EFFECTS OF INFRASTRUCTURE ON FOREIGN DIRECT INVESTMENT IN KENYA

CAROL TERESA WEKESA

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DECLARATION

This project is my original work and has not been presented for a degree award in any other university.

Signature ___________________ Date 19/6/2015

CAROL TERESA WEKESA (B.A KENYATTA UNIVERSITY)

REG: K102/CTY/PT/21338/2012

We confirm that the work reported in this project was carried out by the candidate under our supervision.

Signature ___________________ Date 19/6/2015

PROF. NELSON H.W. WAWIRE (Ph.D.)

ASSOCIATE PROFESSOR OF ECONOMICS

DEPARTMENT OF APPLIED ECONOMICS

SCHOOL OF ECONOMICS

KENYATTA UNIVERSITY

Signature ___________________ Date 22/6/15

DR. GEORGE KOSIMBEI (Ph.D.)

SENIOR LECTURER

DEPARTMENT OF ECONOMIC THEORY

SCHOOL OF ECONOMICS

KENYATTA UNIVERSITY
DEDICATION

This research project is dedicated to my entire family who have been my source of inspiration. Together, they have given me a strong will to tackle this task with great zeal and determination. Without them, this project may not have become a reality.
ACKNOWLEDGEMENT

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# ABBREVIATIONS AND ACRONYMS

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<th>Abbreviation</th>
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<tbody>
<tr>
<td>ADF</td>
<td>Augmented Dickey Fuller</td>
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<tr>
<td>BOOT</td>
<td>Build Own Operate and Transfer</td>
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<tr>
<td>BOT</td>
<td>Build Operate and Transfer</td>
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<td>ERS</td>
<td>Economic Recovery Strategy</td>
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<td>FDI</td>
<td>Foreign Direct Investment</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>ICT</td>
<td>Information Communication Technology</td>
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<td>IMF</td>
<td>International Monetary Fund</td>
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<tr>
<td>kWh</td>
<td>Kilowatt Hour</td>
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<tr>
<td>LAPSSET</td>
<td>Lamu Port South Sudan Ethiopia Transport Corridor</td>
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<tr>
<td>MTEF</td>
<td>Medium Term Expenditure Framework</td>
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<td>MTP</td>
<td>Medium Term Plan</td>
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<td>MW</td>
<td>Mega Watt</td>
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<td>PCA</td>
<td>Principal Component Analysis</td>
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<td>PEV</td>
<td>Post-Election Violence</td>
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<td>PPP</td>
<td>Public Private Partnership</td>
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<td>SAP</td>
<td>Structural Adjustment Program</td>
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<td>SBIC</td>
<td>Schwartz-Bayesian Information Criterion</td>
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<td>UNCTAD</td>
<td>United Nations Conference on Trade and Development</td>
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OPERATIONAL DEFINITION OF TERMS

Communication Infrastructure: These are the various broadcasting and telecommunication facilities that are necessary for communication and transaction services.

Economic Development: This is economic growth accompanied by transformations in the livelihoods of citizens. When there is an improved standard of living, then economic development is said to have taken place.

Economic Growth: This is an increase in the capacity of a country’s economy to generate goods and services. This increase can be compared from one period of time to another.

Energy Infrastructure: These are enablers in the production and consumption of energy resources. In this study, electric power consumption (per kWh), per capita consumption of kilogrammes of oil equivalent, energy generation (MW) as a percentage of demand, renewable energy generation (MW) as a percentage of total generation and percentage connection to the national grid are used to represent energy infrastructure.

Exchange Rate: Kenya’s official exchange rate against the current US dollar.
Foreign Direct Investments: These are net inflows of investment into Kenya, measured in Kshs. It is a summation of equity capital, earnings reinvested and other long and short-term capital.

Infrastructure: These are physical structures (such as roads, rails, sewers, bridges) that are needed for proper functioning of a country/region/organization.

Infrastructure Sector: These are basic physical systems. In this study, a system that aggregates transportation, communication, sewerage, water and electric systems become an infrastructure system.

Macroeconomic Stability: This is a situation when a national economy has minimal vulnerability to external shocks. This in turn increases the prospects for sustained growth.

Openness to Trade: This is a measure of a country’s integration in the world economy. It represents the degree of demand for domestic produce in foreign markets and demand for foreign produced goods and services locally.

Operating Environment: These are underlying conditions or circumstances that have an effect on the operations of an organization.
Return on Investment: This is the benefit to the investor resulting from an investment of some capital. A high rate on investment means the capital compare favorably to returns.

Transport Infrastructure: These are physical structures (such as roads, railways, ports and airports) enabling the passage of vehicles, goods and people.

Water and Waste Management Infrastructure: These are water and waste systems accessed within a certain locality, as defined based on availability, accessibility and affordability.
ABSTRACT

Kenya’s FDI inflows as a percentage of GDP have been increasing negligibly over the last five years, increasing from 0.4 percent in 2010 to 0.9 percent in 2013. This is despite the fact that, since the year 2000, there has been increased budgetary allocation to the infrastructure sector. Empirical evidence has shown that quality infrastructure lowers the cost of doing business and improves the investment climate, thus attracting FDI. However, Kenya still has visible signs of infrastructure inadequacy and inefficiencies. These include congested roads, erratic power supply, long-waiting lists for installation of telephone/power lines, shortages of clean and safe drinking water, and overloaded waste disposal system and pollution. This study, therefore, sought to determine the effects of transport, energy, communication, and water and waste infrastructure development on FDI inflows in Kenya. The study used annual secondary data, spanning 1970 to 2013, sourced from Central Bank of Kenya, World Bank and UNCTAD. Multiple regression analysis was done. It was established that, improved transport infrastructure, communication infrastructure, water and waste infrastructure, exchange rate, economic growth and trade openness are important determinants of FDI inflows into Kenya. Hence, for Kenya to attract more FDI, the government should modernize ports and airstrips, tarmac more kilometres of roads, construct more kilometres of rail line, improve port infrastructure to increase container port traffic, increase broadband internet connectivity, expand technical training institutes, harness innovative ideas for increased export of ICT goods and services, construct and rehabilitate water and waste management systems. It should further strengthen the Public Private Partnerships (PPPs) framework for more private sector participation in infrastructure development; strengthen tax collection mechanisms, sealing loopholes for tax evasion, and ensure more resources are directed towards development vote as opposed to the recurrent vote. Innovative infrastructure financing models should be sought. The use of infrastructure bonds and pension funds are examples. The government should afford investors a conducive investment climate, and at the same time prioritize the implementation of national cohesion and anti-terrorism programs.
CHAPTER ONE
INTRODUCTION

1.1 Background

Kenya's quest for infrastructure development started in earnest soon after the country gained political independence in 1963. This fact is properly captured in Sessional Paper Number 10 of 1965 in which the country wished to develop transport, energy and other basic infrastructure aimed at drawing the country into the market economy while laying the basis for a rapid acceleration of industrial growth. Other development plans followed suit with the Economic Recovery Strategy for Wealth and Employment Creation (Republic of Kenya, 2003) bringing to fore infrastructure as an important prerequisite in creating and supporting a business environment capable of facilitating investment, growth and job creation.

Remarkably, Kenya's long term development blue print, the Kenya Vision 2030 (Republic of Kenya, 2007), has recognized the importance of infrastructure for sustained economic development. The vision is alive to the fact that high costs of doing business arising from inadequate and inefficient infrastructure can prevent the economy from realizing its full potential regardless of the progress on other fronts (ICT, Agriculture, and Financial Management Reforms among others).
1.1.1 Infrastructure for Economic Development

The importance of infrastructure for economic development cannot be gainsaid, as the superstructure of Kenya’s overall wealth hinges on it. Infrastructure development represents a broad spectrum of activities and services without which no meaningful activity can be undertaken in the economy. As presented in the second Medium Term Plan, 2013-2017 (Republic of Kenya, 2013), infrastructure plays a key role in the economy and constitutes the wheels, if not the engine of development. Reliable, adequate and quality infrastructure will increase economic productivity, lower production costs, improve quality of life, raise the country’s regional and global competitiveness, attract Foreign Direct Investment (FDI) and help in modernizing the economy.

Like in other developing countries, Kenya has visible signs of infrastructure inadequacy and inefficiencies. These include congested roads, erratic power supply, long waiting lists for installation of telephone/power lines, shortages of clean and safe drinking water, and overloaded disposal system and pollution. This illustrates the widening gap between demand for and supply of infrastructure and raises questions concerning the sustainability of economic growth.

1.1.2 Role of Infrastructure in Attracting Foreign Direct Investment

The availability of high interconnectivity and access roads, telecommunications, railways, airports, for example, is a key asset for attracting most modern companies/industries and entrepreneurs. According to Rehman et al. (2011),
infrastructure consists of communications, roadways, transportation, highways and ports. A study focusing on the impact of infrastructure on FDI concluded that there was a positive significant contribution of infrastructure in captivating FDI. Transportation costs, tariffs and access to a new market enhances competitive position of a country (Rehman et al., 2011). Infrastructure availability reduces transportation costs, tariffs and improves access to new markets while reducing operational costs in a specific country.

Zheng (2009) categorized infrastructure development as part of public goods. Zheng argued that public goods have a vital impact on cost structure and productivity of private firms, and assumed that if such kind of infrastructure were not extended to local and multinational enterprises publicly, then they (local and multinational enterprises) would be operating with less efficiency as they would have to build their own infrastructure which would result in duplication and wastage of resources. As put by Rehman et al. (2011) and Zheng (2009), availability of public goods lower the cost of private firms even if there is no direct role of infrastructure in the production performance and cost structure of private firms. Both opine that poor infrastructure limits access to both local and global markets which ultimately discourages FDI in developing countries. In summary they argued that infrastructure development promotes FDI and greater return on investment to business owners.
Evidence from the Chinese economic revolution has also shown that transportation factors, such as the average commute time-from main airports, ports and industrial parks, figure prominently in the country's capacity to attract and retain foreign companies, entrepreneurs and talent (UNCTAD, 2005). Access to clean and adequate water, energy and necessary legal framework play a primary role in impacting expansion decisions by these foreign firms/entrepreneurs.

1.1.3 Foreign Direct Investment for Economic Development

Attraction of companies/industries and entrepreneurs is a sure way of attracting Foreign Direct Investment (FDI) to a country. According to Nyaosi (2011), FDI brings financial resources to host countries, provides new technologies and enhances the efficiency of existing technologies. To Nyaosi further, it facilitates access into export markets, thereby playing an important role in strengthening the export capabilities of domestic economies. In support, Mwega (2009) opines that FDI enhances skills and management techniques and may provide cleaner technologies and modern environment management systems. Importantly, FDI helps to develop a host country’s infrastructure. A case in point is the auctioning of two mobile phone operators in Kenya in 1999 and 2000 which resulted in the rapid build-up of telecommunication infrastructure (UNCTAD, 2005).

The Sessional Paper Number 10 of 1965 recognized attraction of FDI as a growing sector rather than a shrinking one and laid down strategies to attract more capital from abroad. Important to this, the paper recommended the need to finance more
development related activities and to improve infrastructure rapidly. However, the
economic stagnation in the mid-1980s and 1990s affected Kenya's
industrialization and hence development. To Rasiah and Gachino (2003), macro-
economic constraints arising from a collapse in the IMF’s Structural Adjustment
Program (SAPs), massive destruction of infrastructure due to El Nino rains and
weak institutions had all contributed to the economic stagnation.

After the disappointing period of the 1990s, Kenya resumed the path to rapid
economic growth in 2002 through the implementation of the Economic Recovery
Strategy for Wealth and Employment Creation (2003-2007), which has been
succeeded by the Kenya Vision 2030. During this period the government
implemented several strategies aimed at spurring growth, and included
establishment of free trade zones, improvement of terms of trade and business
climate, rehabilitation and maintenance of infrastructure facilities, and
implementation of various incentives. Central to this, was a commitment to attract
FDI, which was hoped, would assist in the industrialization process. The
government then, prioritized the infrastructure sector, getting the second highest
budgetary allocation through the Medium Term Expenditure Framework after the
education sector. However, the introduction of these strategies to attract and
promote FDI and export oriented industrialization, have not yielded much.

Attracting FDI has become a policy concern for the government. This is due to the
contribution of FDI to capital formation, which is likely to help in reducing the
financial gap experienced in the country. The following figure shows the trend in FDI net inflows for Kenya since the year 1970 to 2013.

![Graph of Foreign Direct Investment in Kenya (Current US$ in Millions)](image)

**Figure 1.1: Foreign Direct Investment in Kenya (Current US$ in Millions)**

The figure shows that FDI net inflows have been low and stable from 1970 to 2006 when it shot up. It later declined drastically between 2007 and 2008 before it started rising steadily from 2009 to 2011, a slight decline in 2011 to 2012 and thereafter rising sharply between the years 2012 to 2013. The drastic decline may be attributed to the global financial crisis of 2008/2009, and the high fuel and commodity prices.

Empirical evidence has shown that quality infrastructure lowers the cost of doing business and improves the investment climate, thus attracting FDI. This study, therefore, sought to analyze empirically the effects of infrastructure development on FDI flows to Kenya, with a view to generating policy implications.
1.2 Statement of the Problem

Kenya's FDI inflows (as a percentage of GDP) have been increasing negligibly over the last five (5) years. In 2010, the UNCTAD had projected that the country will attract averagely 1.3 billion USD worth of FDI annually in the next eight years, up to 2018. However, the country only attracted 178 million USD, 335 million USD, 259 million USD and 514 million USD between 2010 and 2013, which was way below the projections. Further, FDI growth, as a percentage of GDP, and FDI per capita has been fluctuating over time.

On the other hand, since the year 2000, there has been increased budgetary allocation to the physical infrastructure sector. Towards development, for example, resource allocation increased from Kshs. 88.6 billion in 2008/09 to Kshs. 161.9 billion in 2011/12 and then to Kshs. 200.3 billion in 2014/15, as evidenced from, Energy, Physical Infrastructure and ICT, Medium Term Expenditure Framework (MTEF) Sector Reports (Republic of Kenya, 2007, 2010, 2013). However, Kenya still has visible signs of infrastructure in-adequacy and inefficiencies. These include congested roads, erratic power supply, long waiting lists for installation of telephone/power lines, shortages of clean and safe drinking water, and overloaded disposal system and pollution, among others. This, thus, begs the question, what are the effects of infrastructure development on the meagre increase in FDI recorded in Kenya?
Added to this, no empirical analysis, has been done in the Kenyan context to establish the relationship between infrastructure development and FDI inflows in Kenya, taking into consideration all key infrastructure indicators. For example, Nyaosi (2011) established that infrastructure affects FDI inflows significantly and these findings were similar to those of Mwega (2009); UNCTAD (2005); Calderon (2009) and World Bank (2009). Most of these studies used limited number of variables to represent the whole spectrum of infrastructure development. Key among the omitted variables includes those on water and waste management which are key indicators of growth and their omission would give biased results, hence policy decisions.

Further, most of the studies on the determinants of FDI inflows have relied on data from different regions and horizons to arrive at conclusions and make recommendations. Due to the different operating environments, most of the prescriptions are region-based and hence the need for country-specific solutions. As a support of this, a study done by Asiedu (2002) established that high return on investment and infrastructure are significant determinants of FDI in non-Sub-Saharan Africa countries but not significant for Sub-Saharan Africa. Further, the study found out that the marginal impact of increased openness is a key factor in determining FDI for Sub-Saharan Africa as opposed to the non-Sub-Saharan Africa.
This study, therefore, sought to analyze empirically the effects of infrastructure development on FDI inflows to Kenya, taking cognizance of the fact that infrastructure comprises of many sub-indicators and thus, takes into consideration most of the variables considered in previous studies, in addition to other elected sub-indicators, to construct infrastructure indices.

1.3 Research Questions

The study sought to answer the following questions:

i. What are the effects of transport infrastructure development on FDI inflows in Kenya?

ii. What are the effects of energy infrastructure development on FDI inflows in Kenya?

iii. What are the effects of communication infrastructure development on FDI inflows in Kenya?

iv. What are the effects of water and waste management infrastructure development on FDI inflows in Kenya?

1.4 Objectives of the Study

The main objective of the study was to analyze the effects of infrastructure on Foreign Direct Investment in Kenya.

The specific objectives of the study were to;

i. Determine the effects of transport infrastructure development on FDI inflows in Kenya;
ii. Investigate the effects of energy infrastructure development on FDI inflows in Kenya;

iii. Determine the effects of communication infrastructure development on FDI inflows in Kenya; and

iv. Find out the effects of water and waste management infrastructure development on FDI inflows in Kenya.

1.5 Significance of the Study

The study's importance is both societal and scientific in nature. Together with other existing literature on determinants of FDI in Kenya, the study findings are significant in policy and decision making, while investors will use them to inform their investment decisions in the country. The findings give an insight on the worthiness of continued investment in the infrastructure sector. The study is of great importance to future scholars and academicians as it forms the basis and literature for future research. The study findings are expected to stimulate further research on the impact of infrastructure in attracting FDI, not only in Kenya, but also globally.

1.6 Scope of the Study

This was a causality study and aimed at understanding the effects of infrastructure developed on FDI attraction. It was used to measure the impact of infrastructure development on FDI in Kenya. The researcher took into consideration key infrastructure indicators, the period before and after the El-Nino rains, the Post-
Election Violence (PEV) and the implementation of the first Medium Term Plan, 2008-2012 (Republic of Kenya, 2008). These are key moments in the history of the country. Both the El-Nino rains and the Post-Election Violence (PEV) had a destabilizing effect, with the rains causing havoc to infrastructure facilities. Further, during the implementation of the first Medium Term Plan, 2008-2012, key infrastructure facilities were implemented, among them the Thika Super Highway, Mombasa Port Modernization and dredging, rehabilitation of airports and airstrips, rehabilitation and maintenance key national and international trunk roads.

The study used annual secondary data from various sources, spanning 1970 to 2013. This period was long enough for statistical inference, and data was available. It was sourced from several websites and include that of Central Bank of Kenya, World Bank and UNCTAD. Others sources include statistical abstracts (various) and economic survey (various).

1.7 Organization of the study
This research project is made up of five chapters; chapter one is the background of the study. In what follows, chapter two titled, literature review, presents the various theories and related variables that have been presented to depict the relationship between factors that influence FDI inflows and how FDI on the other hand impacts a country’s overall growth. The chapter further presents an empirical analysis of the several works done on the main determinants of FDI inflows by
different authors. An evaluation of both the theories and empirical literature is finally presented, highlighting the gaps to be filled by conducting this study. Chapter three is the methodology of the study. It presents the research design and a conceptual framework, detailing the relationship between the dependent variable and the explanatory variables. The section further presents the study model, in theory and in concept, an explanation of the variables and their expected signs in the formulated model. Chapter four gives the empirical results and explanations, while Chapter five gives the summary, conclusions and policy implications. The last sections contain references and appendices.
CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter presents the literature review. It presents the various theories and related variables that have been presented to depict the relationship between factors that influence FDI inflows and how FDI on the other hand impacts a country's overall growth. The chapter further presents an empirical analysis of the several works done on the main determinants of FDI inflows by different authors. An evaluation of both the theories and empirical literature is finally presented, highlighting the gaps to be filled by conducting this study.

2.2 Theoretical Literature

From the several studies done on the factors that promote Foreign Direct Investment (FDI) and the impact it has on host countries, one fact is evident, that FDI is a more reliable source of capital to spur growth. In agreement, Lipsey (1999), in the study on the role of FDI in international capital flows, argued that FDI has been the least volatile source of international investment for host countries. Consistently, Lipsey opines that FDI has been the most dependable source of foreign investment for developing countries. Based on Lipsey’s study, and in addition to other underlying reasons, many countries, including Kenya, have adopted policies aimed at attracting foreign investors. However, a deep understanding of the determining factors of FDI inflows coupled with the reasons
why some countries are successful than others in attracting FDI, is a critical pre-
requisite that may provide policy makers with a useful guide for policy direction,
both in the medium and long term.

Literature on the determinants of FDI is available. However, despite the large
number of studies that have been conducted to identify the determinants of FDI, no
consensus view has emerged. In view of this, no set of explanatory variables have
been formulated that can be regarded as the actual determinants of FDI. This,
Chakrabarti (2001) attributed to the different perspectives employed by the
different researchers, methodologies, sample-selection, data horizons and the fitted
models together with the analytical tools. Chakrabarti’s attributions are evident in
the results produced and which are sensitive to these factors, hence an indication
of lack of robustness. Despite this, the Dynamic Macroeconomic FDI Theory
suggests that economic, social and political factors, cultural aspects as well as
government policies are equally significant in establishing a proper environment to
attract FDI (Chakrabarti, 2001).

As opined by Mooya (2003), macroeconomic stability is an important
consideration for investment. Stability increases business certainty and reduces
transaction costs. An example of such factors includes labour costs, trade tariffs
and barriers, terms of trade and trade balance, exchange rate and tax regimes.
These, according to some of the studies conducted have been found to have both
negative and positive effects on FDI. While in agreement that the unavailability of
a set of explanatory variables is due to the absence of a consensus on a theoretical framework to guide empirical work on FDI, Chakrabarti (2003) has made an attempt to develop a theoretical model of FDI. To aid the empirical analysis of FDI, Chakrabarti (as contained in Mooya, 2003) proposes a model that assesses the role of potential determinants of FDI distribution.

According to Chakrabarti, some of the determining variables include policy variables (tax policy, trade policy, privatization policy, macroeconomic policy), business variables (investment incentives), market-related economic determinants (market size, market growth, market structure), resource-related economic determinants (raw materials, labour cost, technology) and efficiency-related economic determinants (transport and communication costs, labour productivity).

In support of Chakrabarti (2003), Dunning’s Eclectic Theory combines industrial economics and international trade to explain FDI. The theory postulates government policies, location specific advantage and ownership as important aspects in attracting FDI. On government policies, the theory considers tariffs, quotas, taxes, incentives, competition policy, subsidies, discrimination and political stability. Policies favourable to business, as important determinants. On host-country infrastructure, the theory talks about the quality of transport, communication, energy and commercial services. This study will concentrate on the location specific advantage factors mostly.
2.3 Empirical Literature

Empirical literature exists on the various factors that promote FDI, both in developing and developed countries. Different studies have attempted to bring out the causal relationship between the factors using different approaches, economic models, considering different variables and considering different datasets with differing horizons. Some have established a uni-directional relationship while others a bi-directional relationship, and have each presented an analysis of the causality differences.

According to Houghwout (2001), the primary benefits of transport infrastructure development are increased accessibility and reduced transport cost and firms can benefit from these without actually contributing directly to the project. In Houghwout’s argument, even if such infrastructure has no direct role in the cost structure, evidence suggests that the indirect spill overs from agglomeration and clustering created by public infrastructure lowers the costs of firms.

In the African context, a study by Asiedu (2002) who analysed 34 African countries over the period 1980-2000, using the number of telephones per 1000 population to measure infrastructure development concluded that countries that improved their infrastructure were rewarded with more investments. To Asiedu, a one unit increase in infrastructure was estimated to lead to a 1.12 percent increase in FDI/GDP in the 1980s.
Yasmin et al. (2003) analysed the volume and determinants of Foreign Direct Investment (FDI) in developing countries. Basing the analysis on a sample of 15 developing countries, 5 each from upper middle, lower middle and lower income countries, the study established that the flow of FDI to developing countries has followed an uneven path. The analysis further showed that urbanization, GDP per capita, standard of living, inflation, current account and wages affect FDI inflows significantly in low income countries; urbanization, labour force, domestic investment, trade openness, standard of living, current account, external debt and wages in lower middle income countries, and urbanization, labour force, GDP per capita, domestic investment, trade openness and external debt in the sampled upper middle income countries. The study attributed variations in FDI to institutional and structural differences among the countries analysed. From the three segments, it is evident that urbanization is a key determinant of FDI inflows, hence well planned urban areas with the necessary infrastructure facilities are likely to attract more FDI.

Using two proxies for road network (total roads length and paved roads) and electricity (installed power capacity and gross generation) in Argentina, Castro et al. (2007) established that paved and reliable roads matter in FDI attraction. From the results, a 10 percent increase in per capita paved roads boost FDI on the average of between 17 percent and 33 percent. Further, increasing energy supply in geographically close provinces would augment FDI inflows between 12 percent and 14 percent.
In a study to establish the impact of FDI in Malawi, Kazembe and Namizinga (2007) found out that investors attach more weight on the need to communicate with clients at ease and operate efficiently under reliable utilities. To Kazembe and Namizinga, such factors include functional transport, energy and communication infrastructure and utilities. Unreliable power and water supply and high cost of transport make it hard for international investors to manufacture and produce efficiently, while better road networks enable investors to transport and supply products at lower costs.

In a study on foreign investment and economic development in Costa Rica, Cordero and Paus (2008) established that the Costa Rican government’s efforts to address concerns on improved road access, telecommunications, uninterrupted access to reliable electricity and water at reasonable prices, had contributed towards attracting more FDI to the country. Cordero and Paus findings are similar to Kazembe and Namizinga (2007) findings.

Jordaan (2010), while studying foreign direct investment and neighbouring influences, established that good quality and well-developed infrastructure increases the productivity potential of investments in a country and therefore stimulates FDI flows towards the country. Consistent with Asiedu (2002) and Ancharaz (2003), Jordaan argued that the number of telephones per 1,000 inhabitants is a good measure for infrastructure development. The study however notes that this measure falls short, and only captures the availability and not the
reliability of the infrastructure. To the study further, it only includes fixed-line infrastructure and not cellular (mobile) telephones, and omits other important infrastructure facilities such as roads and rail transport, water and energy supply and sources.

Using an econometric model based on cross-sectional analysis for 38 developing countries over the period of 2000-2010, Demirhan and Masca (2011) analysed the determinants of foreign direct investment in developing countries. The study used growth of per capita real GDP as a proxy for market size since absolute GDP reflects size of population rather than income; telephone main lines per 1,000 people as a proxy for infrastructure and degree of openness computed as the sum of nominal export and import divided by the nominal GDP. According to the study, market size, infrastructure and the willingness of a country to accept foreign investment were found to positively affect FDI inflows, their effect being significant. It means that better infrastructure is an important determinant in attracting FDI to developing countries.

Voorpijl (2011) analysed FDI in Kenya, with an emphasis on the gains and losses of associated with foreign involvement. Using a qualitative approach with a sample of investors that had made a long term investment, the study unearthed the strengths of analysing the investment climate. This was necessary since the investment climate determine the economic stage of a country and is a reflection of the type of FDI. According to Voorpijl, the most important investment motives
are the presence and access to a good infrastructural network and the presence of a highly educated and relatively cheap but qualified labour force.

To establish the main determinants and impacts of foreign direct investment on China's economy, Ang (2012) considered five key aspects including total inward and outward FDI flows; FDI inflows in comparison with other capital sources; main countries of origin and destination of investment; sectoral and geographical distribution of FDI and forms of investment. On fitting a time-series econometric model, the study found out that size and growth of the Chinese economy; natural and human resource endowments; physical, financial and technological infrastructure; openness to international trade and access to international markets; regulatory framework, and investment protection and promotion as the main determinants. In the study, physical, financial and technological infrastructure were found to be highly correlated with FDI inflows. This, Ang (2012) opines is as a result of the multiplier effect of infrastructure development, key to this being openness to international trade and access to international markets, which depends on sound infrastructural facilities.

Using cross-sectional data covering 18 Arab countries, Moosa (2012) empirically argued that FDI can be explained in terms of the GDP growth rate, enrolment in tertiary education, spending on research and development, country risk and domestic investment. To Moosa in general terms, countries that are more successful in attracting FDI are those that have growing economies that pay
attention to education and research. Additionally, Moosa argued that openness of
the economy represents the FDI and exports relationship, while telephone lines per
1000 inhabitants is a measure of availability and cost of telecommunications. To
Moosa, energy availability and sustainability is of particularly importance to
efficiency seeking investors.

According to Dumon (2014), every economy requires infrastructure resources in
order to facilitate the sale of goods and services. To Dumon, roads, highways,
bridges and other forms of physical infrastructure should be present, maintained
and provide sufficient safety for the transportation of goods as well as for the
commute of employees. Lower transaction costs enables investors to earn returns
on their investments as their enterprises are able to generate profits.

Several studies have argued that good infrastructure is a necessary condition for
foreign investors to operate successfully. The positive effect of infrastructure on
FDI has been found to be sensitive to time periods and countries considered.
Rehman et al. (2011) found positive impact of infrastructure on FDI in Pakistan,
while Wheeler and Mody (1992) found that infrastructure quality is an important
variable for developing countries seeking to attract FDI from the United States.
Further, using a self-reinforcing model of FDI, Cheng and Kwan (2000) found
support for good infrastructure (density of roads) as a determinant of FDI into 29
Chinese regions from 1985 to 1995.
The role of growth in attracting FDI has also been the subject of controversy. Chakrabarti (2003) stated that a rapidly growing economy provides relatively better opportunities for making profits than the ones growing slowly or not growing at all. Chakrabarti found a significantly positive effect of growth on FDI. On the other hand, Hausmann and Fernandez (2000) found no relationship between FDI flows and political risk. Using data on US FDI, Loree and Guisinger (1995) found that political risk had a negative impact on FDI. In a study on capital flows and FDI in developing countries, Edwards (2010) established that political instability was significant, while political violence was insignificant.

2.4 Overview of Literature

There is varied opinion on the impact of FDI to host countries. Some scholars have suggested that FDI growth has mainly negative effects for developing countries, while others argue the effects are mainly positive. Those in support argue that FDI provides developing countries with the needed capital, employment opportunities, knowledge, skills and new technology. Those against argue that foreign investors are interested in exploiting the local capabilities freely, while promoting private investments.

From the literature analysis, it is evident that the determinants of FDI inflows are many and varied. Most of these factors have been captured vividly by Chakrabarti (2003). Different studies have used different variables, some based on the Chakrabarti proposals and others as constructed by the authors. From the analysis,
further, it is evident that most of the studies are in agreement on the levels of variable measurement and description. It has been established that the different perspectives employed by the different studies, methodologies, sample-selection, data horizons and the fitted models coupled with the analysis tools, cause most of the variations. However, a sizable number of the results are in consonance.

For example, factors like labour costs, trade tariffs and barriers, trade openness and balance, exchange rate, quality infrastructure, economic growth and tax regimes have been found to be significant determinants of FDI inflow. The level of significance has been found different for different regions and income cohorts. Hence, there are concerns on the reliability of the results of previous studies, in relation to their robustness.

One notable factor that has been narrowly captured by most of the studies has been infrastructure. Moosa (2012); Jordaan (2010); Asiedu (2002) and Ancharaz (2003) have all used telephone lines per 1000 inhabitants to represent the whole infrastructure spectrum. To them, this is part of the infrastructure needed to conduct international business and is a measure of availability and cost of telecommunications, which is important for multinationals to coordinate cross-border activity. Nyaosi (2011) established that infrastructure affects FDI inflows significantly and these findings were similar to those of Mwega (2009); UNCTAD (2005); Calderon (2009) and World Bank (2009). All these studies used a few variables to represent the whole spectrum of infrastructure development. Key
among the omitted variables includes those on water and waste management, which are key indicators of growth and their omission would not give comprehensive results, hence policy decisions.

This study, therefore, takes cognizance of the fact that infrastructure comprises of many sub-indicators and thus, takes into consideration most of the variables considered in previous studies, in addition to other selected sub-indicators, to construct infrastructure indices using Principal Component Analysis (PCA). Together with the infrastructure indices, other variables as presented in the conceptual framework (see figure 3.1) were included in the study.
CHAPTER THREE
METHODOLOGY

3.1 Introduction
The section presents the methodology of the study. It presents the research design and conceptual framework, detailing the relationship between the dependent variable and the explanatory variables. The section further presents the study model, in theory and in concept, an explanation of the variables and their measurements in the formulated model.

3.2 Research Design
This was a causality study and aimed at understanding the effects of infrastructure development on FDI attraction in Kenya. The study was motivated by the need to establish either an empirical association or non-spuriousness. The direction and strength of the relationship were key in this study. The study used secondary, quantitative and qualitative time series data, spanning from 1970 to 2013.

3.3 Conceptual Framework
The following is the conceptual framework showing the relationship between infrastructure development and FDI. It was expected that good infrastructure facilities would hasten production and distribution processes, hence spurring economic growth.
Figure 3.1: Conceptual Framework

It was expected that a functioning transport system as well as an efficient and reliable energy and water supply will cut down production costs. On the other hand, good communication systems will hasten communication, both locally and internationally. From literature, it has been established that investment decisions are hinged on quality infrastructure systems. Thus, improved infrastructural facilities lower the cost of doing business and hence improve the investment climate. Besides infrastructure, other factors such as economic growth rate, exchange rates, openness to trade, wages and security also influence the growth of
FDI in a specific country. FDI on the other hand leads to improvement of a country’s infrastructure, contributes to a country’s capital formation hence bridging the gap emanating from low domestic savings, creates employment, results into technical transfers; with technical transfer, local firms crop-up.

### 3.4 Theoretical Model

As proposed by Kinda (2010), determinants of FDI and the decisions to invest in a certain country fundamentally depends on the return on investment. The return on investment, profit, is the Total Revenue (TR) less Total Cost (TC).

Thus,

\[
\text{Profit} = f(P, Q, TC) \tag{3.1}
\]

Where \( P \) = Price of the Output, \( Q \)

On the other hand,

\[
TC = IC + OC + HC \tag{3.2}
\]

Where \( IC \) = Input Costs (i.e. labour, raw materials), \( OC \) = Operation Costs, and \( HC \) = Hidden cost.

It follows that, factors that determine profit also determine FDI, hence,

\[
FDI_i = f(P, Q, TC) \tag{3.3}
\]

Substituting (3.2) into (3.3)

\[
FDI_i = f(P, Q, IC, OC, HC) \tag{3.4}
\]
From equation (3.4), it is evident that several factors attract FDI to a certain country and include, in this case, economic factors (transport infrastructure, energy infrastructure, communication infrastructure, economic growth, and exchange rate), social factors (water and waste management infrastructure, wage) and political factors (security and openness to trade). This theoretical relationship can be expressed as:

\[ FDI_t = f(\text{economic factors}, \text{social factors}, \text{political factors}) \]  

(3.5)

3.5 Empirical Model

Using the theoretical model developed in equation (3.5), the FDI model is of the form:

\[ FDI = \beta_0 + \sum \sigma_j X_{ji} + \epsilon \]  

(3.6)

In equation (3.6), \( X_i \) represents Kenya’s FDI determinants and in this case, as presented in equation (3.5), they are economic, social and political factors.

Including specific factors that determine FDI in Kenya, the econometric model is of the form:

\[ FDI_t = f(TI_t, EI_t, CI_t, WWI_t, EG_t, ER_t, W_t, SE, W) \]  

(3.7)

Where, \( FDI = \) Foreign Direct Investment, \( TI = \) Transport Infrastructure Index, \( EI = \) Energy Infrastructure Index, \( CI = \) Communication Infrastructure Index, \( WWI = \) Water and Waste Infrastructure Index, \( EG = \) Economic Growth, \( ER = \) Exchange Rate, \( SE = \) Security and took a value of 1 if insecurity situations were reported and zero otherwise, \( W = \) Nominal average earnings per person and \( O = \) Openness to Trade, calculated as the ratio of Kenya’s sum of exports plus imports to GDP.
### 3.6 Definition and Measurement of Variables

#### Table 3.1: Variable Definition and Measurement

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Foreign Direct Investment (FDI)</strong></td>
<td>This is a measure of net inflows in Kshs. It was the dependent variable</td>
<td>Ratio</td>
</tr>
<tr>
<td><strong>Transport Infrastructure Index (TI)</strong></td>
<td>Transport infrastructure: Air transport (no. of passengers and freight), km of tarmacked roads as a percentage of total road network in Kenya, km of railway line, port infrastructure (container port traffic in numbers), and no. of passenger cars (per 1000 people).</td>
<td>Ratio</td>
</tr>
<tr>
<td><strong>Energy Infrastructure Index (EI)</strong></td>
<td>Energy infrastructure: electric power consumption per kWh; per capita consumption of kilogrammes of oil equivalent; energy generation in MW as a percentage of demand; renewable energy generation in MW as a percentage of total generation; percentage connection to the national grid.</td>
<td>Ratio</td>
</tr>
<tr>
<td><strong>Communication Infrastructure Index (CI)</strong></td>
<td>Communication infrastructure: fixed broadband internet subscribers per 1000 people; telephone lines per 1000 people, ICT goods exports (as a percentage of total goods exports), ICT goods imports (as a percentage of total goods imports), mobile cellular subscriptions (per 100 people).</td>
<td>Ratio</td>
</tr>
<tr>
<td><strong>Water and Waste Management Infrastructure Index (WWI)</strong></td>
<td>Water and waste management infrastructure: km of sewer lines as a percentage of urban population; water availability measured in M$^3$ as a percentage of demand in M$^3$; improved water source in urban areas (% of urban population with access).</td>
<td>Ratio</td>
</tr>
<tr>
<td><strong>Economic Growth (EG)</strong></td>
<td>The level of economic growth expressed as a percentage</td>
<td>Ratio</td>
</tr>
<tr>
<td><strong>Exchange Rate (ER)</strong></td>
<td>Kenya’s official exchange rate against the US dollar</td>
<td>Ratio</td>
</tr>
<tr>
<td><strong>Wage (W)</strong></td>
<td>Nominal average earnings per person in Kenya shillings</td>
<td>Ratio</td>
</tr>
<tr>
<td><strong>Security (SE)</strong></td>
<td>This was a dummy variable. It proxies security situation in the country since 1980 as follows. The coup of 1982; tribal clashes in</td>
<td>Nominal</td>
</tr>
</tbody>
</table>
Infrastructure comprises of many sub-indicators and thus, in this study, selected sub-indicators were used to construct four (4) infrastructure indices using Principal Component Analysis (PCA). The index was defined as;

\[ II_i = W_1X_{i1} + W_2X_{i2} + \ldots + W_nX_{ijn} \tag{3.8} \]

Where, \( II_i \) = Infrastructure Index for the \( i^{th} \) category (i.e. TI, EI, CI and WWI) and \( W_i \) is the weight of the \( j^{th} \) indicator.

### 3.7 Data Type and Sources

The study used annual secondary data from various sources, spanning 1970 to 2013. It was sourced from several websites and include that of Central Bank of Kenya, World Bank and UNCTAD. Other sources included government statistical abstracts (various) and economic survey (various).

### 3.8 Data Cleaning and Refinement

To avoid errors in the analysis, the data was cleaned and refined. Several diagnostics (linearity test, test for influential elements, test for normality,
homoscedasticity) were done prior to actual analysis to avoid admission of spurious results. Data completeness was ensured.

### 3.9 Correlation Analysis

Pair-wise correlation analysis were done for the independent variables. The correlation coefficient was used as a measure of the strength and the direction of a linear relationship between a pair of variables. The coefficient ranges from -1 to 1, and if close to one (1), the relationship between the pair is strong, and vice versa. When two independent variables are highly correlated, then model coefficients cannot be estimated with precision (Gujarati, 1999).

### 3.10 Stationarity Analysis

To avoid admission of spurious results, the data was tested to ensure there is no trend or seasonality in the data. The unit root test was done using Augmented Dickey Fuller (ADF) test. The tests were done at levels and differences to determine the order of integration. According to Gujarati (1999), ADF test assumes that the error terms are independently and identically distributed.

The ADF involves the estimation of the following equation;

\[
\Delta Y_t = \alpha + \beta T + \phi Y_{t-1} + \mu_t
\]

Whose hypotheses are;

\[H_0: \phi = 0 \text{ (unit root exists)}\]

\[H_1: \phi \neq 0\]
If a variable has unit roots, they were differenced until none exists, hence determining the order of integration.

3.11 Cointegration Analysis

Long-term relationship between the variables was tested using the Johansen Maximum Likelihood Cointegration test, given the multivariate nature of the model. Prior to this, the model lag length was determined using Schwartz-Bayesian Information Criterion, as the Johansen Maximum Likelihood method is sensitive to the number of lags. With cointegration present then, an Error Correction Mechanism was used to determine the speed and direction of adjustment to shocks.

3.12 Data Analysis

To determine the effects of transport, energy, communication, water and waste management infrastructure development on FDI inflows in Kenya, multiple regression analysis was done, through estimation of 3.7. Prior to this, selected sub-indicators were used to construct the four (4) infrastructure indices, using 3.8. It was expected that coefficients resulting from regressing explanatory variables against the dependent variable would explain how FDI responds to changes in the explanatory variable. After estimation, model specification tests (goodness of fit and test for omitted variables) were done. The results were tabulated for ease of comprehension.
CHAPTER FOUR

EMPIRICAL RESULTS AND DISCUSSION

4.1 Introduction

This Chapter presents the results from the analysis. The section presents the lag length selection procedure, stationarity test, cointegration test, and both short and long run regression results. An explanation is presented for each section.

4.2 Time Series Properties

4.2.1 Lag Length Determination

The model lag length was determined using Schwartz-Bayesian Information Criterion (SBIC), as the Johansen Maximum Likelihood method for testing for cointegration is sensitive to the number of lags. In this case, one lag was selected for the model as shown in table A6 in the appendix. The lag length with the lowest SBIC was selected.

4.2.2 Unit Root Test Results

To avoid admission of spurious results, the data was tested to ensure there was no trend or seasonality. The test was done using Augmented Dickey Fuller (ADF) test. The tests was done at levels and differences to determine the order of integration. The unit root test results are presented in table 4.1.
Table 4.1: Stationarity Test Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Test Statistic</th>
<th>p-value</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>log foreign direct investment</td>
<td>-3.896</td>
<td>0.0021</td>
<td>Stationary</td>
</tr>
<tr>
<td>log transport infrastructure</td>
<td>-0.316</td>
<td>0.9232</td>
<td>Not Stationary</td>
</tr>
<tr>
<td>1st Difference log transport infrastructure</td>
<td>-8.088</td>
<td>0.0000</td>
<td>Stationary</td>
</tr>
<tr>
<td>log energy infrastructure</td>
<td>-2.448</td>
<td>0.1286</td>
<td>Not Stationary</td>
</tr>
<tr>
<td>1st Difference log energy infrastructure</td>
<td>-6.692</td>
<td>0.0000</td>
<td>Stationary</td>
</tr>
<tr>
<td>log communication infrastructure</td>
<td>-0.577</td>
<td>0.8762</td>
<td>Not Stationary</td>
</tr>
<tr>
<td>1st Difference log communication infrastructure</td>
<td>-6.994</td>
<td>0.0000</td>
<td>Stationary</td>
</tr>
<tr>
<td>log water and waste infrastructure</td>
<td>0.713</td>
<td>0.9901</td>
<td>Not Stationary</td>
</tr>
<tr>
<td>1st Difference log water and waste infrastructure</td>
<td>-6.184</td>
<td>0.0000</td>
<td>Stationary</td>
</tr>
<tr>
<td>log Openness</td>
<td>-3.479</td>
<td>0.0086</td>
<td>Stationary</td>
</tr>
<tr>
<td>log exchange rate</td>
<td>-0.712</td>
<td>0.8436</td>
<td>Not Stationary</td>
</tr>
<tr>
<td>1st Difference log exchange rate</td>
<td>-5.037</td>
<td>0.0000</td>
<td>Stationary</td>
</tr>
<tr>
<td>log Wage</td>
<td>-0.443</td>
<td>0.9026</td>
<td>Not Stationary</td>
</tr>
<tr>
<td>1st Difference log Wage</td>
<td>-5.321</td>
<td>0.0000</td>
<td>Stationary</td>
</tr>
<tr>
<td>log economic growth</td>
<td>-4.602</td>
<td>0.0001</td>
<td>Stationary</td>
</tr>
</tbody>
</table>

Most of the variables, log of transport infrastructure, log of communication infrastructure, log of energy infrastructure, log of water and waste infrastructure, log of nominal wage and log of exchange rate were found to be integrated of first order, I (1), while log of FDI, log of economic growth and log of openness were found to be integrated of order zero, I (0). This meant that, log of transport infrastructure, log of communication infrastructure, log of energy infrastructure, log of water and waste infrastructure, log of nominal wage and log of exchange rate were integrated of order zero, I (0).
rate were stationary at difference. The log of FDI, log of economic growth and log of openness were stationary at level, meaning that the null hypotheses for the presence of unit roots were rejected at 5 percent for these variables.

4.2.3 Cointegration Test

Having established that some of the variables in the study were I (0) and others I (1), it was important to establish the existence of long run relationship between the dependent and independent variables. Using the Johansen test for cointegration, the trace statistic was found to be smaller than the critical value at 5 percent level of significance, with a maximum rank of 4. This implied that cointegration was present and that there existed at least four (4) co-integrated equations, in either bi-directional or uni-directional relationship as shown in table A2 in the appendix. This meant that the dependent and independent variables move closely to achieve a long run equilibrium.

4.3 Correlation Analysis Results

Pair-wise correlation analysis was done for the independent variables, and the results are shown in table A5 in the appendix. The correlation coefficient was used as a measure of the strength and the direction of a linear relationship between a pair of variables. The coefficient ranges from -1 to 1, and if close to one (1), the relationship between the pair is strong, and vice versa. The results indicated that the log of Energy Infrastructure and the log of Transport Infrastructure, the log of Water and Waste Infrastructure and the log of Exchange Rate have strong negative
relationships. The log of Transport Infrastructure and the log of Communication Infrastructure had a strong positive relationship, while the log of Communication Infrastructure had a strong negative relationship with the log of Exchange Rate. However, a Durbin-Watson (DW) statistic of 2.46 lies in the indecision quadrant (is closer to 2 and far from the extreme values, 0 and 4), hence, the variables were considered as having no serial correlation problem.

4.4 Diagnostic Test Results

Table 4.2 shows a summary of the diagnostic tests conducted. These include normality tests, test for omitted variables, model specification, serial correlation, model fit and test for homoscedasticity. Several diagnostic tests were performed to ensure soundness of the results as shown in the following table.

<table>
<thead>
<tr>
<th>Test</th>
<th>Description</th>
<th>t-statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jarque-Bera</td>
<td>For checking normality</td>
<td>0.89</td>
<td>0.641</td>
</tr>
<tr>
<td>Ramsey RESET Test</td>
<td>Test for omitted variables</td>
<td>0.58</td>
<td>0.632</td>
</tr>
<tr>
<td>Durbin-Watson Test</td>
<td>Test for serial correlation (if lies close to 0 and 4, then presence of collinearity)</td>
<td>2.46</td>
<td>-</td>
</tr>
<tr>
<td>Link Test</td>
<td>Test for Model fit</td>
<td>.067</td>
<td>0.454</td>
</tr>
<tr>
<td>White's Test</td>
<td>Test for homoscedasticity</td>
<td>44</td>
<td>0.429</td>
</tr>
</tbody>
</table>

As the study model was multiple regression equation, the error term was expected to be normally distributed, with a zero mean and constant variance. This test was done by predicting residuals and running a density and normal plots as shown in
figure A1 and figure A2 in the appendix. The plot showed that the error terms were not normally distributed before transformation, but were after the data was transformed. A Shapiro-Wilk test for normal data and Jarque-Bera Normality test (as shown in table A8 in the appendix) supports the result. Hence, the assumption that the residuals followed a normal distribution could not be rejected at 5 percent level of significance.

Further, using the White's test, the error term was found to be homoscedastic with a calculated Chi-square (43) value of 44.00 with probability 0.4290, implying that the null hypothesis of constant variance could not be rejected at 5 percent level of significance, as the probability was greater than 0.05 as shown in table A9 in the appendix. Again, a Durbin-Watson (DW) statistic of 2.46 lies in the indecision quadrant (is closer to 2 and far from the extreme values, 0 and 4), hence, the variables were considered as having no serial correlation problem.

The data was also tested for linearity using a graph matrix. The graph matrix showed that the independent variables were not in linear relationship before transformation, but were after the data was transformed.

Model specification tests were done using the Ramsey RESET test and the null hypothesis was that the model had no omitted variables. The test results showed that the model had no omitted variables \[F (3, 32) =0.70, p>0.05\)], while a test of model specification showed that the model fitted well (\(p =0.449\)). Hence, the null hypotheses that the model had no omitted variables and fitted well could not be
rejected at 5 percent level of significance. A CUSUM test, as shown in figure A4 and A5 in the appendix, shows that parameter constancy in the model is maintained for entire study period. This supports the model stability test as shown in figure A3 in the appendix.

4.5 Regression Results

The following table contains the multiple regression results from a model with the log of FDI as the dependent variable, and log of transport infrastructure, log of energy infrastructure, log of communication infrastructure, log of water and waste infrastructure, log of trade openness, log of exchange rate, log of economic growth, log of annual nominal wage and security, as explanatory variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>t-statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>2416.455</td>
<td>0.41</td>
<td>0.686</td>
</tr>
<tr>
<td>log transport infrastructure</td>
<td>4.881**</td>
<td>4.26</td>
<td>0.000</td>
</tr>
<tr>
<td>log energy infrastructure</td>
<td>1.524</td>
<td>1.25</td>
<td>0.213</td>
</tr>
<tr>
<td>log communication infrastructure</td>
<td>1.127**</td>
<td>9.77</td>
<td>0.000</td>
</tr>
<tr>
<td>log water and waste infrastructure</td>
<td>0.605**</td>
<td>6.21</td>
<td>0.000</td>
</tr>
<tr>
<td>log exchange rate</td>
<td>0.602**</td>
<td>6.75</td>
<td>0.000</td>
</tr>
<tr>
<td>log economic growth</td>
<td>0.460**</td>
<td>2.80</td>
<td>0.005</td>
</tr>
<tr>
<td>log openness</td>
<td>0.624**</td>
<td>4.72</td>
<td>0.000</td>
</tr>
<tr>
<td>log wage</td>
<td>-0.131</td>
<td>-1.50</td>
<td>0.132</td>
</tr>
<tr>
<td>Security</td>
<td>-0.352</td>
<td>-0.93</td>
<td>0.353</td>
</tr>
</tbody>
</table>

R-squared = 0.5604, Adjusted R-squared = 0.4440, Root Mean Squared Error = 1.0713; *p < 0.05, **p < 0.01; F (9, 34) = 4.81, p = 0.004

The F-statistic (4.8) is statistically significant at 1 percent level of significance meaning that all the independent variables as a group, explain 56.04 percent of the total variations in FDI inflows (R² = 0.5604). An Adjusted R² of 0.4440 shows that
the number of variables is small compared to the number of cases (in this case, 9 variables each with 44 cases). The model has a better fit since its Root Mean Squared Error is 1.0713. The closer the Root Mean Squared Error to zero, the better the model. The model has a trend at 2416.455, meaning that in the absence of all the model variables, FDI inflows increase with a constant factor, equivalent to the trend as shown in table A7 in the appendix.

4.5.1 Effects of Transport Infrastructure Development on FDI Inflows

The coefficient of the log of transport infrastructure index was significant at 1 percent level of significance (p<0.01), meaning that transport infrastructure was important in attracting FDI. Consistent with theory, a percentage increase in transport infrastructure development index increases FDI inflows by 4.88 percent, making transport infrastructure very important in attracting FDI. This means that an increase in air transport (passengers and freight), more kilometres of tarmacked roads as a percentage of total road network, more kilometres of rail line, improvement in port infrastructure (container port traffic), and increase in passenger cars, are key determinants in attracting FDI to the country.

These findings are similar to those by Dumon (2014); Rehman et al. (2011); Cheng and Kwan (2000); Castrol et al. (2007); Kazembe and Namizinga (2007); Demirhan and Masca (2011) and Jordaan (2010). Interestingly, although in different regions, according to Castro et al. (2007), a percentage increase in paved roads causes a 1.7 percent growth in FDI in Argentina, and 4.88 percent growth in
FDI inflows in Kenya, in this study. The positive causal relationship between the two (FDI inflows and transport infrastructure) was significant.

In response, the government of Kenya recognizes the importance of transport infrastructure and has prioritized the expansion and modernization of airports and airstrips, aimed at increasing air transport passengers and freight. According to the second MTP of the Kenya Vision 2030, plans are underway to relieve congestion in main urban areas, through the construction of mass rapid transit systems. Expansion of roads has also been prioritized, aiming at achieving a road network with 75-80 per cent of the classified roads in good condition and construction or rehabilitation of 5,500 km of roads.

Further, with the construction of the standard gauge railway line from Mombasa to Malaba, rail transport will be expected to handle 50 per cent of the freight cargo throughput, thus easing the pressure on roads, lowering the cost of doing business, and enhancing trade and regional integration in Eastern Africa. The new Lamu port and the LAPSSET corridor are to be implemented as part of upgrading the national transport framework.

4.5.2 Effects of Energy Infrastructure Development on FDI Inflows

The coefficient for the log of energy infrastructure index was not significant (p>0.05) at 5 percent level of significance, meaning that energy infrastructure was not important in attracting FDI. A percentage increase in energy infrastructure development index has no effect on FDI inflows in Kenya. This may be due to the
fact that the cost of energy, a key determinant, is not considered in the
determination of the Energy Infrastructure Index. This result differ significantly
from that by Castrol et al. (2007) and Kazembe and Namizinga (2007). Both
establish a positive and significant causal relationship between the two variables,
with Castro et al. establishing that a percentage increase in reliability of energy
supply increases FDI inflows by 1.2 percent, the increase being significant.

Nevertheless, in support of the sector, the government has put in place a strategy
aimed at modernizing energy infrastructure network, increasing the share of
energy generated from renewable energy sources, and providing energy that is
affordable and reliable to businesses and homes. This will ensure that energy
supply is adequate and efficient in order to support increased use in
manufacturing, agriculture, services, public facilities and households. The strategy
further aims at increasing installed capacity for electricity generation by 5,538

4.5.3 Effects of Communication Infrastructure Development on FDI Inflows

The coefficient of the log of communication infrastructure index was significant at
1 percent level of significance (p<0.01), meaning that communication
infrastructure was important in attracting FDI. Consistent with theory, a
percentage increase in communication infrastructure development index increases
FDI inflows by 1.13 percent. This means that increased broadband internet
connectivity, increased export of ICT goods and services, and increased mobile
cellular subscriptions are key determinants in attracting FDI to the country. This result resonates with that in a study to establish the impact of FDI in Malawi, by Kazembe and Namizinga (2007). The study found out that investors attach more weight on the need to communicate with clients at ease and operate efficiently under reliable utilities. Such include functional transport, energy and communication infrastructure and utilities.

In recognition of the importance of this sector, the government plans to continue upgrading ICT Infrastructure by expanding the Fibre Optic Networks to cover all parts of the country, establishing a universal service fund that finances the roll out of infrastructure and access of service to the unserved and underserved areas will be created, rolling out advanced networks to provide faster internet and increase bandwidth capacity, among other initiatives.

4.5.4 Effects of Water and Waste Infrastructure Development on FDI Inflows

The coefficient of the log of water and waste infrastructure index was significant at 1 percent level of significance (p<0.01), meaning that water and waste infrastructure was important in attracting FDI. A percentage increase in water and waste infrastructure development index increases FDI inflows by 0.61 percent. This means that improved water availability and access, and proper waste disposal in urban areas (% of urban population with access) are key determinants in attracting FDI to the country. According to Kazembe and Namizinga (2007), unreliable power and water supply and high cost of transport make it hard for
international investors to manufacture and produce efficiently. This result is consistent with that in Jordaan (2010); Asiedu (2002) and Ancharaz (2003).

The government of Kenya is in the process of constructing and/or rehabilitating water supply and solid waste management systems in all major urban centres by 2017. The country has also prioritized conservation and sustainable management of water catchment areas (Republic of Kenya, 2013).

4.5.5 Effects of Exchange Rate, Economic Growth, Trade Openness, Wage and Security on FDI Inflows

The coefficients for the log of exchange rate, log of economic growth and log of trade openness were significant (p<0.01), making exchange rate, economic growth and trade openness important determinants of FDI inflows to Kenya. A percentage increase in the log of exchange rate, log of economic growth and log of trade openness causes an increase of 0.602, 0.46 and 0.624 percentage points in FDI inflows respectively. A strong exchange rate means that exports are cheaper compared to imports, hence a positive balance of payment. The volumes of trade as a percentage of GDP determine how open an economy is. In this case, and as presented by Yasmin et al. (2003); Ang (2012); and Moosa (2012), trade openness is one of the key determinants of FDI inflows in most economies. Additionally, when the economy grows, the market for goods and services grows, stimulating savings, hence investments.
As expected, the coefficient of log nominal average earnings per person and security were negative, meaning that nominal average earnings and insecurity had a negative relationship with FDI inflows. A percentage increase in nominal wage has no effect on FDI inflows in Kenya, because the coefficient was not significant (p>0.05) as shown in table 4.3. However, according to theory, high costs of labour discourages investors. As presented in the theoretical framework, the decisions to invest in a certain country fundamentally depends on the return on investment. The return on investment, profit, is the total revenue less total cost. The total cost includes input costs (i.e. labour, raw materials), operation costs, and hidden cost. In this case, high labour costs reduces the rate of return.

The coefficient of security was negative and not significant (p>0.05). This implies that the presence of insecurity has a no effect on FDI inflows into Kenya. In this case, the coup of 1982; tribal clashes in 1992, 1997, 2002 and 2007/2008 and terrorist attacks in 1998, 2001, 2012 and 2013, represent years Kenya has experienced remarked insecurity. This finding was contrary to that of Nyaosi (2011) study which established that insecurity situations constrain the investment climate, thus scaring away investors.
CHAPTER FIVE

SUMMARY, CONCLUSION AND POLICY IMPLICATIONS

5.1 Introduction

This chapter presents a summary of the study. It further highlights key conclusions and policy implications based on the findings.

5.2 Summary

Empirical evidence has shown that quality infrastructure lowers the cost of doing business and improves the investment climate, thus attracting FDI. However, Kenya still has visible signs of infrastructure inadequacy and inefficiencies. These include congested roads, erratic power supply, long waiting lists for installation of telephone/power lines, shortages of clean and safe drinking water, and overloaded disposal system and pollution.

However, Kenya’s FDI inflows (as a percentage of GDP) have been increasing negligibly over the last five years despite the fact that, since the year 2000, there has been increased budgetary allocation to the physical infrastructure sector. Towards development, for example, resource allocation increased from Kshs. 88.6 billion in 2008/09 to Kshs. 161.9 billion in 2011/12 and then to Kshs. 200.3 billion in 2014/15, as evidenced from, Energy, Physical Infrastructure and ICT, Medium Term Expenditure Framework (MTEF) Sector Reports of Kenya.
This study, sought to determine the effects of transport, energy, communication, and water and waste infrastructure development on FDI inflows in Kenya. The study used annual secondary data, spanning 1970 to 2013, sourced from Central Bank of Kenya, World Bank and UNCTAD, among other sources. A multiple regression model with the log of FDI as the dependent variable, and log of transport infrastructure, log of energy infrastructure, log of communication infrastructure, log of water and waste infrastructure, log of trade openness, log of exchange rate, log of economic growth, log of annual nominal wage and security, as explanatory variables was fitted.

The findings indicated that transport infrastructure, communication infrastructure, and water and waste infrastructure were important in determining FDI inflows in Kenya, at 1 percent level of significance. The three had a positive relationship with FDI inflows. Energy infrastructure, on the other hand, had a positive relationship with FDI inflows, although the coefficient was not significant at 5 percent level of significance. The findings indicate that several economic, social and political factors influence FDI flows into Kenya.

Improved transport infrastructure, communication infrastructure, water and waste infrastructure, exchange rate, economic growth and trade openness increases FDI inflows. Further, even though not significant, improved energy supply increases FDI inflows while high labour costs and insecurity are detriments to FDI inflows in the country.
5.3 Conclusions

Transport infrastructure, communication infrastructure, and water and waste infrastructure are important determinants of FDI inflows into the country. Hence, increase in air transport (passengers and freight), more kilometres of tarmacked roads as a percentage of total road network, more kilometres of rail line, improvement in port infrastructure (container port traffic), increased broadband internet connectivity, increased export of ICT goods and services, and increased mobile cellular subscriptions, improved water availability and access, and proper waste disposal in urban areas (% of urban population with access), are key for the country to record increased FDI inflows.

5.4 Policy Implications

On transport infrastructure, the government should modernize ports and airstrips, tarmac more kilometres of roads, construct more kilometres of rail line, and improve port infrastructure to increase container port traffic. This is because the coefficient of the log of transport infrastructure index was found to be significant at 1 percent level of significance, meaning that transport infrastructure was important in attracting FDI inflows.

On communication infrastructure, the government should increase broadband internet connectivity, expand technical training institutes and harness innovative ideas for increased export of ICT goods and services. The regression results showed that the coefficient of the log of communication infrastructure index was
significant at 1 percent level of significance, meaning that communication infrastructure was important in attracting FDI inflows.

The government should construct and rehabilitate water and waste management systems. The existing water and waste systems have been in existence for long and cannot cater for increased rural-urban migration and increased population. The coefficient of the log of water and waste infrastructure was found to be significant at 1 percent level of significance, meaning that water and waste infrastructure was important in attracting FDI inflows.

The government should strengthen the Public Private Partnerships (PPPs) framework for more private sector participation in infrastructure development. Lessons from global PPPs experiences show that, they have succeeded in cases where there has been a detailed policy for their implementation, proper planning, project development, full support by government, proactive public communication for sustainability, transparent bidding process (zero tolerance to corruption), defined sources of revenue, and proper allocation of risk and adequate protection for lenders (Ehlers, 2014). Elaborate mechanisms such as Build Own Operate and Transfer (BOOT), Build Operate and Transfer (BOT) or concessioning for fast implementation of infrastructure projects is in order.

The government should seek innovative financing models for infrastructure development such as, upscaling the use bonds and the pension fund to finance infrastructure development. China, for example, has relied on infrastructure bonds
to finance development of mega infrastructure projects, while most Nordic Countries, and Australia have relied on their pension fund for infrastructure development (Ehlers, 2014 and OECD, 2014).

The government should formulate an Infrastructure Investment Policy. This policy should encompass investment strategies under each sub-sector of the infrastructure sector. Key among the policy components should be a resource mobilization strategy.

To raise more revenue for infrastructural development, the government should strengthen tax collection mechanisms, sealing loopholes for tax evasion, and ensuring more resources are directed towards development vote as opposed to the recurrent vote.

The government should work towards improving the investment climate as openness, coupled with ease of doing business, was found to be a key requisite to investments. Under this, the government should strengthen institutional infrastructures and governance, as they play a critical role in attracting foreign investments.

Economic growth and a strong currency are key determinants of FDI inflows, hence, macro-economic stability should be sought. The Central Bank of Kenya should strive to retain inflation and interest rates as low as possible, and a strong
currency. At all times, a strong macro-economic environment should be maintained.

5.5 Areas for Further Research

Having established that energy infrastructure development increases FDI inflows by 1.52 percentage points (although the change is not significant (p>0.05)), the argument could be that cost of energy, a key determinant, is not considered in the determination of the Energy Infrastructure Index. Hence, a future research taking into consideration the cost of energy is in order.

The success of some countries in attracting FDI as compared to others, is also an important point to consider when conducting future research.
REFERENCES


### APPENDICES

**Appendix I: Tables**

**Table A1: Raw Data**

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<td>EI</td>
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<td>CI</td>
<td>WWI</td>
<td>W</td>
<td>O</td>
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<td>5.74</td>
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### Table A2: Johansen Test for Cointegration Results

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<td>maximum rank</td>
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<tr>
<td>8</td>
<td>106</td>
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<tr>
<td>9</td>
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<td>271.31146</td>
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### Table A3: Long Term Regression Results

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<th>P&gt;chi2</th>
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<tr>
<td>_cel</td>
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<td>179.7395</td>
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</tbody>
</table>

Identification: beta is exactly identified

Johansen normalization restriction imposed

| beta     | Coef. | Std. Err. | z    | p>|z| | [95% Conf. Interval] |
|----------|-------|-----------|------|----|---------------------|
| _cel     | lnFDI | 4.881021  | 1.14597 | 4.26  | 0.000 | 2.634962  | 7.12708 |
|         | lnTI  | 1.524857  | 1.224688 | 1.25  | 0.213 | -0.8754864 | 3.925201 |
|         | lnCI  | 1.126636  | 0.513743 | 2.21  | 0.023 | 0.128374  | 2.144998 |
|         | lnER  | 0.6019674 | 0.0974433 | 0.65  | 0.516 | -0.271483 | 0.475414 |
|         | lnEG  | 0.460483  | 0.0769819 | 6.01  | 0.000 | 0.313482  | 0.607483 |
|         | lnD   | 0.6238902 | 0.1321409 | 0.47  | 0.635 | -0.266743 | 0.514026 |
|         | lnw   | -0.1310683 | 0.0871241 | -1.50 | 0.132 | -0.301828 | 0.0396918 |
| security| _cons | 2416.455 | -0.9958 | -0.03  | 0.977 | -1.094316 | 3.905155 |

### Table A4: Model Specification

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<td>Ramsey RESET test using powers of the fitted values of lnFDI_NEW</td>
</tr>
<tr>
<td>HO: model has no omitted variables</td>
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<tr>
<td>F(3, 31) = 0.70</td>
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<tr>
<td>Prob &gt; F = 0.5569</td>
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</table>

<table>
<thead>
<tr>
<th>. linktest</th>
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</thead>
<tbody>
<tr>
<td>Source</td>
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<tr>
<td>--------</td>
</tr>
<tr>
<td>Model</td>
</tr>
<tr>
<td>Residual</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

| lnFDI_NEW | Coef. | Std. Err. | t | P>|t| | [95% Conf. Interval] |
|-----------|------|-----------|---|----|---------------------|
| _hat     | 0.5280228 | 63.30765 | 0.83  | 0.409 | -0.750511 | 1.806547 |
| _hatsq   | 0.0674352 | 0.0882979 | 0.76  | 0.449 | -0.1108861 | 0.2457505 |
| _cons    | 0.7488775 | 1.093605 | 0.68  | 0.498 | -1.146343 | 2.641498 |
### Table A5: Correlation Analysis

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<th>lnEI</th>
<th>lnCI</th>
<th>lnWWI</th>
<th>lnER</th>
<th>lnEG</th>
<th>lnO</th>
<th>lnW</th>
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<tr>
<td>lnTI</td>
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<td>1.0000</td>
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<tr>
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<tr>
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<td>0.8492</td>
<td>-0.8282</td>
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<tr>
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<td>0.7141</td>
<td>-0.7621</td>
<td>1.0000</td>
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<tr>
<td>lnER</td>
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<tr>
<td>lnEG</td>
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<td>-0.1363</td>
<td>0.2294</td>
<td>-0.0851</td>
<td>-0.0861</td>
<td>0.2869</td>
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<tr>
<td>lnO</td>
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<td>-0.3840</td>
<td>0.2437</td>
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<td>-0.9052</td>
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### Table A6: Lag Length Selection

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<th>df</th>
<th>p</th>
<th>FPE</th>
<th>AIC</th>
<th>HQIC</th>
<th>SBIC</th>
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<td>3.09947</td>
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<td>-7.34005</td>
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<tr>
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<td>-5.90715</td>
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<tr>
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Endogenous: lnFDI lnTI lnEI lnCI lnWWI lnER lnEG lnO lnW
Exogenous: _cons

### Table A7: Regression Results

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<tr>
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<td>34</td>
<td>1.14778451</td>
<td>Prob &gt; F = 0.0004</td>
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<tr>
<td>Total</td>
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<td>43</td>
<td>2.06426948</td>
<td>R-squared = 0.5604</td>
</tr>
</tbody>
</table>

| beta | Coef. | Std. Err. | z     | P>|z| | [99% Conf. Interval] |
|------|-------|-----------|------|------|----------------------|
| lnFDI | 4.880841 | 1.145924 | 4.26 | 0.000 | 1.929137 | 7.832546 |
| lnTI  | 1.524806 | 1.22464 | 1.25 | 0.213 | -1.628067 | 4.679269 |
| lnEI  | 1.126592 | 1.153697 | 9.77 | 0.000 | 0.8294196 | 1.423765 |
| lnCI  | 0.6053614 | 0.0974393 | 6.21 | 0.000 | 0.3543744 | 0.8563484 |
| lnWWI | 0.6019428 | 0.0891268 | 6.75 | 0.000 | 0.3722745 | 0.8316111 |
| lnER  | 0.4604649 | 0.1643897 | 2.80 | 0.005 | 0.0370251 | 0.8839048 |
| lnEG  | 0.6238654 | 0.1321357 | 4.72 | 0.000 | 0.2835062 | 0.9642245 |
| lnW   | -0.1310624 | 0.0871206 | -1.50 | 0.132 | -0.3554702 | 0.0933454 |
| security | -0.3516925 | 0.3788776 | -0.93 | 0.353 | -1.327617 | 0.6242316 |
| _cons | 2416.359 | .     | .     | .     | .     | .     | .     |

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### Table A8: Jarque-Bera Normality Test

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<th>Variable</th>
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<th>Pr(Kurtosis)</th>
<th>adj chi2(2)</th>
<th>Prob&gt;chi2</th>
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</table>

**.hist r, norm**
(bin=6, start=5.0349727, width=.83368929)

### Table A9: Homoscedasticity Test

White's test for Ho: homoskedasticity against Ha: unrestricted heteroskedasticity

\[
\chi^2(43) = 44.00 \\
\text{Prob} > \chi^2 = 0.4290
\]

Cameron & Trivedi's decomposition of IM-test

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<th>df</th>
<th>p</th>
</tr>
</thead>
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<td>43</td>
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</tr>
<tr>
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<td><strong>Total</strong></td>
<td>52.95</td>
<td>53</td>
<td>0.4759</td>
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Appendix II: Figures

Figure A1: Residual Density Plot (Before Transformation)

Figure A2: Residual Density Plot (After Transformation)
Figure A3: Model Stability
Figure A4: CUSUM Test

Figure A5: CUSUM Squared Test