with 1.95e+10 and 1.72e+10 respectively. HC had the least value of the standard deviation of 1.019996 and the second largest.

This study also presented the maximum and minimum values of the variables. It was noted that the least value of the FDI was -1803112 while the largest value of the FDI was 1.22e+09. Among the variables of the study, GDP had the highest attainable value of 6.34e+10 followed closely by TEL with 6.01e+10 while the least maximum was HC with 4.04682.

4.3 Unit Root Test

The non-stationarity of time series data has often been regarded as a problem in empirical analysis. Working with non-stationary variables leads to statistical inference problems which further give meaningless results. A stationary series is important for two main reasons as given by (Gujarati, 2011). First, if a time series is nonstationary, its behavior can be studied only for the period under consideration. This implies that it is impossible to generalize it to other time periods which is a disadvantage for the purposes of forecasting nor policy implication. Secondly, regressions subjected to two nonstationary time series may lead to spurious regressions. To test for stationarity

for all the variables, an Augmented Dickey-Fuller test for Unit Root test under the Null hypothesis of non-stationarity was carried out. The results of the test are displayed in the table 3 below:

Table 3: Unit Root Test for Stationarity

Variable	levels			Order of differencing	Difference		
	Statistic	P-Value	Comment		Statistic	P-Value	Comment
FDI	-2.856	0.0508	Non- Stationary	1	-8.570	0.0000	Stationary
GDP	1.235	0.9962	Non- Stationary	1	-4.200	0.0007	Stationary
REER	-0.356	0.9172	Non- Stationary	1	-6.709	0.0000	Stationary
HC	-0.322	0.9224	Non- Stationary	1	-3.750	0.0000	Stationary
OPEN	-2.588	0.0955	Non- Stationary	1	-3.322	0.0000	Stationary
INF	-4.553	0.0002	Stationary	0	-4.553	0.0002	Stationary
ELECT	-1.372	0.5955	Non- Stationary	1	-5.407	0.0000	Stationary
TEL	-0.379	0.9135	Non- Stationary	1	-4.669	0.0001	Stationary
TRANS	0.377	0.9806	Non- Stationary	1	-6.787	0.0000	Stationary

Source: Author (2018)

When the ADF test was done on all the variables, their t statistical values in all the variables except for Inflation rate were less than the t critical values in all the significant levels. Therefore we could not reject the null hypothesis which states that there is unit root or the variables are non-stationary at levels except for inflation rate. To rectify this, the researcher differenced the variables once and they became stationary upon checking for unit root at first difference.

4.4 Principle Component Analysis

Given the aspect that infrastructure has various sub-indicators, which includes telecommunication (mobile cellular subscription), electricity power generation (kilowatts), and transport infrastructure (total government expenditure on infrastructure), it is important to come up with a principle component to measure infrastructure. In this regard, the study carried out a Principle Component Analysis (PCA). The central idea of the PCA was to reduce the dimensionality of a data set

consisting of a large number of interrelated variables, while retaining as much as possible of the variation present in the data set. This is achieved by transforming to a new set of variables, the principal components (PCs), which are uncorrelated, and which are ordered so that the first few retain most of the variation present in all of the original variables.

The composite index is built by grouping together the indicators into intermediate composite indices (Nicoletti *et al.* 2000), depending on the total number of components, in this case we have three components. Once the three intermediate indices are constructed, they are combined together. The best choice to build the intermediate indices is the geometric aggregation, as the single indicators have different units. Moreover, poor performance in some indicators cannot be compensated by high values in other indicators, as it happens with additive aggregation (Nardo *et al.* 2005). The composite index I was built as:

$$I = \sum_{i=1}^{N=3} w_i \left(\prod_{q=1}^{10} x_q^w \, q, i \right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 6$$

Where X_q represented the normalized values of the indicators. The principal component weights given by covariance matrix are the eigenvectors.

Specifically, the Infrastructure component was given by:

$$INFRACOMP = \text{W1 (telecommunication)} + \text{W2 (electricity power generation)} + \text{W3 (transport infrastructure)} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 7$$

The output from the PCA is represented in table 4 below:

Table 4: Infrastructure Principle Component

Variable	Comp1	Comp2	Comp3	Unexplained
TEL	0.5401	0.7670	0.3464	0
TRANS	0.5672	-0.6358	0.5234	0
ELECT	0.6217	-0.0863	-0.7785	0

Source: Author (2018)

From this components, a new variable (Infrastructure Component) was generated and used in the succeeding analysis.

4.5 Cointegration Test

As noted by Guajarati (2004), two or more variables are said to be co-integrated if they have a long run equilibrium or relationship between them. Differencing of variables to achieve stationarity leads to loss of long run properties. For this reason, a test for cointegration relationship was important. The study used a Johansen test to establish the long run relationships. Prior to carrying out the test, it is important to determine the lag length. The study used the Akaike Information Criterion (AIC), the Schwarz Bayesian information criterion (SBIC) in determining the optimal lag Lengths. The results of the lag selection criterion is displayed in table 5 below:

Table 5: Lag-Selection Criterion

Selection-order criteria
Sample: 1984 - 2015 Number of obs = 32

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-120.112				.000107	7.88197	7.97307	8.1568
1	-16.9945	206.23	36	0.000	1.7e-06	3.68716	4.32484	5.61094
2	16.2044	66.398	36	0.002	2.6e-06	3.86223	5.04649	7.43496
3	76.1407	119.87	36	0.000	1.3e-06	2.36621	4.09705	7.58789
4	175.789	199.3*	36	0.000	2.0e-07*	-1.61179*	.665629*	5.25884*

Source: Author (2018)

From the output above, the optimal lag length was determined to be 4, this is selected by both the AIC and SBIC among others. Having determined the optimal lag-length to be four, the researcher proceeded to carry out the cointegration test. The Johansen test results are displayed in table 6 below:

Table 6: Johansen Test for Cointegration

Johansen tests for cointegration
Trend: constant Number of obs = 32
Sample: 1984 - 2015 Lags = 4

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	114	55.025692	.	241.5260	94.15
1	125	120.57332	0.98337	110.4307	68.52
2	134	144.62493	0.77759	62.3275	47.21
3	141	157.04655	0.53992	37.4843	29.68
4	146	168.60768	0.51450	14.3620*	15.41
5	149	175.70258	0.35817	0.1722	3.76
6	150	175.78868	0.00537		

Source: Author (2018)

The Johansen test is done by comparing the trace statistics with the critical value .If the value of the trace statistics is greater than the critical value then this implies cointegration at the specific level. From the results in table 6 above, the variables were found to be cointegrated at order 4, that is, I (4). This is because the trace statistic was found to be less than the critical value, that is, 14.3620 was less than 15.41. Since the variables were found to be cointegrated at order 4, which implied multiple equilibrium interactions, the researcher proceeded to estimate the Vector Error Correction Model (VECM) as described in the preceding chapter. It is important to note that, due to the fact of the small sample size, not all the equilibrium interactions were considered in the model.

4.6 VECM Estimation Results

Table 7: Vector Error Correction Model Results

	Foreign Direct Investment	**Infrastructure Component**
	D.lnFDI	D.INFRACOMP
L._ce1	-1.658***	-1.222*
	(0.317)	(0.479)
LD.*lnFDI*	0.434*	0.617*
	(0.193)	(0.291)
LD.*INFRACOMP*	0.316**	-0.429*
	(0.113)	(0.171)
LD.*lnGDP*	-3.766	-5.330
	(2.008)	(3.029)
LD.*lnREER*	5.218	3.468
	(2.671)	(4.029)
LD.*lnOPEN*	-2.067	-5.062
	(2.245)	(3.386)
LD.*lnINF*	0.124	0.327
	(0.211)	(0.319)
LD.*lnHC*	0.404	0.758
	(0.417)	(0.629)
Constant	0.0248	0.0254
	(0.221)	(0.333)
AIC	*3.95211*	*3.95211*
SBIC	*6.331436*	*6.331436*
HQIC	*4.763528*	*4.763528*
Log likelihood	*-14.18586*	*-14.18586*

Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Upon establishing that all the variables are I (4), we proceeded to estimate a VECM with one cointegration relationship in each of the equations. The VECM allows the long-run behavior of

the endogenous variables to converge to their long-run equilibriums while maintaining the short-run dynamics. From the results in Table 7, the coefficient of the Error Correction term for FDI stock variable has the correct sign(that is, negative, which shows long-run relationships), and its statistically significant at 1 percent level of significance , and has a convergence speed to equilibrium of 165 percent. This implies that in the short-run, FDI stocks adjusts by 165 percent of the past year's from equilibrium. This explains that the speed of adjustment is rapid.

On the other hand, the coefficient of the ECT for infrastructure component is negative and statistically significant at 5 percent level. The adjustment speed toward equilibrium is 122 percent which is rapid. This implies that the restoration to equilibrium term will take a shorter time. The significant coefficient of the ECT shows that they all cause one another in the long run.

Analyzing the short-run dynamics, Infrastructure has a positive and significant effect on the flow of FDI. An Increase in the infrastructural component by one percent increases FDI flow by 0.316 at the 90% confidence level in the first lag. This is in line with, Bakar and Harun (2012) in Malaysia and Rehman et al. (2010) in Pakistan who established that in Malaysia, infrastructural development has a positive and substantial impact on FDI inflows as well as Pakistan. Furthermore, Using government expenditure and Telephone mainlines in measuring infrastructure component, (Bakar et al, 2012 and Akram et al 2010) showed that infrastructure plays an important role on FDI. In Africa, availability of the transport infrastructure is key in attracting FDI in Africa according to Khadaroo and Seetanah (2009) who used both the static and dynamic panel data approach in their analysis.

On the other hand, FDI affects infrastructure positively and significantly. A one percent increase in the amount of FDI flow impacts infrastructure by 0.617.Tnis implies that FDI causes

infrastructural development in the short run and the effect is significant at 90% level of confidence. This is in line with the study by Aheto (2014) who found a unidirectional causal relationship of FDI to Infrastructure and did not investigate the impact of Infrastructure on FDI inflows.

GDP was found to be negatively affecting both FDI inflow and infrastructural development negatively but not significant. Growth in GDP by one percent causes a reduction in the FDI and infrastructural development by 3.766 and 5.330 respectively. Thus increase in economic performance may not necessary imply growth in FDI and infrastructure. This is consistent with the findings by Socrates and Manyanza(2012, 2012) that growth in GDP is detrimental to the flow of the FDI in Kenya.

The study findings indicate a positive but insignificant relationship between real effective exchange rate and the two dependent variables; FDI and infrastructural development. A one percent growth in the real effect exchange rate will increase FDI and infrastructural development by 5.218 and 3.468 respectively. On the other hand, trade openness negatively affect FDI and infrastructural development .Improvement in the trade openness cause a reduction in the FDI and infrastructural development by 2.067 and 5.062 respectively in the short run.

Increasing inflation was found to positively increase FDI and infrastructural development in the short run though the effect is not significant. A one percent increase in the inflation rate increase FDI and inflation by 0.124 and 0.327 in the short run .This too is the case on the human capital development, a one percent increase in the human capital development in the short run lead to the increase in the FDI and infrastructural development by 0.404 and 0.758 respectively. This increase is insignificant.

4.7 Long-run Cointegration Estimates

Table 8: Long-Run Cointegration Estimates

beta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_ce1						
lnFDI	1	.	.	.	.	.
INFRACOMP	.2607626	.0494962	5.27	0.000	.1637518	.3577735
lnGDP	-1.993865	.1112283	-17.93	0.000	-2.211868	-1.775862
lnREER	1.930109	.4906253	3.93	0.000	.9685009	2.891717
lnOPEN	-1.517145	.5665598	-2.68	0.007	-2.627582	-.4067084
lnINF	.3967444	.0978679	4.05	0.000	.2049269	.5885619
lnHC	1.058064	.1151576	9.19	0.000	.8323594	1.283769
_cons	25.2154	.	.	.	.	.

Source: Author (2018)

To interpret the long run results, the coefficients are multiplied by -1. An empty model shows that the level of FDI would be 25.2154 when no variables are included in the model. Improvement of the infrastructure causes a decreases in the level of FDI by 0.2607626 at 5% level of significance. This implies that there is a negative relationship between FDI and infrastructure in Kenya in the long run. This is because a certain threshold has to be reached.

Growth in GDP is positively and significantly related to the FDI. A unit increase in the GDP will cause an increase in the FDI by 1.993865 at 5% level of significance. A study by Abala (2014) noted that Enhanced infrastructure among other variables GDP cause growth in the FDI inflows in Kenya for the period 1970 to 2010 (Abala, 2014).These findings were contradicted the findings by Studies carried out in the analyses in the causes of FDI inflows in Kenya found a positive relationship between FDI and established that GDP growth rate deters FDI inflow (Socrates, 2012 and Manyanza, 2012).

There exists a negative relationship between real effective exchange rate and FDI in Kenya. A one percent increase in the Real Effective Exchange rate will lead to the decrease in FDI by 1.930109.Therefore real effective exchange rate reduces flow of FDI in the country.

Trade openness leads to the increase in the flow of FDI flow in Kenya. These were the findings of this study that the higher the level of the trade openness the higher the flow of FDI into the country.

Inflation has a negative effect on the flow of FDI in Kenya. An increase in the level of inflation in the country reduces the level of FDI flow into the country by the antilog of 0.3967444.

Human capital development is negatively related to the flow of FDI in Kenya. A one percent increase in the level of human capital development reduces the flow of FDI in Kenya by 1.058064.The implication is that as the level of skills and training increase in the country, this is detrimental to the flow of FDI in Kenya.

4.8 Granger Causality test

Table 9: Granger Causality Test

Equation	Excluded	chi2	df	Prob > chi2
lnFDI	INFRACOMP	1.5097	2	0.470
lnFDI	lnGDP	22.266	2	0.000
lnFDI	lnREER	.90632	2	0.636
lnFDI	lnOPEN	1.6412	2	0.440
lnFDI	lnINF	.59274	2	0.744
lnFDI	lnHC	13.473	2	0.001
lnFDI	ALL	85.904	12	0.000
INFRACOMP	lnFDI	7.4763	2	0.024
INFRACOMP	lnGDP	8.0032	2	0.018
INFRACOMP	lnREER	.93068	2	0.628
INFRACOMP	lnOPEN	2.931	2	0.231
INFRACOMP	lnINF	2.052	2	0.358
INFRACOMP	lnHC	1.993	2	0.369
INFRACOMP	ALL	22.573	12	0.032

Source: Author (2018)

This study sought to establish whether there was a bi-directional causality between FDI and infrastructure and thus Granger causality was carried out and results presented in table 9.The first equation in which the FDI was treated as the depended variable found causality running from GDP and human capital development to FDI only. The second equation treated infrastructural development as the dependent variable and it was established that there was a causality running from FDI and GDP to infrastructural development. Since there is only causality running from FDI to infrastructural development and not from infrastructural development to FDI, then it can be concluded that the causality was unidirectional from FDI to infrastructural development.

CHAPTER FIVE

CONCLUSION AND POLICY RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the of the study findings, policy recommendations, weakness of the study and finalizes by proposing further areas of the reach

5.2 Summary and Conclusion

This study sought to examine the relationship between infrastructure and FDI in Kenya, by specifically examining the long run and short run relationships between the two variables using time series data from 1980 to 2015. Using the Vector Error Correction Model estimation techniques, it was established that the two variables affect each other both in the long run and short run.

The first objective of this study was to establish the long-run and short-run impact of Infrastructure on FDI stocks in Kenya. The results established that infrastructural led to an increase in FDI stocks in the long run at 99% confidence level .The short run results indicated that infrastructural development had a positive and significant effect on the FDI in Kenya. An Increase in the infrastructural component by one percent increases FDI flow by 0.316 at the 90% confidence level. This is affirmed by the Granger Causality test which established that Infrastructure Granger Causes FDI significantly.

The second object objective was to find out the impact of the FDI on the infrastructure in Kenya. The VECM model showed that FDI affected infrastructural development in the long run as well

as in the short run. In the short run, a one percent increase in the amount of FDI stocks impacts infrastructure by 0.617, at 90% level of confidence.

5.3 Policy Recommendation

Since infrastructure affects FDI positively in the short run, has a positive effect on flow of FDI, this study recommends that proper measures should be put in place to facilitate infrastructure development because this would lead to the increase in the flow of FDI in the country which is beneficial in variety of ways in the country. This includes lowering the energy and transport costs which enables firms to lower costs and take advantage of economies of scale. Furthermore, government investments in transport infrastructure allows people to move easily to follow employment opportunities that match their skills, thus improving economic efficiency. This facilitates an increase in MNC investments in the country. Investment to infrastructure should be given priority to both the private and public funded projects.

Secondly, the study results provided evidence of the causality running from FDI to infrastructural development which implies FDI positively affect development in the infrastructure. Proper government policies aimed at encouraging FDI can facilitate transformation in the infrastructure sector. This includes such policies as creating Special Economic Zones, facilitating free economic environment for foreign companies, and furthermore removal of the centralization in economy. Additionally, tax policies such as not taxing MNC two years after their beneficial year, and half-collected in next three years , after these five years , they can maintain another three years for half-collected tax. Such policies will see improvement in the FDI inflows in Kenya, and through this, key transformations in infrastructure will be realized.

5.4 Limitations of the study

This study is limited in scope since it did not consider the quality of infrastructure and furthermore, the efficiency of the type of infrastructure available. Additionally, this study is limited on the component of infrastructure yet FDI is affected by other sectors of the economy such as tourism and institutional quality in the country.

5.5 Further areas of Research

The study recommends further studies to examine the quality of infrastructure and its impact on FDI stocks and further extend the scope to the East African context with the countries within the same trading bloc.

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