Discussion Paper Series

The Effect of Infrastructure on Foreign Direct Investment in Kenya

Esther Nyabiage Nyaosi

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The Effect of Infrastructure on Foreign Direct Investment in Kenya

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Kenya Institute for Public Policy
Research and Analysis

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Abstract

This study investigates the effect of infrastructure on foreign direct investment (FDI) in Kenya from 1980-2008. An index of infrastructure was constructed using sub-indicators from energy, transport and communication sectors, using principal component analysis (PCA) methodology. The model variables integrated at order (1), warranting the use of Ordinary Least Squares (OLS), and short run dynamic relationship was estimated using an error correction model (ECM). Results show that infrastructure index (lagged two years) coefficient is positive and statistically significant at 5 per cent level of significance. More specifically, a one unit increase in infrastructure index increases FDI by 0.32 per cent in the long run. In the short run, infrastructure index is positive but not statistically significant. Logarithm of exchange rate influences FDI positively in the long run, and it is also statistically significant at 5 per cent level of significance. The implication is that a stable exchange rate is necessary in attracting FDI. Overseas Development Assistance (ODA) has a negative coefficient at 1 per cent level, and it is inversely related to FDI in the long term. Results reveal that a unit increase in ODA, other variables under ceteris paribus, will reduce FDI by approximately 0.14 per cent in the long run. This result is rather puzzling, since for the case of Kenya, a direct relationship was anticipated. More investigation is recommended to ascertain the probable relationship between the two variable. Corruption impacts on FDI negatively. This study affirms that Kenya suffers from poor governance, as evidenced in low scores in the Transparency International Corruption Perception Index rating. Additionally, corruption constrains FDI, and therefore the government should not relent in the fight against it. Based on the findings, policies geared towards up-scaling infrastructure to attract more FDI are worth considering.

Abbreviations and Acronyms

ADF	Augmented Dick Fuller test for unit roots
CPI	Corruption Perception Index
ERS	Economic Recovery Strategy for Wealth and Employment Creation (2003-2007)
ESAF	Enhanced Structural Adjustment Facility
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GSM	Global System for Mobile Communication
IMF	International Monetary Fund
I-S	Import-Substitution
KER	Kenya Economic Report
KIA	Kenya Investment Authority
Kwh	Kilo watt hour
L	Natural Log
LIC	Low Income Countries
MNCs	Multinational Corporations
MNEs	Multinational Entreprises
MTP	Medium Term Plan (2008-2012)
MW	Mega Watts
NNI	Net National Income
OECD	Organization for Economic Co-operation and Development
ODA	Official Development Assistance and Official Aid
OLI	Ownership, Location and Internalization paradigm
PCA	Principal Component Analysis
SEZs	Special Economic Zones
SPV	Special Purpose Vehicle
SSA	Sub-Saharan Africa
TI	Transparency International
UNCTAD	United Nations Conference on Trade and Development
u.d	un-dated
WDI	World Development Indicators
WIR	World Investment Report

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1. Introduction

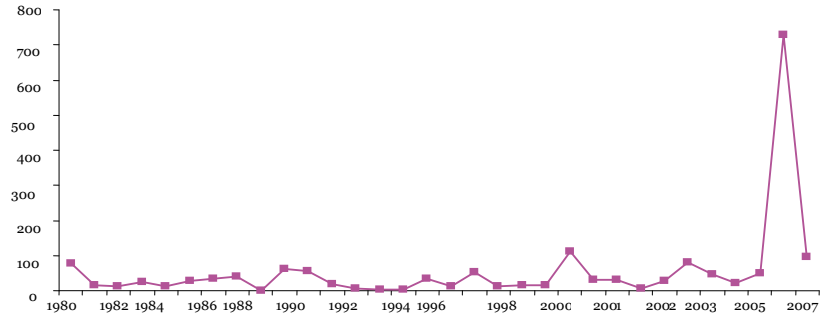
Poor infrastructure has been cited as a disincentive in attracting FDI to Kenya. Rising transport costs, erratic energy supplies and high tariffs have resulted in high production costs incurred by private firms, thus making their goods uncompetitive (Kenya Vision 2030 and United Nations Conference on Trade and Development (UNCTAD), 2004 and 2005). This has necessitated some foreign firms to close business in Kenya and relocate to other countries such as Egypt, Uganda, Tanzania and South Africa (UNCTAD, 2005).

The role of FDI in stimulating growth and development of an economy has been studied widely. FDI brings investible financial resources to host countries, provides new technologies and enhance the efficiency of existing technologies. It may facilitate access into export markets, thereby playing an important role in strengthening the export capabilities of domestic economies. It may enhance skills and management techniques and may provide cleaner technologies and modern environment management systems (Mwega, 2009b). Additionally, FDI may help to develop the host country's infrastructure. For instance, the auctioning of two mobile phone operators in 1999 and 2000 resulted in the rapid build-up of telecommunication infrastructure in Kenya (UNCTAD, 2004; 2005).

Kenya has received low FDI flows from the 1980s through the 1990s (Figure 1.1), and one of the most contributing factors cited is the poor state of infrastructure in the country. From Figure 1.1, it is evident that FDI inflows remained below US$ 100 million from 1980 to 1999, with a sharp increase in the years 2000 and 2007, with FDI inflows of US$ 111 million and US$ 728 million, respectively. This is a meager figure compared to Egypt, which recorded an FDI flow of USD10,043 million in 2006 and US$ 11,578 million in 2007 (World Investment Report - WRI, 2008). However, despite the decreased flows in FDI over the years, there has been a remarkable rise in FDI inflows to Kenya, much of it being noted in the manufacturing and services sectors such as energy, transport and communications (Mwega, 2009b).

Attracting FDI has become a policy concern of the government. This is due to the contribution of FDI to capital formation, which may help in reducing the financial gap currently experienced in the country. Evidence has shown that quality infrastructure lowers business costs and improves the investment climate, thus attracting FDI. FDI helps the

Figure 1.1: FDI inflows to Kenya from 1980-2008 (US$ million)



Source: The figure was constructed using data from UNCTAD website

country meet its development targets in line with the country's long term development agenda of the Kenya Vision 2030 and its Medium Term-Plan - MTP (2008-2012), as well as scale up projects geared towards realizing the Millennium Development Goals by 2015. This study seeks to investigate the effect of infrastructure index on FDI flows to Kenya, with a view to generating policy recommendations based on the study findings.

1.1 FDI Inflow Trends to South Africa, Botswana, Tanzania, Uganda, Egypt and Kenya

Kenya became a prime choice for foreign investors seeking to establish a presence in Eastern and Southern Africa in the 1970s, leading to a steady growth of Foreign Direct Investment (FDI) through the period. The country had a relatively high level of development, good infrastructure, market size, growth and FDI openness compared to other countries in the region that had relatively closed regimes, thus prompting Trans National Corporations (TNCs) choosing Kenya as their regional hub (UNCTAD, 2004). However, this was not the case in the 1980s (Figure 1.2). According to UNCTAD, the country started experiencing low FDI flows and other development indicators compared to other selected African countries (such as Egypt, Botswana, Uganda, and Tanzania) due to poor economic policies, poor growth performance, inconsistent efforts at structural reforms, growing problems of corruption and governance, deteriorating infrastructure and rising cost of public services.

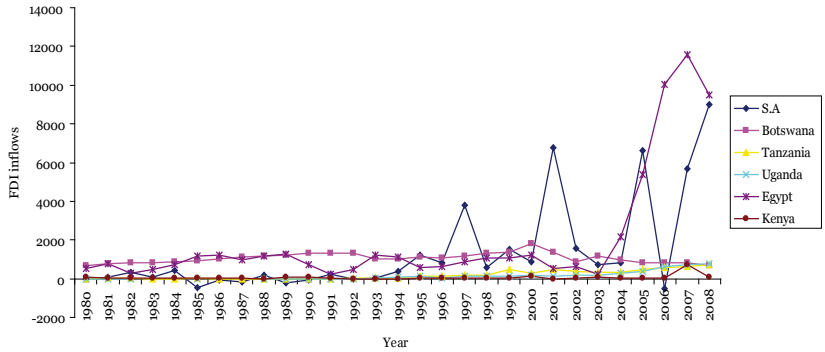
FDI inflows in 1996-2003 averaged US$ 39 million a year, a tiny amount compared to inflows to Tanzania and Uganda that surged to US$ 280 million and US$ 220 million, respectively, from negligible levels in the 1980s. Around this time, the average inflow to African countries was sixfold. Although developing countries as a whole attracted an annual average of US$ 41 of FDI per capita between 1996 and 2003, Kenya only drew an average inflows of US$ 1.3 per capita (Mwega, 2009b).

Despite the decline of FDI in the last two decades (Figure 1.1), it is evident that the country recorded an improved FDI inflows in the years 2001 to 2007. For instance, Mwega (2009b) argues that the performance of FDI improved recently and averaged US$ 123.6 million in 2000-2007. Net FDI increased to an average of 0.70 per cent of GDP and to an average of 3.2 per cent of gross investment between 2000 and 2007 (Table 1.1).

The upsurge of FDI inflows was noted in sectors such as telecommunications, electricity and water services. For instance, the 2000 upsurge owed to new investments by mobile phone companies (involving mergers and acquisition of US$ 3 million) and accelerated offshore borrowing by private companies to finance electricity generated activities, which became necessary as a result of the drought that prevailed that year. On the other hand, the 2007 jump in FDI owed to the coming in of a new mobile telephone operator (France Telcom) and the privatization of Telkom Kenya (WIR, 2008; and Mwega, 2009b).

Therefore, there is need to reverse the situation to make Kenya a prime FDI destination, a position it lost in the 1980s. This is possible

Figure 1.2: FDI inflows in US$ to South Africa, Botswana, Tanzania, Uganda, Egypt and Kenya (1980-2008)



Source: The figure was constructed using FDI data from UNCTAD website

Table 1.1: Net FDI flows to Kenya, 2000-2007

Year	Net FDI (US$ mn)	FDI stock (US$ mn)	Net FDI/ GDP (%)	Net FDI/Gross investment (%)	FDI Stock/ GDP (%)
2000	111	931	1.05	6.84	8.82
2001	5	937	0.04	0.31	8.34
2002	21	964	0.17	1.03	7.66
2003	80	1046	0.58	3.27	7.54
2004	42	1092	0.29	1.50	7.61
2005	11	1113	0.07	0.33	6.86
2006	27	1164	0.15	0.64	6.47
2007	728	1892	3.25	11.85	8.87
Average	123.6	1142.4	0.70	3.23	7.77

Source: UNCTAD FDI database, adopted from Mwega (2009b)

through development and provision of quality infrastructure and improvement of other socio-political and economic development indicators in Kenya.

1.2 Problem Statement

Kenya was a prime choice of FDI destination in the East African region from the 1970s. However, in the last two decades, the country lost its glory to other countries (Mwega, 2009b). Poor infrastructure, macroeconomic policies and governance issues are some of the reasons that eroded the confidence of investors. Poor infrastructure contributes to high production costs, thereby making investors' goods and services uncompetitive in the market. To regain investor confidence, the government has been implementing some reforms and has increased financial resources to the development of sub-sector infrastructure. For instance, there has been increased budgetary resource allocation to infrastructure projects since the year 2003 towards development, rehabilitation and maintenance of various infrastructure facilities. In the development expenditure, for example, resource allocation increased from Ksh 13.8 billion in 2000/03 to Ksh 53.5 billion in 2006/07, and Ksh 57.3 billion in 2007/08. Consequently, some improvement has been recorded in the infrastructure sub-sectors such as in telecommunications, energy and transport.

Despite the increased budgetary resource allocation towards the development and improvement of infrastructure, the country has not attracted more FDI flows except for year 2007, when it received one of

the highest FDI flows of US$ 728 million in three decades. The increase in the year 2007 can be attributed to the privatization of Telkom Kenya. Although developing countries as a whole attracted an annual average of US$ 41 of FDI per capita in 1996-2003, Kenya only drew average inflows of US$ 1.3 per capita (Mwega, 2009b). This is a negligible percentage, which poses the question: what other factors attract FDI?

This study aims to investigate the effect of infrastructure on FDI. Recommendations will be advanced based on study findings.

1.3 Research Questions

This study answers the following questions:

(i) Is inadequate infrastructure a constraint to FDI?; and,

(ii) How can infrastructure attract FDI?

1.4 Objectives of the Study

The objective of this study is to examine the link between infrastructure and FDI. Specifically, the research aims at:

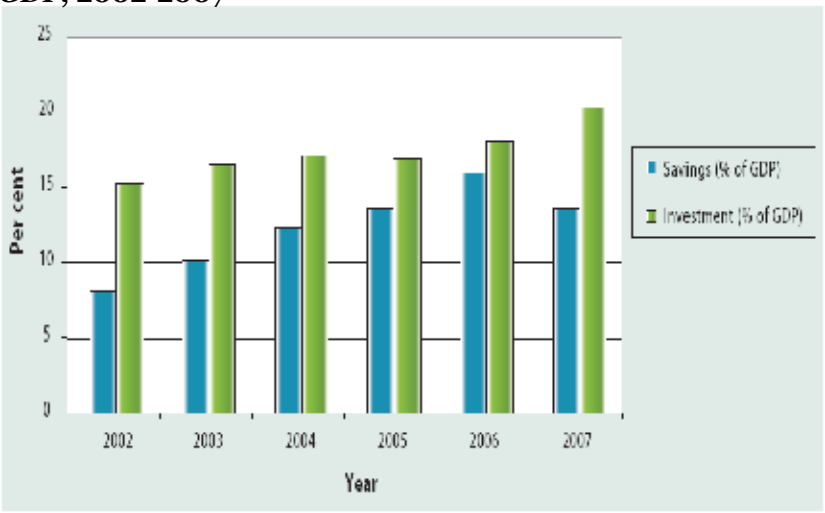
(i) Assessing the factors that attract FDI; and,

(ii) Suggesting policy recommendations based on study findings.

1.5 Motivation of the Study

Kenya aspires to attain the status of a middle level income country by the year 2030. To realize this objective, it has to mobilize a lot financial resources to meet the development process (KIPPRA, 2009). However, private and domestic investments in Kenya have suffered in the past decades from a combination of poor investment climate, high external indebtedness, and low domestic savings. These factors and policies have generated a sharp contraction in public investment in infrastructure and social services, reduced the availability of funds for private investment, and increased their cost (UNCTAD, 2005). In 2002, gross investment rate was 13.1 per cent of GDP, while gross domestic savings was 10.4 per cent of GDP. The country's savings rate increased from 10.1 per cent in 2003 to about 16.0 per cent in 2006. The figure is estimated to have declined

Figure 1.3: Kenya's savings and investment as a percentage of GDP, 2002-2007



Source: Government of Kenya (2007;2008); Economic Survey, adopted from KIPPRA (2009)

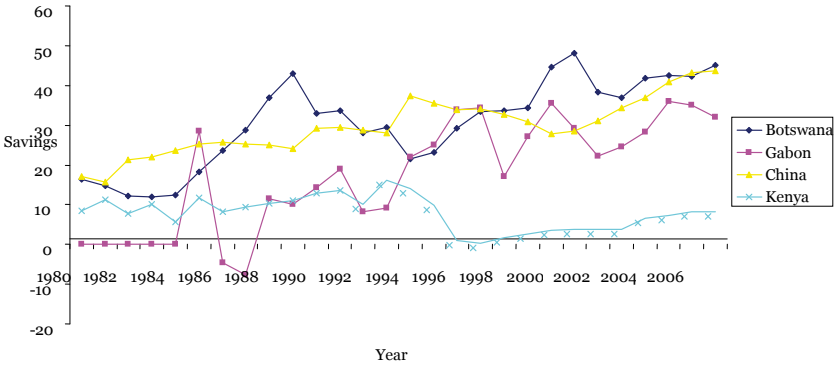
to 13.6 in 2007 (Figure 1.3). The country requires a savings rate of about 25-28 per cent to propel the country into the 10 per cent growth path (KIPPRA, 2009).

Kenya's savings compare unfavourably with some selected countries of the developing world (Figure 1.4). In Sub-Sahara Africa, Botswana's savings are higher than Kenya's, so is that of China in the high income category. China's high savings have continued to account for the largest share of the increase in investment since the 1990s. They accounted for about three quarters of the total gross capital formation in 2005, and half of five percentage points of GDP increase in investment since the 1990s (KIPPRA, 2009). So what drives China's high investments? Barnett and Brooks (2006) argue that among the drivers of investment in China is good infrastructure and liquidity (availability of finance).

Kenya's investment as a percentage of GDP is minuscule (Figure 1.3). The trend shows that investment rose over time in 2002 to 2007, but still more is required to stimulate the growth of the economy.

Good and quality infrastructure has been identified in Vision 2030 to improve investment climate, thus raising the country's global competitiveness. This is through reduced production and transport costs of goods and services. Regional and international trade integration is achieved in countries with well-connected roads,

Figure 1.4: Adjusted savings as a percentage of net national income for Botswana, China, Gabon and Kenya



Source: World Bank, World Development Indicators (2007; 2009)

railways, ports and communication systems. A country connected with quality infrastructure attracts FDI, which boosts investment in infrastructural facilities of the home country.

Based on the foregoing arguments, it is evident that Kenya requires sufficient finances to meet its development targets. Therefore, FDI can generate additional capital and investment to help close the savings gap. Therefore, there is need for a study on the link between infrastructure and FDI, with a view to generating recommendations on possible policy interventions based on study findings.

2. Background Information

2.1 Kenya's Infrastructure Situation and Competitiveness

Infrastructure is defined as public utilities (power, telecommunications, piped water supply, sanitation and sewerage, solid waste collection and disposal and piped gas); public works (roads, and major dam and canal works for irrigation and drainage); and, other transport sectors (urban and inter-urban railways, urban transport, ports and water ways and airports) (World Bank, 1994). This study focuses on infrastructure that comprises transport, energy and telecommunication sectors. It uses proxies from the three sectors and constructs an infrastructure index, which is explained in more detail in the methodology section.

In Kenya, various studies have established that the country's infrastructure fabric has been in a poor state in the last two decades. This led to increased production and transport costs, and reduced the country's competitiveness. Factors that contributed to the deterioration of infrastructure include inadequate resource allocation for construction, maintenance and rehabilitation of the facilities, poor contractual work, rapid urbanization, high population growth and adverse weather conditions (Government of Kenya National Development Plan, 2002-2008: 76).

Due to the poor state of infrastructure, Kenya compares unfavourably with some selected countries on selected infrastructure indicators

Table 2.1: Kenya's infrastructure indicators compared with some selected countries of the world, 2009 and 2010

Indicators	Kenya	Sub-Saharan Africa	Low income countries	Latin America and the Caribbean
GNI per capita, Atlas method (current US$)	790	1,176	528	7,733
Access to electricity (% of population), 2009	16.1	32.5	23.0	93.4
Electric power consumption (kwh per capita), 2009	147	511	229	1,892
Improved water source (% of population with access	59	61	65	94
Improved sanitation facilities (% of population with access)	32	31	37	79
Total telephone subscribers per 100 inhabitants)	62	45	33	98

Source: World Bank, World Development Indicators (2012)

(Table 2.1). For instance, Kenya's percentage population that accesses electricity is 16.1 per cent, which is below that of low income countries at 23.0 per cent in the year 2009. In the same year, the electric power consumption (kwh per capita) in Kenya stood at 147, that of SSA, Latin America and the Caribbean countries were 511 and 1,892, respectively. Additionally, while the percentage of the population that has access to improved water source and sanitation facilities in 2010 is 59 and 32 per cent, respectively, for Kenya, it was 65 and 37 per cent, respectively, for low income countries (LICs) and 94 and 79 per cent, respectively, for Latin America and the Caribbean countries in the same year.

2.2 Government Funding of Infrastructure

After a long spell of low funding of infrastructural facilities, the government has made increased budgetary allocations for financing infrastructure (Table 2.2). For instance, actual expenditure on roads and public works was Ksh 2,362 million in the financial year 2002/03, which increased to Ksh 11,502 million in 2005/06 financial year. Transport budget also increased from Ksh 86 million to Ksh 5,864 million in 2002/03 and 2005/06, respectively. Energy also received increased budgetary allocation, from Ksh 5,517 million in 2002/03 to Ksh 7,820 in 2005/06.

The proposed budget allocations for development expenditure on infrastructure projects also depict an increasing trend. For instance, the total proposed resource allocation for roads and public works, transport and energy for the financial year 2006/07 was Ksh 43,065,914,796, which is a high of Ksh 58,797,815,575 in financial year 2009/2010 (Table 2.3).

Table 2.2: Actual development expenditure (Ksh Million) on infrastructure

Sub-sector	2002/03	2003/04	2004/05	2005/06
Roads and public works	2,362	3,018	4,824	11,502
Transport	86	147	536	5,864
Energy	5,517	5,507	5,913	7,820

Source: Government of Kenya, Ministry of Finance: Physical Infrastructure Sector Report, 2007-2010

Table 2.3: Proposed development resource allocation 2007/08/09/10 (Ksh) for infrastructure

Gross figures				
Sub-sector	**2006/07**	**2007/08**	**2008/09**	**2009/2010**
Roads and public works	32,690645,830	23,496, 310,793	28,266,061,884	34,286,733,065
Transport	1,935,500,000	5,013,200,640	6,060,880,370	7,315,457,889
Energy	8,439,768,966	11,783,967,274	14,176,112,631	17,195,624,621
Total	43,065,914,796	40,293,478,707	28,503,054,885	58,797,815,575

Source: Government of Kenya, Ministry of Finance: Physical Infrastructure Sector Report, 2007-2010

2.3 Funding of Infrastructure through the Infrastructure Bond

The Kenyan government rolled out a successful plan of mobilizing funds to finance infrastructure projects through the infrastructure bond. To that effect, Ksh 18.5 billion was mobilized through the Capital Markets Authority in 2009 to finance projects in energy, water, transport and telecommunication sub-sectors of the economy. Other countries such as South Africa, Malaysia, Botswana and Singapore have developed their infrastructure through issuance of infrastructure bonds.

2.4 Privatization of Infrastructure

Privatization means a transaction that results in a transfer, other than to a public entity of any of the following: (a) assets of a public entity including the shares in a state corporation; (b) operational control of assets of public entity; and, (c) operations previously performed by a public entity (Government of Kenya, 2005). It comprises three essential elements, namely: contractual agreement, substantial risk transfer, and outcome-based financial rewards. Private organization assumes the associated risk, and in return receives a fee according to determined performance criteria, which may be entirely from service tariffs or user charges, entirely from a ministry's budget, or a combination of both. An example of Private-Public Partnerships in Kenya is the privatization of Telkom Kenya. Privatization of Telkom has improved service delivery and revolutionized the telecommunication industry in Kenya. With the landing of the fibre optic cable in Kenya, more Kenyans will receive telecommunication services at competitive prices countrywide. Kenya will also enjoy competitive communication costs such as those of Egypt and South Africa, thus improving the investment climate for investors.

2.5 State of Kenya's Infrastructure, 1980-2008

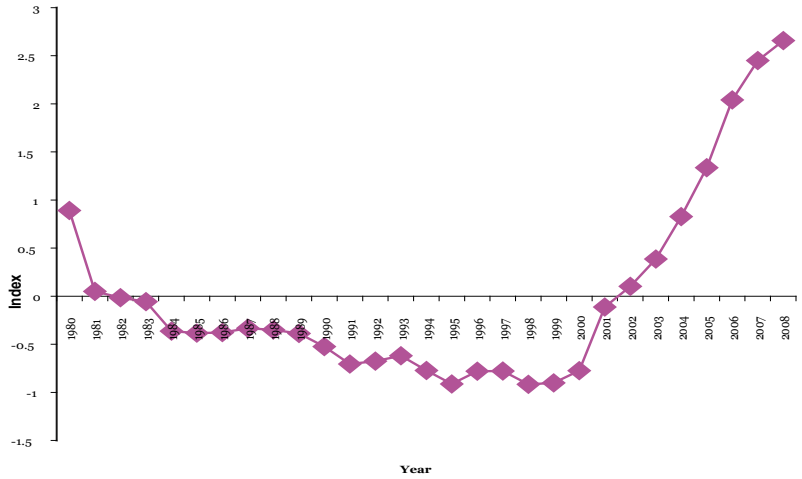
Figure 2.1 shows Kenya's infrastructure stock from 1980 to 2008. Before the 1980s, Kenya had a relatively high stock of infrastructure. The infrastructure stock performed below zero from around 1982 until 2001. After 2002, it started increasing steadily. This implies that Kenya's stock of infrastructure is improving over time. This can be attributed to increased budget allocations towards infrastructure development, and rehabilitation, maintenance and implementation of government policies such as privatization.

2.6 Kenya's Business Regulatory Process

2.6.1 Starting a business in Kenya

According to the World Bank's Doing Business 2010 Report, Kenya was ranked number 124 out of 183 economies in starting a business category. The top ten performing economies ranked ahead of Kenya include: New Zealand, Canada, Australia, Singapore, Georgia, Macedonia, Belarus, United States, Ireland and Mauritius, in that order. There are about 14 procedures to start a business in China, while in Kenya, there are 12. For Mauritius, Tanzania and Uganda, the number of procedures required are 6, 13 and 18, respectively, between 2004 and 2010. Additionally, the number of days required to start a business in China reduced from

Figure 2.1: Kenya's infrastructure index stock, 1980-2008



Source: Compiled by author using data from World Bank (2007; 2009) and Government of Kenya (various) Statistical Abstracts and Economic Surveys

48 days in 2004 to 37 days in 2010. For Kenya, Ghana and Mauritius, it reduced from 60 to 34, 85 to 33 and 46 to 6, respectively.

2.6.2 Registering property in Kenya

The World Bank Doing Business 2010 report further reveals that to register property in Kenya, the number of days required increased from 39 days in 2004 to 73 days in 2005, and reduced thereafter to 64 days. For China, the number of days was constant at 29 from 2004 through 2010. Those of Ghana reduced from 169 days in 2004 to 34 in 2010. For Mauritius, the days reduced from 210 in 2004 to only 26 in 2010.

2.6.3 Trading cross border

This aspect consists of three indicators, namely, number of all documents required to export/import goods, time necessary to comply with all procedures required to export/import goods, and the cost associated with all the procedures required to export/import goods. Singapore tops the 183 countries in cross border trading, followed by Hong Kong China, Estonia, Finland and Denmark. In Africa, Mauritius ranks best in the 19th position, while Egypt takes the 29th position. Ghana takes the 83rd and Tanzania 108th positions. Madagascar ranks ahead of Kenya at the 111th position. Uganda too ranks close to Kenya at 145th place. Kenya takes the 147th position, with Rwanda at 170th position. In Africa, Rwanda is among the top 10 best reformed countries in ease of doing business.

From the foregoing comparisons, it can be concluded that it takes longer periods to start business and register property in Kenya than in Mauritius and Ghana. Also, trading across borders is constrained by lengthy regulatory procedures, translating to a high cost of doing business. This was one of the concerns of the Kenya Private Sector Alliance (KEPSA) 5th Prime Minister's roundtable discussion in March 2010, which advocated for the achievement of meaningful and less burdensome business regulation.

3. Theoretical Literature

3.1 Infrastructure and Foreign Direct Investment

A number of theories have advanced reasons why firms choose to locate in certain geographic areas than in others. Markusen *et al.* (2005) discusses theories of foreign direct investment and arm's-length trade in firm-specific assets. The author argues that until the 1980s, FDI was just viewed as part of the theory of capital movements in factor-proportions. He reports huge empirical evidence which holds that most FDI is among high-income capital rich countries that led to new approaches to what Markusen is now calling off-shoring.

Mankiw (2003), applying the Solow growth model argues that private businesses invest in traditional types of capital such as bulldozers and steel plants and newer types of capital such as computers and robots. On the other hand, governments invest in various forms of public capital called infrastructure, such as roads, bridges and sewer systems. Mankiw further argues that policy makers trying to stimulate growth must confront the issue of what kind of capital the economy needs most. In other words, what kind of capital yields the highest marginal products?

Head and Mayers (2001) and Amiti and Wei (2005) as cited by Castro *et al.* (2007) discuss recent theoretical models of economic geography, which attempts to explain the spatial location of FDI. They assume that the decision of a Trans National Corporation (TNC) on which province to locate investment depends on a set of characteristics of the host province affecting firm's revenue or costs such as factor endowments, market size, income per capita, skilled labour and availability of public infrastructure, among others.

Turnovsky (1996 and 1999) and Ott and Soretz (2006) as quoted by Aliello *et al.* (2009) argue that other things equal, a change in infrastructure expenditure influences the cost faced by the firm in adjusting its current capital stock to the target level. They argue that this is a reasonable assumption, given that the adjustment costs depend not only on the firm's internal characteristics, but also on external factors such as provision of public infrastructure.

Udo and Obiora (2006) discuss explanations of multinational production based on neoclassical theories of capital movement and trade within the Hecksher-Ohlin framework. However, they criticize

these theories on the basis that they were founded on the assumption of existence of perfect factor and good markets, and were therefore unable to provide satisfactory explanation of the nature and pattern of FDI. In the absence of market imperfections, these theories presumed that FDI would not take place. Nevertheless, they argue that the presence of risks in investing abroad implies that there must be distinct advantages of locating in a particular host country.

The eclectic paradigm of Dunning (1988) provides a robust framework for analyzing and explaining the determinants of international production and how this varies between firms, industries and countries over time. Dunning provides a framework of three sets of advantages to analyze why and where MNEs would invest abroad. This is the famous ownership, location and internalization (OLI) paradigm (or eclectic paradigm). In this context, investment could be natural (resource)-seeking, market-seeking, efficiency-seeking or strategic asset-seeking.

The ownership advantages refer to firm-specific features sometimes called competitive or monopolistic advantages, which must be sufficient to compensate for the cost of setting up and operating a foreign value-adding operation, in addition to those faced by indigenous producers. Such features include brand, patents, market access, research and development, trademarks and superior technology, among others. These may be deficient in the host country. When foreign firms use such features in exploiting host country opportunities, they employ adverse selection in an imperfect market situation in fostering their activities. Consequently, due to information asymmetry and limitation of the features possessed by host country firms, competition with MNCs is difficult. The ownership specific advantages, being superior to home country firms, may make foreign investors to crowd out domestic investments.

The locational advantage is the second strand of the eclectic paradigm. It is concerned with the "where" of production. These include host country-specific characteristics that can influence MNCs to locate an economic activity in that country. It entails economic factors such as competitive transportation and communication costs, investment incentives, availability of comparatively cheap factors of production, policy issues such as tariff barriers, tax regimes, access to local and foreign markets, among others (Dunning, 1988; 1998).

The third factor is the internalization advantage, which explains 'why' a MNE would want to exploit its assets abroad by opening or acquiring a subsidiary, versus simply selling or licensing the rights to exploit those assets to a foreign firm. Udo and Obiora (2006) report that though this theory has been criticized for only listing the conditions necessary for FDI without explaining its phenomenon, it has widely contributed to international production theory.

3.2 Empirical Literature

3.2.1 Infrastructure and FDI

Panayides, Song and Nielson (2002) contend that the emergent reasons for locating in a particular area or city include the presence of good infrastructure in terms of transport and communication networks, as well as good port facilities that can offer opportunities for developing sea networks with other regions and countries. For instance, the companies mainly invest in the coastal areas of China and in cities such as Guangzhou, Shanghai, Tianjin, Dalian and Qingdao, compared to other parts of the country due to better infrastructure that supports transportation of cargo. They also have good ports with sufficient terminal facilities able to cater for the large and increasing volume of exports.

Infrastructure influences the investment decisions of firms. For instance, a study of the factors influencing the direction of US equity investments overseas found that infrastructure quality was a significant factor in determining the countries in which US firms invest (Loree and Guisinger, 1995).

Obwona and Egesa (2004) assert that efficient seeking investors have not been attracted to Uganda due to infrastructure constraints, skills level, as well as the land locked nature of the country. Mali and Mozambique in Africa made major strides in attracting FDI due to good infrastructure and the stock of human capital (Morisset, 2000).

Aliello, Iona and Leonida (2009) analyzed the impact of regional infrastructure on firm investment. They model how infrastructure expenditure in a region contributes to determining firm value and argue that the two main channels for the transmission of infrastructure effects on firm investment are those working through adjustment costs and the marginal profitability of capital. Their empirical results show that the core infrastructure affects the level of firm investment

positively and significantly via adjustment costs. They too found out that infrastructure affects firm investment via the components of profit; that is to say, through costs and revenue. More specifically, when variable costs interact with core infrastructure expenditure, the coefficient is positive and statistically significant, hence indicating that an increase in costs reduces the sensitivity of firm's investment to infrastructure.

3.2.2 Determinants of FDI

Many factors have been considered in literature as determinants of FDI. However, the selection of determinants is often *ad hoc*. The selection process is determined by the availability of data and the nature of relations studied (Gholami, Lee and Heshmati, 2005; and Koutsoyiannis, 1977).

The variables that have so far been used in FDI modeling are availability of quality infrastructure, particularly electricity, transportation, water and telecommunications. When developing countries compete for FDI, the country that is best prepared to address infrastructure bottlenecks will secure a greater amount of FDI (Sahoo, 2006). Previous studies have used several proxies for infrastructure. For instance, telephone lines per 1,000 people have been used by Kinoshta (2002), Asieudu (2002), and Ngugi and Nyang'oro (2005). Khadaroo and Seetanah (2008) have used transportation infrastructure, while others have used telecommunication infrastructure, for instance Lydons and Williams (2005). Other studies have used infrastructure index as proxy for infrastructure (Loree and Guisinger, 1995; Calderoń, 2009; Calderoń, Moral-Benito and Serven, 2009; Sahoo, 2006; and Kumar, 2008). Use of single infrastructure indicators such as telephone line per 1,000 people posed some challenges in effectively capturing the overall effect of infrastructure on FDI, hence the need to use an infrastructure index. This study uses infrastructure index as a proxy for infrastructure.

MNEs are often attracted to developing countries by the abundance of their cheap labour. Urata (1997) contends that low wages, low inflation and undervalued exchange rates are important determinants of cost-saving FDI. Low labour costs can attract investment in labour intensive activities, and thus stimulate vertical FDI. Khadaroo and Seetanah (2008) and Fung *et al.* (2002) have used nominal wage as a proxy for labour cost. This study will use annual average wage in the private sector as a proxy for labour cost. A positive relationship is postulated.

Campos and Kinoshita (2008) aver that market size is a determinant of the geographical distribution of FDI across emerging economies. Khadaroo and Seetanah (2008) argue that for foreign investors, the size of the market, which also represents the host country's economic conditions and the potential demand for their output are an important element in the FDI decision-making. Other empirical studies that have used the variable include Wheeler and Mody, 1992; Loree and Guisinger, 1995; and Asieudu, 2002 among others.

Sustainability of low inflation rates tells investors that the host countries are committed to prudent macroeconomic stability, hence prospects for further growth (Kinoshita and Campos, 2002). They use an average rate of inflation as a proxy for macroeconomic stability. Other studies that have used inflation to proxy for macroeconomic stability include Ngugi and Nyang'oro (2005), Opolot, Mutenyo and Kario (2008), and Urata (1997), among others.

Exchange rate volatility has been empirically proven as a disincentive to foreign investment inflows. Kirkpatrick, Parker and Zhang (2006) in investigating FDI in infrastructure in developing countries concludes that instability in the real exchange rate is statistically significant and negative. It acts as a disincentive toward inward investment. A negative sign is postulated between this variable and FDI.

Agglomeration economies have played a very vital role in attracting inward FDI to a host country. Kinoshita and Campos (2002) uses one lag stock of FDI as an independent variable to capture the agglomeration effects. Other studies have used the number of industrial zones or Economic Processing Zones as proxies to capture agglomeration effects. This variable also proxies for policy incentives such as tax exemptions and tax holidays, which influence foreign firms to locate in a certain geographical region. This study uses a share of manufacturing output to GDP as a proxy to capture the agglomeration effects.

Investigating the link between Official Development Assistance and Foreign Direct Investment flows, Yasin (2005) uses panel data from 11 Sub-Saharan African countries for 1990-2003. Results show that bilateral assistance has a significant and positive influence on FDI flows. However, Multilateral Development Assistance does not have a statistically significant effect on FDI. Karakaplan, Neyapti and Sayeki (2005), investigate the effect of aid on FDI in view of the hypothesis that countries receiving aid become more likely to receive FDI. They conclude that this happens only in case of good governance

and developed financial markets, and not necessarily otherwise. An empirical study by Njeru (2003) indicates that the flow of foreign aid does influence government spending patterns in Kenya. However, poor governance acts as a deterrent to foreign aid disbursement. For instance, in the year 1990/91, the Consultative Group of the donor community froze Kenya's aid on the basis of corruption, poor governance and democratization. Further, in July 1997, the International Monetary Fund (IMF) suspended the Enhanced Structural Adjustment Facility (ESAF) programme amounting to about US$ 200 million. The relationship between ODA and FDI is assumed to be direct for the case of Kenya.

Insecurity in host country has been established to deter FDI. Asante (2000) assessed the determinants of private investment behaviour in Ghana and found that political instability has a negative sign and is highly significant, suggesting that military takeovers may have created a climate hostile to private investment. Ngowi (2001) avers that conflicts are a barrier to efforts of increasing a location's share of global FDI. Citing crime and violence, the author contends that such incidences have many direct economic costs that may hinder FDI inflows directly or indirectly. The study uses a dummy variable in which the variable takes a value of one, if the situation is classified as insecure, and zero otherwise.

Corruption has become a policy concern of most of the governments the world over. This is because it leads to increased costs of doing business. Al-Sadig (2009) studied the effects of corruption on FDI flows and the results show that corruption level in the host country has an adverse effect on FDI inflows: a one-point increase in the corruption level leads to a reduction in per capita FDI inflows by about 11 per cent. A negative relationship is postulated between corruption and FDI flows.

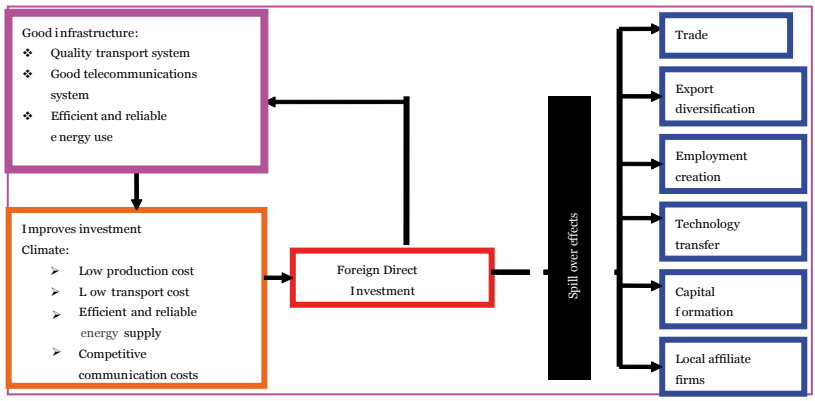
After reviewing the relevant literature, this study finds a dearth of literature on the contribution of infrastructure index in influencing FDI inflows to Kenya. No studies have used an infrastructure index in assessing its effect on FDI. It is for this reason that a country may have good transport infrastructure, while its telecommunications infrastructure may be underdeveloped. Using single infrastructure indicator alone in FDI modeling will not capture the availability of infrastructure effectively (Kumar, 2001). Therefore, this study fills this gap in the academic literature by using an infrastructure index to capture its overall effect on FDI attraction to Kenya.

4. Methodology

4.1 Conceptual Framework

Figure 4.1 shows the conceptual framework on the relationships between infrastructure and FDI. Good infrastructure in form of quality transport systems facilitates the transport of goods and services produced by firms, and hastens the distribution process.

Figure 4.1: Conceptual framework showing the link between infrastructure and FDI



Source: Author

Timely transaction arising from good transportation networks as well as an efficient and reliable energy supply to companies will cut down production costs and scale up factor productivity. Firms benefit from low telecommunication cost as this will hasten communication both locally and internationally. Investment decisions largely rely on good and improved infrastructure system. Thus, quality and well developed infrastructure lowers the cost of doing business and improves the investment climate to foreign private firms, thereby influencing them to invest abroad. Foreign direct investment can also lead to development and improvement of host country infrastructure. This can be elucidated by the development of the telecommunications infrastructure, with entry of the new telephony operator (French Telcom) in Kenya in 2007, and privatization of Telkom Kenya (Mwega, 2009b). This resulted to an increase in the number of mobile phone subscribers, ease of communication and development of innovative ways of money transfers such as via the mobile telephony. Other ways that the mobile telephony has revolutionalized the lives of people is that they can now use their mobile telephones to carry out many transactions

such as payment of bills such as water, electricity, hospital, school fees, and many others, without traveling long distances and making long queues to settle them.

FDI contributes greatly to host economy in what is termed as spillover effects. These are shown as indicated on the right hand side of Figure 4.1. Thus, FDI can contribute to the development of the country by generating investments that can bridge the resource gap arising from low domestic savings and investment, thus scaling up flagship projects earmarked in spearheading the country's Vision of becoming a middle income country by year 2030.

4.2 Theoretical Models

This study adopts Dunning (1988) eclectic paradigm in explaining the locational determinants of FDI. The locational advantage of the eclectic theory holds that host countries possess certain characteristic (advantages) that can attract foreign investors. Such factors include market size, performance of the financial markets, macroeconomic stability, adequate infrastructure (economic factors) and labour (social factors). Others include good investment climate, competent institutions of government, transparent systems and stable exchange rates (political factors), among others. The functional relationship between foreign investment and host country factors can be expressed in the form of:

$$FDI = f(economic, social, and\ political\ factors) \quad \text{.....1}$$

4.3 Model Specification

Using the framework given in 1 above, foreign investment model takes the form of:

$$FDI = \beta_0 + \Sigma Xi + \varepsilon \quad \text{----------} \quad (2)$$

where *Xi* is a set of host country FDI determinants. In this case, they are economic, social and political factors. Introducing the specific factors that determine FDI in Kenya, some in absolute and others in logarithm form, the model takes the form of:

$$LFDI = \beta_0 + \beta_1 IINDEX + \beta_2 AGR + \beta_3 LOGWAGE + \beta_4 LOGXRATE + \beta_5 LOGMAN\_GDP + \beta_6 ODA + \beta_7 SECURITY + \beta_8 CPI + \varepsilon \quad \text{----------} \quad (3)$$

Where FDI=Foreign Direct Investment; IINDEX=Infrastructure Index; AGR=annual growth rate; LOWAGE=Labour; XRATE=official

exchange rate; LOGMA_GDP=agglomeration effects, measured as the share of manufacturing to GDP. ODA is net Official Development Assistance and net official aid expressed in current US dollars. Security is a dummy which depicts insecurity situation during particular year periods and it takes the value of 1 if insecurity instances occurred, zero otherwise. CPI is Corruption Perception Index as given by Transparency International. The ε is the stochastic disturbance term and the study covers the period from 1980-2008.

It is worth noting that despite review of many factors that determine FDI, a few are used in the model, taking account of multi-colinearity between variables.

4.4 Definition of Variables, Expected Signs and Sources of Data

Table 4.1: Variables definitions, sources of data, and the expected sign of coefficients

Variable	Variable used as proxy	Sources of data	Expected sign
Foreign Direct Investment in logs	FDI, measured as net inflows in million current US dollars, and is the dependent variable	UNCTAD's FDI.net website and WDI database	
Infrastructure Index: It is constructed using PCA analysis using some selected sub-indicators, from energy, telecommunications, and transport sub-sector, and it is lagged twice in the FDI equation			+
	1. Transport infrastructure: Air transport, freight (million tonne-km). Air transport, passenger carried per capita, paved roads as a percentage of total road, rail lines (total route-km)	http://www.nationmaster.com/time.php World Bank Group website	
	2. Energy infrastructure: Per capita consumption in terms of kilogrammes of oil equivalent, in 1,000 tonnes of oil equivalent	Statistical Abstracts (Various)	
	Electric power consumption per Kwh	Economic Suveys (Various)	
	3. Communication infrastructure: Access to information: Internet users per 1,000 people	World Bank Group Website; Earth Trends website	
	Access to information: Cellular mobile telephone subscribers per 1,000 people	World Bank Group Website; Earth Trends website	
	Access to information: Telephone lines per 1,000 people	World Bank Group web-site, 2007; Earth Trends website	

Exchange rate	XRATE- Kenya's official exchange rate against US currency in dollars	World Development Indicators	-
LOGWAGE	Annual average wage earnings per employee in Ksh. in the private sector, measured in logs	Government of Kenya, Economic Surveys (Various)	+
Official Development Assistance (ODA)	ODA - is the net official ODA and net official aid	World Bank's WDI database	+ or -
Corruption Perception Index	Corruption is defined by Transparency International as the abuse of public office for private gain. It is measured on a scale of 1-100, where low value numbers indicate high level of corruption and high value numbers signify a high level of transparency	Transparency International's website	-
Annual growth rate	AGR	World Bank's WDI database	+
Security dummy	Security - It proxies insecurity in Kenya as follows: During the 1982 coup de tat, 1992 Molo clashes, 1997 Likoni clashes, 1998 terrorist attack of US Embassy in Nairobi, 2001 bombing of Kikambala hotel in Mombasa, 2007 chaos that resulted due to disputed general election presidential results in that year, which continued till early 2008. The year that the incidences occurred takes the value of 1 and 0 otherwise	-	-
Agglomeration effects	LOGMA_GDP- is the share of manufacturing to GDP	Government of Kenya, Economic Surveys (Various)	+

4.5 Selected Infrastructure Indicators

The various aspects of infrastructure indicators used in the construction of the Infrastructure index in this study are transport, energy and telecommunications infrastructure. Each sector's subset proxies are explained as follows:

i) Transport infrastructure: This sector has many aspects such as ports, roads, airways and railways. Four variables were considered. The railway is proxied by railway lines per tonne-kilometer (tonne-km); roads is presented by paved roads as a percentage of total road network; air transport uses two variables, which are the passenger carried per capita and air freight (million tonne-km).

ii) Telecommunications infrastructure: This sector comprises various components such as Internet use, radio, newspapers, mail, and

telephony, both land line and mobile, among others. The study uses three sub-sectors of this infrastructure, which are cellphone sub-subscribers, Internet users and telephone lines per 1,000 people for each.

iii) Energy infrastructure: Two proxies were used to capture this sector, namely energy consumption per capita kilowatt hour (kwh) and energy use per capita (kilogramme oil equivalent).

4.6 Principal Component Analysis (PCA)

Use of a single infrastructure indicator such as roads, in a FDI equation, poses some challenges such as not portraying the overall effect of infrastructure on FDI. This is because infrastructure comprises many sub-indicators such as roads, water, electricity, airways and many more. Thus, this study uses selected variables from energy, transport and communication, and constructs an infrastructure index using a principal component analysis to capture the overall effect of infrastructure on FDI, than one single indicator could. The PCA is a statistical technique that constructs a single index that captures the variance or information contained in different variables, capturing different aspects of infrastructure. It finds linear combinations of the original variables to construct principal components or factors with a variance greater than any single original variable (Kumar, 2001). PCA has some advantages. First, it reduces the measurement error associated with taking a single-infrastructure indicator (for either quantity or quality) in the empirical analysis and, secondly, it solves the problem of high collinearity among the different types of infrastructure assets (Calderoń, 2009). The principle of this method lies in the fact that when different characteristics are observed about a set of events, the characteristic with more variation explains more of the variation in the dependent variable compared with the variable with lesser variation in it (Pravakar and Kumar, 2009). The authors further state that the issue is to find weights to be given to each of the concerned variables. The weight to be given to each variable is determined on the principle that the variation in the linear composites of these variables should be the maximum. According to Pravakar and Kumar, the composite index is defined as:

$$Ci = W_1X_{11} + W_2X_{12} + W_3X_{13} + ... + W_nX_{1n}$$

Where C_i= the composite index for the ith observation, W_j is the weight

assigned to j^{th} indicator, and x_{ij} is the observation value after elimination of the scale bias. The weights (w) are generated by the computer software, and in this case the SPSS software was used to calculate the components.

The Eigen values and respective variance of the components and component scores of original values are given in Appendix Table A1 and A2, respectively. The first component has an Eigen value larger than one (2.760), and it explains over two thirds of the total variance in percentage form (69.011%). There is a very big difference between the Eigen values and variance explained by the first and the next principal component. For instance, the second component has an Eigen value of 0.761, and its corresponding variance is 19.013 per cent. Thus, the first component is chosen to make the index.

5. Regression Results

Table 5.1: Summary descriptive statistics

	LFDI	LOGWAGE	ODA	CPI	AGR	LOGMA_ GDP	LOGXRATE	IINDEX
Mean	1.358	4.787	5.330	1.440	3.448	1.106	1.566	-0.0000345
Median	1.447	4.682	4.820	1.900	4.000	1.114	1.741	-0.363
Maximum	2.862	5.582	9.430	2.509	7.000	1.176	1.895	2.659
Minimum	-0.398	3.753	1.060	0.000	-1.000	1.041	0.879	-0.917
Std. Dev.	0.614	0.545	2.316	0.934	2.229	0.051	0.320	1.000
Skewness	-0.478	0.006	0.087	-0.799	-0.186	-0.232	-0.481	1.463
Kurtosis	4.484	1.680	2.463	1.911	2.057	1.444	1.751	4.143
Jarque-Bera	3.767	2.105	0.386	4.518	1.242	3.186	3.000	11.923
Probability	0.152	0.349	0.825	0.104	0.537	0.203	0.223	0.003
Observations	29	29	29	29	29	29	29	29

Source: Computed by author

From Table 5.1, the mean logarithm of annual FDI is 1.358 and -0000345 for infrastructure index. The implication of the negative mean value for infrastructure is that, on average, the stock of infrastructure is not good enough to attract FDI. ODA in absolute term averages is 5.33, which is quite low. CPI records a mean of 1.44, implying that Kenya is perceived to be a corrupt country due to its low scores. Logarithm of wage and agglomerations (LOGMA-GDP) has means of 4.787 and 1.106, respectively.

5.1 Correlation Matrix

From the correlation matrix (Table 5.2), infrastructure index, CPI and wage are positively correlated with FDI. However, ODA and agglomeration effects are negatively correlated with FDI. Wage is highly correlated with agglomeration effects and exchange rates. Additionally, log of exchange rate is highly correlated with log wage, CPI and agglomeration effects. On the basis of these high correlations, a number of equations will be regressed, dropping those variables that correlate each other in turn (Table 5.5).

Table 5.2: Correlation matrix of the relationship between independent variables and dependent variable, FDI

	LFDI	LOGWAGE	ODA	CPI	AGR	LOGMA_ GDP	LOGXRATE	IINDEX
LFDI	1.000							
LOGWAGE	0.382	1.000						
ODA	-0.493	0.072	1.000					
CPI	0.032	0.715	0.223	1.000				
AGR	0.260	0.073	-0.172	-0.134	1.000			
LOGMA_GDP	-0.329	-0.915	0.005	-0.668	-0.050	1.000		
LOGXRATE	0.117	0.847	0.226	0.890	-0.196	-0.864	1.000	
IINDEX	0.504	0.492	-0.001	0.081	0.496	-0.414	0.180	1.000

Source: Computed by author

5.2 Unit Root Tests

5.2.1 Granger causality test

Here, the causality test is carried out to establish the direction of feedback mechanism: that is, does FDI Granger cause infrastructure or does infrastructure Granger cause FDI? Economists have argued that to depict causality, we are essentially looking at P-values of variables under study. If coefficients of these variables are less than 0.05 per cent, we can conclude that Granger causality exists. From Table 5.3, the null hypothesis that FDI does not Granger cause infrastructure index is not rejected, while the null hypothesis that infrastructure index (IINDEX) does not Granger cause FDI is rejected at 5 per cent level of significance. This means that infrastructure index (IIDEX) affects FDI. Thus, there is a uni-directional relationship between FDI and infrastructure index, and this information helped in choosing the dependent variable.

Table 5.3: Pair wise Granger, causality tests

Sample: 1980-2008			
Lags: 3			
Null Hypothesis	**Obs**	**F-Statistic**	**Prob.**
IINDEX does not Granger cause LFDI	26	3.43	0.04
LFDI does not Granger cause IINDEX		0.90	0.46

Source: Compiled by author

Table 5.4: Unit root tests

Variable	ADF	t-statistics at different levels			Order of integration	Comments
		1%	5%	10%		
LFDI	-6.48	-2.65	-1.96	-1.61	I(1)	pure random walk
LOGXRATE	-6.03	-2.65	-1.96	-1.65	I(1)	pure random walk
AGR	-5.23	-2.65	-1.96	-1.61	I(1)	pure random walk
LOWAGE	-8.06	-2.65	-1.96	-1.61	I(1)	pure random walk
ODA	-5.82	-2.65	-1.96	-1.61	I(1)	pure random walk
CPI	-5.07	-2.65	-1.96	-1.61	I(1)	pure random walk
IINDEX	-3.42	-2.65	-1.96	-1.61	I(1)	pure random walk
LOGMA_ GDP	-7.34	-2.65	-1.96	-1.61	I(1)	pure random walk

Source: Compiled by author

Table 5.5: Long run equations: Dependent variable: Log of FDI

	Model 1	Model 2	Model 3	Model 4
IINDEX_2	0.289* (1.731)	0.259 (1.505)	0.302 (1.618)	0.325** (2.116)
AGR_1	0.070 (1.272)	0.022 (0.448)	0.035 (0.668)	0.049 (1.003)
LOGWAGE	0.680* (1.818)	0.516* (1.947)	-	-
LOG XRATE_1	2.532** (2.042)	-	-	0.325** (2.116)
LOGMA_ GDP_1	11.363* (1.928)	-	-2.895 (-1.047)	-
ODA	-0.161*** (-3.766)	-0.130*** (-3.170)	-0.125*** (-2.741)	-0.136*** -3.460
SECURITY	-0.316 (-1.326)	-0.194 (-0.843)	-0.129 (-0.507)	-0.181 (-0.814)
CPI	-0.426* (-1.711)	-0.044 (-0.267)	0.069 (0.419)	¬-
C	-17.085* (-1.963)	-0.356 (-0.300)	5.092 (1.635)	0.836 (1.445)
R-squared	0.662	0.579	0.525	0.561
A/R-squared	0.513	0.453	0.383	0.456
Durbin-Watson	2.599	2.511	2.521	2.564
F-statistic	4.419	4.587	3.69	5.366
Prob(F-statistic)	0.004	0.004	0.012	0.002

*Source: Compiled by author; Note: *** p<0.001, ** p<0.05, * p<0.10; t-values are in parentheses*

5.2.2 Co-integration tests

In macroeconomics, estimating time series data will not yield meaningful results, since most variables are not stationary. Attempts to run regressions of non-stationary variables will lead to spurious results. Thus, the variables are first tested for stationarity using Augmented Dickey Fuller tests. All variables are co-integrated at order one I (1), meaning they were stationary at first difference (Table 5.4). Co-integrating of variables at order one implies that there exists a long run relationship between the variables at the equilibrium state and consequently, a short run dynamic relationship was fitted to establish the percentage speed of adjustment to the equilibrium state through the error correction model. The details of regression results of variables integrating at order one are indicated in the Appendix B.

5.3 Empirical Results

5.3.1 Long-run FDI relationship

Since variables were found co-integrated, estimation of coefficients of the long run relation was done (Table 5.6). This was followed by estimation of the short run dynamic relationship using the error correction model (ECM) (Table 5.7).

From the correlation matrix presented in Table 5.2, the log of exchange rate (LOGXRATE) is highly correlated with logarithms of wage (LOWAGE), Corruption Perception Index (CPI) and agglomeration effects (LOGMA_GDP). LOGMA_GDP is also correlated with LOWAGE. This led to the estimation of the second, third, and fourth models (Table 5.5). In the second model, exchange rate and agglomeration effects are dropped since the latter correlates with wage, CPI and agglomeration effects. The third model excluded wage and exchange rates, while model four dropped logarithm of wage, agglomeration effects and CPI. Given that the said variables are highly correlated, it was not possible to use them simultaneously in one equation.

Model 4's Representation

LFDI=-0.1811776987*SECURITY+0.04859223408*AGR_1+0.3248717859*IINDEX_2 - 0.1363590035*ODA + 0.7561664911*LOGXRATE_1 + 0.8357100306

Table 5.6: Long run estimation of FDI equation using least squares

Variable	Coefficient
IINDEX_2	0.288567*(1.731066)
AGR_1	0.070178(1.272347)
LOGWAGE	0.680256* (1.817637)
LOGXRATE_1	2.532381**(2.041868)
LOGMA_GDP_1	11.36199* (1.928272)
ODA	-0.160551***(-3.765541)
SECURITY	-0.315978 (-1.326309)
CPI	-0.425739*(-1.710807)
C	-17.08498* (-1.963262
R-squared	0.662593
Adjusted R-squared	0.512635
Durbin-Watson stat	2.599131
Prob (F-statistic)	0.004235
Prob (F-statistic)	0.004235

*Source: Compiled by author; Note: *** p<0.001, ** p<0.05, * p<0.10; t-values are in parentheses*

From Table 5.5, model 4 is selected, and it forms the basis for long run interpretation of the results. Infrastructure index (IINDEX) positively affects FDI and it is statistically significant at 5 per cent by level of significance. This means that a one unit rise in Infrastructure Index leads to a 0.32 per cent increase in FDI inflows. The positive relationship between infrastructure and FDI is consistent with the findings of other research work by Loree and Guisinger (1995), Sahoo (2006), Kumar (2001), Hoffman (2002) and Khadaroo and Seetanah (2008), to name but a few. The logarithm of exchange rate (LOGXRATE_1) affects FDI positively, and it is statistically significant at 5 per cent level of significance. The implication is that a stable exchange rate attracts FDI. ODA exhibits a negative correlation with FDI. Its coefficient is significant at 1 per cent level of significance in all the four models. A one unit increase of ODA will cause a decrease of about 0.14 per cent of FDI in the long run. The inverse relationship between ODA and FDI is rather shocking for the case of Kenya. One could expect that ODA flows could improve conditions for private investors, thus resulting in a direct relationship between the two variables. This could imply that if the development community countries could withdraw aid, citing instances of bad governance in Kenya, private investors would follow

suit. In this case, more investigation is suggested to ascertain the probable relationship between the two variables.

Though corruption lacks statistical significance, it has economic and policy implications. Corruption has a negative sign as was expected and it implies that it acts as a disincentive to investors as it increases transaction costs (Ngugi and Nyang'oro, 2005). Investors cannot invest in countries where corruption is rampant, as this could lead to increased production costs, thus rendering their goods uncompetitive in the market. There is need, therefore to effect austere government intervention measures to alleviate this vice. The security dummy variable is also statistically insignificant but it affects FDI negatively. The negative sign means that insecurity situations constrain the investment climate, thus scaring away investors. Annual economic growth rate has economic and policy relevance, but lacks statistical significance. In the long run, robust economic growth will act as a pull factor for attracting FDI inflows.

5.3.2 Short run FDI estimation equation and the error correction model

For variables cointegrated at I (1), there exists a long run relationship; consequently, a dynamic relationship was established to obtain the speed of adjustment into equilibrium, through the error correction model (ECM). Table 5.7 presents the results of the short run equation. Results indicate that infrastructure index positively affects FDI, but its coefficient is insignificant. Corruption exhibits a negative sign implying that it acts as an embedment to FDI inflows. The coefficient is statistically significant at 10 per cent level.

All the other variables are not statistically significant. The short run dynamic relationships will be corrected by the error correction term (ECT). The ECT implies that the speed of adjustment towards the equilibrium state is about 89.8 per cent each year.

Table 5.7: Results of short run regression of an FDI equation

Variable	Coefficients
DIINDEX_2	0.020158 (0.034606)
DAGR_1	-0.026314 (-0.361470)
DCPI	-0.676263* (-1.865832)
SECURITY	-0.466190 (-1.230955)
DLOGMA_GDP_1	7.719504 (1.243321)
DLOGWAGE	0.032714 (0.091367)
DLOGXRATE_1	-1.641483 (-0.704639)
DODA	-0.145400*** (-3.410190)
ECT_1	-0.898174** (-2.554057)
C	0.128600 (0.074083)
R-squared	0.740158
Adjusted R-squared	0.584252
Durbin-Watson stat	2.332897
F-statistic	4.747479
Prob(F-statistic)	0.004029

*Source: Compiled by author: Note: *** p<0.001, ** p<0.05, * p<0.10; t-statistics are in parentheses*

6. Conclusion and Recommendations

This study sought to establish the link between infrastructure and FDI in Kenya. The results indicate that infrastructure index (lagged two years) positively affects FDI, in the long term, and its coefficient is statistically significant at 5 per cent level of significance. More specifically, a one unit increase in the infrastructure index, other variables held constant, will cause FDI to rise by approximately 0.32 per cent. The implication is that the government policy should target many resources to develop all types of infrastructure, which include transport, energy and telecommunications. Increased investment in infrastructure coupled with good investment climate will boost Kenya's development objectives of attaining a middle level income country by year 2030, as well as meet the Millennium Development Goals by 2015.

Additionally, this study proposes formulation and implementation of a National Infrastructure Policy as a framework to guide infrastructure investment, development, maintenance and rehabilitation. The policy will, among other things, highlight particular intervention measures geared towards infrastructure upscaling investment to attract FDI to the country. The national policy will consolidate all policies governing different infrastructure sub-sectors such as those of transport, energy, housing, Nairobi metropolitan and communications policies, among others, into a national policy for easy administration and coordination.

Both the short and long term results indicate that ODA is a constraint to FDI inflows to Kenya. This result is rather a puzzle than it was thought. One could expect that ODA flows could improve conditions for private investors, thus resulting in a direct relationship between the two variables. Further research is suggested to assess the probable relationship between these two sources of development finance.

The results also indicate that insecurity deters FDI inflows, though the results are not statistically significant, both in the short and long run. The policy implications is that insecurity is a major concern of investors, who are always conscious to invest in safe destinations. Therefore, policy intervention measures should be strengthened to ensure a secure and stable investment climate that attracts foreign investment.

The long term results show that stable exchange rates act as a pull factor in attracting FDI. Therefore, the Central Bank monetary stabilization policies should be geared towards ensuring a stable exchange

rate at all times. Corruption is also a major concern of investors, since it contributes to increased transaction costs. Government policies should be stringent in the fight against corruption, which has not only affected foreign investors, but also affected all other aspects of development.

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Appendix

Appendix A

Table A1: Eigen values and variance explained by principal components

Component	Eigen values	Percentage of variance	Percentage cumulative variance
1	2.760	69.011	69.011
2	0.761	19.013	88.024
3	0.351	8.782	96.805
4	0.128	3.195	100.000

Table A2: Component scores of original values

Infrastructure variables	Component scores
Air passengers, per capita	0.307
Power consumption (khr)	0.329
Telephone (mobile+fixed land line) per 1,000 people	0.273
Paved roads as a percentage of total road network	0.292

Appendix B

LFDI at I (1)

Null Hypothesis: D(LFDI) has a unit root
Exogenous: None
Lag Length: 1 (Automatic based on SIC, MAXLAG=3)

		t-statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.482865	0.0000
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

**MacKinnon (1996) one-sided p-values*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LFDI,2)
Method: Least Squares
Date: 04/20/10 Time: 17:28
Sample (adjusted): 1983 2008

Included observations: 26 after adjustments

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(LFDI(-1))	-2.057592	0.317389	-6.482865	0.0000
D(LFDI(-1),2)	0.417721	0.190662	2.190903	0.0384
R-squared	0.769445	Mean dependent var		-0.032603
Adjusted R-squared	0.759839	S.D. dependent var		1.423902
S.E. of regression	0.697801	Akaike info criterion		2.192038
Sum squared resid	11.68623	Schwarz criterion		2.288814
Log likelihood	-26.49649	Durbin-Watson stat		2.257198

IINDEX_2 I (1)

Null Hypothesis: D(IINDEX) has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=3)

		t-Statistic	**Prob.***
Augmented Dickey-Fuller test statistic		-3.424429	0.0014
Test critical values:		1% level	-2.653401
		5% level	-1.953858
		10% level	-1.609571

**MacKinnon (1996) one-sided p-values*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D (IINDEX,2)
Method: Least Squares
Date: 04/27/10 Time: 07:02
Sample (adjusted): 1982 2008
Included observations: 27 after adjustments

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(IINDEX(-1))	-0.446805	0.130476	-3.424429	0.0021
R-squared	0.293878	Mean dependent var		0.038901
Adjusted R-squared	0.293878	S.D. dependent var		0.252735
S.E. of regression	0.212376	Akaike info criterion		-0.224580
Sum squared resid	1.172696	Schwarz criterion		-0.176586
Log likelihood	4.031836	Durbin-Watson stat		1.610451

Annual Growth rate AGR I (1)

Null Hypothesis: D(AGR) has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=3)

			t-Statistic	**Prob.***
Augmented Dickey-Fuller test statistic			-5.224670	0.0000
Test critical values:		1% level	-2.653401	
		5% level	-1.953858	
		10% level	-1.609571	

**MacKinnon (1996) one-sided p-values*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D (AGR,2)
Method: Least Squares
Date: 04/27/10 Time: 07:39
Sample (adjusted): 1982 2008
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(AGR(-1))	-1.047619	0.200514	-5.224670	0.0000
R-squared	0.512089	Mean dependent var		-0.037037
Adjusted R-squared	0.512089	S.D. dependent var		2.941500
S.E. of regression	2.054656	Akaike info criterion		4.314428
Sum squared resid	109.7619	Schwarz criterion		4.362422
Log likelihood	-57.24478	Durbin-Watson stat		1.959632

CPI I (1)

Null Hypothesis: D(CPI) has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=3)

		t-Statistic	**Prob.***
Augmented Dickey-Fuller test statistic		-5.071447	0.0000
Test critical values:		1% level	-2.653401
		5% level	-1.953858
		10% level	-1.609571

**MacKinnon (1996) one-sided p-values*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D (CPI, 2)
Method: Least Squares
Date: 04/20/10 Time: 17:39
Sample (adjusted): 1982 2008
Included observations: 27 after adjustments

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(CPI(-1))	-0.994578	0.196113	-5.071447	0.0000
R-squared	0.497289	Mean dependent var		1.44E-17
Adjusted R-squared	0.497289	S.D. dependent var		0.488390
S.E. of regression	0.346279	Akaike info criterion		0.753190
Sum squared resid	3.117639	Schwarz criterion		0.801184
Log likelihood	-9.168070	Durbin-Watson stat		1.999940

ODA I (1)

Null Hypothesis: D(ODA) has a unit root
Exogenous: None
Lag Length: 1 (Automatic based on SIC, MAXLAG=3)

		t-Statistic	**Prob.***
Augmented Dickey-Fuller test statistic		-5.820138	0.0000
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

**MacKinnon (1996) one-sided p-values*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D (ODA,2)
Method: Least Squares
Date: 04/20/10 Time: 17:41
Sample (adjusted): 1983 2008
Included observations: 26 after adjustments

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(ODA(-1))	-1.873193	0.321847	-5.820138	0.0000
D(ODA(-1),2)	0.478961	0.228203	2.098834	0.0465
R-squared	0.693644	Mean dependent var		0.165052
Adjusted R-squared	0.680879	S.D. dependent var		4.871707
S.E. of regression	2.752066	Akaike info criterion		4.936384
Sum squared resid	181.7728	Schwarz criterion		5.033161
Log likelihood	-62.17299	Durbin-Watson stat		2.122027

LOMA_GDP I (1)

Null Hypothesis: D (LOGMA_GDP) has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=3)

		t-Statistic	**Prob.***
Augmented Dickey-Fuller test statistic		-7.339989	0.0000
Test critical values:	1% level	-2.653401	
	5% level	-1.953858	
	10% level	-1.609571	

**MacKinnon (1996) one-sided p-values*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D (LOGMA_GDP, 2)
Method: Least Squares
Date: 04/20/10 Time: 17:48
Sample (adjusted): 1982 2008
Included observations: 27 after adjustments

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(LOGMA_GDP(-1))	-1.348986	0.183786	-7.339989	0.0000
R-squared	0.674493	Mean dependent var	0.000000	
Adjusted R-squared	0.674493	S.D. dependent var	0.040680	
S.E. of regression	0.023209	Akaike info criterion	-4.652198	
Sum squared resid	0.014005	Schwarz criterion	-4.604204	
Log likelihood	63.80467	Durbin-Watson stat	2.025897	

Null Hypothesis: D (LOGMA_GDP) has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=3)

		t-Statistic	**Prob.***
Augmented Dickey-Fuller test statistic		-7.339989	0.0000
Test critical values:	1% level		-2.653401
	5% level		-1.953858
	10% level		-1.609571

**MacKinnon (1996) one-sided p-values*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D (LOGMA_GDP, 2)
Method: Least Squares
Date: 04/20/10 Time: 17:48
Sample (adjusted): 1982 2008
Included observations: 27 after adjustments

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(LOGMA_GDP(-1))	-1.348986	0.183786	-7.339989	0.0000
R-squared	0.674493	Mean dependent var		0.000000
Adjusted R-squared	0.674493	S.D. dependent var		0.040680
S.E. of regression	0.023209	Akaike info criterion		-4.652198
Sum squared resid	0.014005	Schwarz criterion		-4.604204
Log likelihood	63.80467	Durbin-Watson stat		2.025897

LOWAGE AT I(1)
Null Hypothesis: D (LOGWAGE) has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=3)

			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-8.064927	0.0000
Test critical values:		1% level	-2.653401	
		5% level	-1.953858	
		10% level	-1.609571	

**MacKinnon (1996) one-sided p-values*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D (LOGWAGE, 2)
Method: Least Squares
Date: 04/20/10 Time: 18:02
Sample (adjusted): 1982 2008
Included observations: 27 after adjustments

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D (LOGWAGE(-1))	-1.428485	0.177123	-8.064927	0.0000
R-squared	0.714420	Mean dependent var		-0.000667
Adjusted R-squared	0.714420	S.D. dependent var		0.484478
S.E. of regression	0.258904	Akaike info criterion		0.171612
Sum squared resid	1.742809	Schwarz criterion		0.219606
Log likelihood	-1.316768	Durbin-Watson stat		2.152119

LOXRATE I(1)

Null Hypothesis: D (LOGXRATE) has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=3)

			t-Statistic	**Prob.***
Augmented Dickey-Fuller test statistic			-6.025447	0.0000
Test critical values:		1% level	-2.653401	
		5% level	-1.953858	
		10% level	-1.609571	

**MacKinnon (1996) one-sided p-values*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D (LOGXRATE, 2)
Method: Least Squares
Date: 04/28/10 Time: 06:45
Sample (adjusted): 1982 2008
Included observations: 27 after adjustments

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D (LOGXRATE (-1))	-1.055529	0.175179	-6.025447	0.0000
R-squared	0.582036	Mean dependent var		-0.004903
Adjusted R-squared	0.582036	S.D. dependent var		0.124827
S.E. of regression	0.080701	Akaike info criterion		-2.159798
Sum squared resid	0.169329	Schwarz criterion		-2.111804
Log likelihood	30.15727	Durbin-Watson stat		2.022308

Residuals I (1)

Null Hypothesis: RESID06 has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=3)

			t-Statistic	**Prob.***
Augmented Dickey-Fuller test statistic			-6.939322	0.0000
Test critical values:		1% level	-2.656915	
		5% level	-1.954414	
		10% level	-1.609329	

**MacKinnon (1996) one-sided p-values*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D (RESID06)
Method: Least Squares
Date: 04/28/10 Time: 07:00
Sample (adjusted): 1983 2008
Included observations: 26 after adjustments

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
RESID06(-1)	-1.295960	0.186756	-6.939322	0.0000
R-squared	0.658150	Mean dependent var		0.010681
Adjusted R-squared	0.658150	S.D. dependent var		0.619521
S.E. of regression	0.362221	Akaike info criterion		0.844576
Sum squared resid	3.280095	Schwarz criterion		0.892964
Log likelihood	-9.979490	Durbin-Watson stat		2.162463

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