EFFECT OF INFRASTRUCTURE DEVELOPMENT ON DOMESTIC PRIVATE INVESTMENT AND FOREIGN DIRECT INVESTMENT IN KENYA

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A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF ECONOMETRICS AND STATISTICS IN THE SCHOOL OF BUSINESS, ECONOMICS AND TOURISM IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF ECONOMICS (ECONOMETRICS) DEGREE OF KENYATTA UNIVERSITY

MARCH 2025

DECLARATION

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

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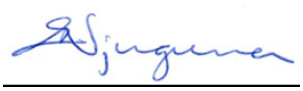
Signature:  Date: 03/03/2025

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DEDICATION

To my supervisor Dr. Angelica E Njuguna.

ACKNOWLEDGEMENTS

I thank God for the wisdom, good health, and knowledge that enabled this project to succeed. I also thank Dr. Angelica E Njuguna, my supervisor, for guiding me in developing this project. I want to acknowledge all lecturers in the School of Business, Economics, and Tourism for their invaluable contribution to this project's realization. I also would like to express my gratitude to my entire family and friends for the support they gave. Much appreciation goes to my employer Ramco Printing Works Limited, for giving me ample time to carry out my studies. Finally, my gratitude goes to Higher Education Loans Board for granting me the scholarship to undertake my studies.

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ABBREVIATIONS AND ACRONYMS

FDI	Foreign direct investment
DPI	Domestic private investment
UN	United nation
AIDT	Africa Infrastructure Development index
WB	World Bank
EAIF	Emerging Africa Infrastructure Fund
OLS	Ordinary Least squares
OLI	Ownership, location and internationalization strategy
ARDL	Autoregressive distributed lag model
VECM	Vector error correlation model
ADF	Autoregressive distributed model
SSA	Sub-Saharan Africa
KNBS	Kenya national bureau of statistics
LM	Lagrange Multiplier

OPERATIONAL DEFINITION OF TERMS

Foreign direct investment: Refers to investment inflow from the country of the investor to a foreign country with the aim of creating a long term interest in the foreign country. It is one of the dependent variable for the study.

Domestic private investment: This is the amount of capital domestic businesses invests within their own country. It is one of the dependent variable for the study.

Infrastructure development: This is the quality improvement of the different infrastructure components such as, transport, ICT, energy, water, and sanitation. It is the independent variable for the study.

Exchange rate: This is the value of a nation's currency against another currency. It is one of the control variable for the study.

ABSTRACT

Kenya has prioritized infrastructure development since independence. This is evidenced in the seasonal paper number 10 of 1965, various economic development policies of the 1970s, National development policies in the 1980s, Medium-term plans of 2008 to the present term, as well as the vision 2030. All these economic planning strategies aim to provide an excellent environment for infrastructure development in the country to facilitate industrialization and make Kenya an attractive market economy. Availability of quality infrastructure boosts economic productivity, the cost of production, improves the quality of life, boosts domestic private investment (DPI), attracts foreign direct investment (FDI), and helps modernize the country. There is an evident effect of infrastructure development on DPI and FDI, as seen by the empirical literature. However, no study has analyzed whether the growth in infrastructure development is the reason for the structural change in FDI inflow and DPI development in Kenya. FDI and DPI in Kenya had a more or less uniform in trend from 1970 to 2006, to a significantly steeper upward trend from 2007 to 2021. This means that there is an observed structural change in both FDI and DPI. Logistic regression was applied in the study to explain the shift in the mean values from the low mean observed in 1970-2006 to a higher mean observed in 2007-2021, making this study different from any other study carried out on the subject. The first objective of the study was to analyze the effect of infrastructure development on FDI while the second objective was to examine the effect of infrastructure development on DPI in Kenya. Flexible accelerator theory on investment was the central theory of the study. From the results of the study, Information and Communication Technologies (ICT) infrastructure had a positive and significant effect on both FDI and DPI at 5 per cent level of significance. Energy infrastructure had a positive and significant effect on FDI but for DPI, it had insignificant effect. Transport infrastructure had a positive and significant effect on DPI but it had insignificant effect on FDI inflow in Kenya. GDP growth rate, inflation rate and exchange rate were used as the control variables in the study and they were not statistically significant in increasing both FDI and DPI at 5 per cent level of significance. Based on these findings the government should prioritize ICT development since it has a ripple effect on the FDI inflow as well as DPI development. Investing in cyber security measures and cloud networking will give investors confidence in the security of their data hence the urge to invest. Foreign investors prioritize energy generation capacity in the host country. Therefore, the government should prioritize expanding greater and efficient energy supply to attract more investors. Domestic investors on the other hand relies on transport infrastructure. Therefore, the government should see on how to reduce road congestions, port clearance bureaucracies as well as freight charges to boost more investment. The study therefore conclude that greater and efficient ICT infrastructure, Transport Infrastructure and Energy infrastructure are prerequisites for higher investment in the country.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The overall framework of Kenya's economy lies on infrastructure development. It entails a broad continuum of activities without which no significant activity can be carried out in the economy (Wekesa, Wawire & Koseimbei, 2017). The effect of infrastructure development is felt across nations globally. The development of transport, energy, and telecommunication networks directly affects any nation's investment and economic growth since all types of infrastructure are essential inputs in production. The availability of quality infrastructure boosts economic performance, raises Kenya's competence in the global market, boosts domestic private investment (DPI), attracts foreign direct investment (FDI), and helps modernize the economic performance (Rehman, Abdul, Muhammad, Hassan, & Akram, 2011).

Low infrastructure development reflects the low industrialization of many African countries (Africa's Infrastructure, 2018). While access to energy reduces industrialization costs, the average per capita energy consumption in the SSA (exempt of SA) is 180 kilowatts per capita in comparison to 13,000 kilowatts per capita in America and 6,500 kilowatts per capita in Europe as of 2018 (Africa's Infrastructure , 2018). The ease of electricity accessibility in Brazil explains the 21 percent structural transformation in Brazil between 1970 and 2006 (Steinbuks, 2022).

Telecommunication infrastructure significantly affects the industrial sector of any economy. Levendis and Lee (2013) studied the impact of telecommunication on investment and economic development. The studies confirmed that telecommunication infrastructure and investment development has a significant and a positive relationship. Internet availability accounts significantly for the two percent higher economic growth in the SSA countries in the early 2000s (Lindlacher, 2022). Mobile internet accessibility closes the information asymmetry gap between

the producers and the market in various economies and therefore boosting trade and investment (Kassa, 2022).

Transport infrastructure boosts trade and attract more investors. Quality transport infrastructure eases the transportation of both production inputs and finished products to the desired destinations (Smith, 1994). Nottemboom and Rodrigue (2013) expounds that quality transportation system is essential for better accessibility to markets, facilitating domestic private investment, additional foreign direct investments and reduced operational costs. Limao and Venables (2001) examined the correlation between infrastructure development, transportation expenditures, and trade. The study found that low quality of infrastructure leads to high transportation costs, resulting to reduced trade and the volume of investment.

Addis Ababa Action Agenda (2015) on funding for development equally acknowledged that investing in resilient and sustainable infrastructure, including energy, transport, Information and Communications Technologies (ICT), water, and sanitation, is a prerequisite for achieving most countries' goals. Reliable and quality infrastructure significantly attracts investors from other countries and facilitates domestic private investment (Wekesa et al., 2017).

As of 2021, the African countries had a wide infrastructure gap. Seychelles had 98.45 percent, while Somalia had 4.79 percent of infrastructure development. Kenya was ranked 18th at 26.52 percent (African infrastructure development index [AIDI], 2023). AIDI factored water and sanitation, ICT, transport, and electricity to scale the infrastructure development in Africa. North African countries mainly dominated this scale at the forefront of infrastructure development, and a few were from South African nations (African infrastructure development index, 2023).

The attractiveness of any country to hold foreign investors is determined by the level of its infrastructure development. Quality infrastructure lowers the business operational cost in the

economy, therefore attracting more FDI (Koseimbei et al., 2017). Better access to competent infrastructure services is an important determinant of favorable investment condition for foreign direct investors and a necessary engine for viable economic development (Stephane, 2021). Studies by Rehman et al. (2011), Asiedu (2002) and Seetanah (2009) concluded that development of infrastructure in an economy significantly contributes to the attractiveness that country towards FDI inflow, particularly for the SSA countries.

Foreign direct investment plays a crucial role in economic development as well as income-generating opportunities for developing economies. FDI inflows facilitate the development of financial markets, resource mobilization, and pro-poor economic growth (Njuguna & Nnadozie, 2022). The Addis Ababa Action Agenda 2015 on financing for change explains that FDI can make justifiable development, principally when projects are geared towards the national and regional sustainable development policies. With FDI contributing positively to economic growth in most countries (Baliamoune-Lutz, 2004; Adams, 2009), most governments strive to improve the competence of their infrastructure development. The attractiveness of any country to hold foreign investors is influenced by comparative advantage in global production and domestic investment climate (Njuguna & Nnadozie, 2022). The attraction of foreign multinational companies is a certain way of boosting FDI inflow in a country (Wekesa et al., 2017).

Attracting and boosting DPI through infrastructure development is a vital goal of the Kenyan government since it is a prerequisite for modernization and economic development in Kenya (Nelson & Emase, 2018). No matter the globalization of the world, investment and development begin within an individual country (United Nation Monterrey Consensus, 2003). Mobilization of domestic resources to build the domestic infrastructure is a vital principle for domestic private

investment (Ababio et al., 2022). Therefore, improved conditions for domestic private investment and FDI are necessary to build every economy (Ababio et al., 2022).

1.1.1 Infrastructure Development in Kenya

The availability of modernized interconnectivity of infrastructure is a crucial strength for attracting and maintaining most contemporary companies/industries. Infrastructure entails communications, ICT, roadways, water and sanitation, transportation, highways, and ports (Rehman et al., 2011). With five international airports, a competent road transport and quality railway connections, a modern sea port at Mombasa, liberalized energy sector, as well as digital telecommunication, Kenya continues to develop the infrastructure sector to lead in the East and Central Africa region (Kenya Investment Authority, 2022).

The principal benefits of the development of transportation networks are ease in accessibility and reduced costs of transportation. A liberal supply of transportation networks at an affordable cost is perceived to positively affect firms' efficiency (Seetanah & Khadaroo, 2009). The transport system in Kenya has grown over the past two decades, with a standard gauge railway covering 592 kilometers from Mombasa to Naivasha and is prospected to cover another 369 kilometers to Malaba in the second face (Ministry of Transport, Infrastructure, Housing, Urban Development and Public Works, 2021).

Road transport sector has also grown to 161,452 kilometers as of 2021, with the Nairobi expressway being the most recent long-term project to be accomplished in 2022. Annual length of paved roads in kilometers in Kenya had an increasing trend from the year 1970 to early 1990s as seen in Figure 1.1.

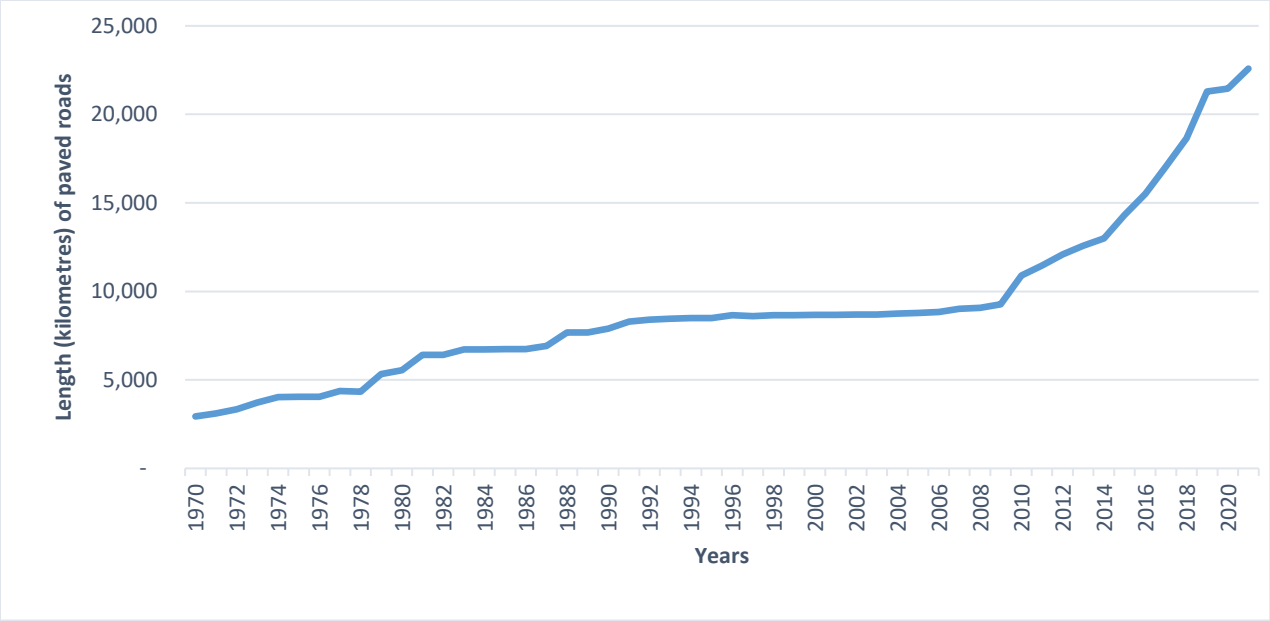

Figure 1.1 Length (kilometers) of paved roads in Kenya, 1970 - 2021

Source of data: Government of Kenya Statistical Abstract, and CBK Annual Reports and Financial Statements.

From 1992 to 2009, the trend of annual paved roads in Kenya increased by a minimal margin but later began to increase by a significant margin from the year 2010 to the year 2021. Devolution of infrastructure in the 2010 constitution had a direct influence on the development of paved roads in Kenya (Kingozi, 2022). Prioritizing the development of the paved roads began from the first Medium Term Plan (MTP) to the present MTP. While the first MTP laid more foundation on the paved road development in Kenya, the second MTP prioritized road infrastructure to attract more national and international business in the country (Mugambi, 2016). The third MTP continued with the pace of road development and with the aim of easing domestic investment and attracting more investors in the country (Kingozi, 2022).

New ICT offers vast prospects for progress in most countries globally. Opportunities for economic development, enhancement of quality medical supply, better service delivery, remote education, and social relation improvements. Today's mobile phones have computer power comparable to

yesterday's CPUs and run comparable purposes. Investment efficiency has been boosted by internet availability, reciprocating increased investments globally. Telephony connections, which include mobile cellular and fixed telephone connections in Kenya has had a very low trend from the year 1970 to 2000, and an increasing trend from the year 2001 to the year 2021 as seen in Figure 1.2.

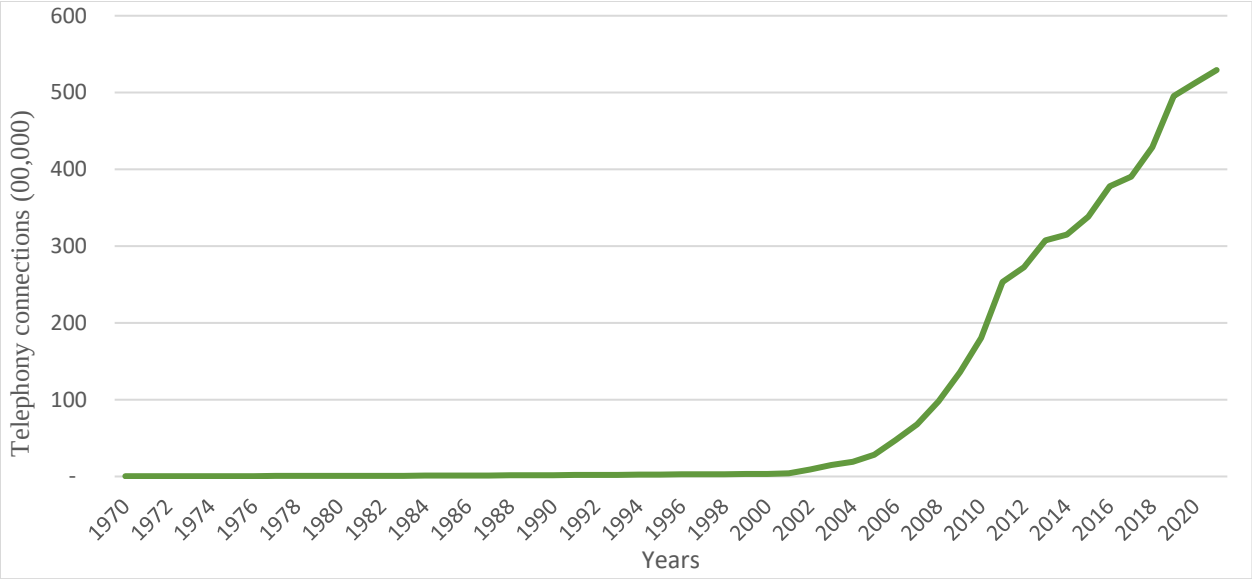

Figure 1.2 Trend in Telephony connections in Kenya, 1970-2021

Source of data: Government of Kenya Statistical Abstract, and CBK Annual Reports and Financial Statements.

Fortinet, the first commercial Internet Service Provider (ISP) in Kenya, became operational in the year 1995 and revolutionized the internet supply in the country from low trend experienced between the 1970 and the year 2000 to an increasing trend experienced between the year 2001 and the year 2021. The entry of more ISPs annually in the country by early 2000s, created more competition in the market, hence the increased the telephony trend as seen in Figure 1.2. In the year 2000, there were about 313 thousand telephony connections in the country, with an estimated monthly growth of 300 new subscribers per month. The primary users of the Internet in this era

were multinational corporations, international organizations, and Non-Governmental Organizations (Kenya Internet ICT, 2019). As at 2021, the telephony connection was at about 52.9 million connections with an estimated monthly growth of 139 thousand subscribers per month.

Energy infrastructure investment is one of the main prerequisites for facilitating developing countries to attract more investors (Gakuo, 2015). An economy's electricity production and consumption are primary displays of its size and level of growth. Modern societies increasingly depend on reliable and secure electricity supplies to underpin domestic and foreign investment (United Nations [UN], 2020). The Kenyan electric power generation capacity in megawatt has had a relatively increasing trend from the year 1970 to the year 2021 as seen in Figure 1.3

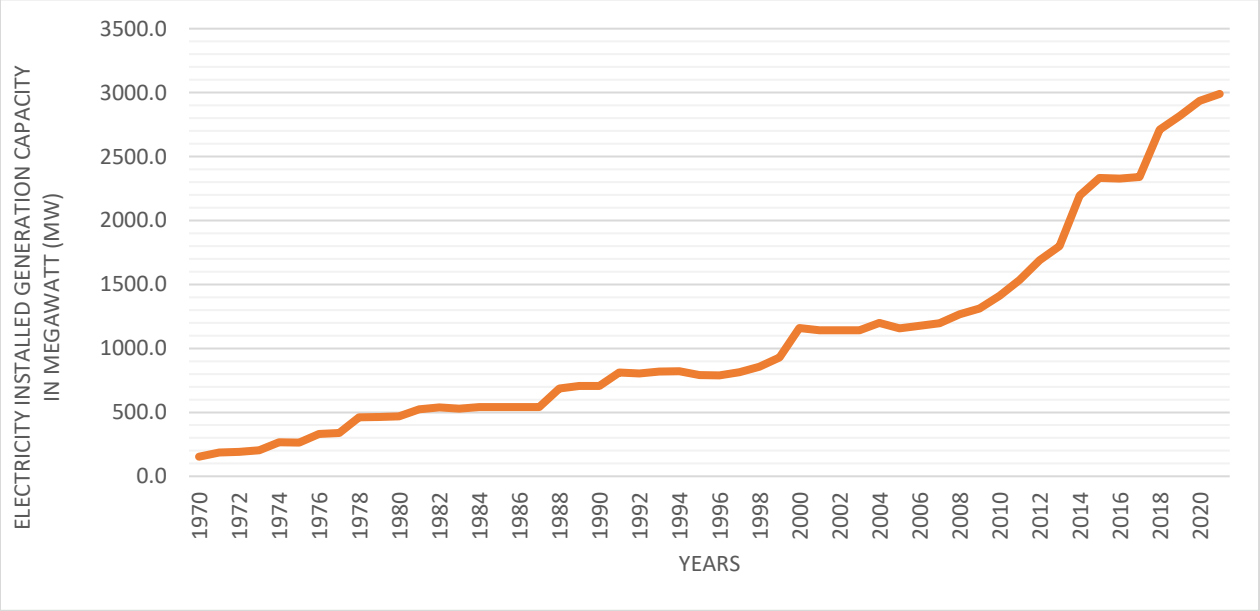

Figure 1.3 Electricity installed generation capacity in megawatt (MW), 1970 - 2021

Source of data: Government of Kenya Statistical Abstract and CBK Annual Reports and Financial Statements.

The predominant source of electricity in Kenya annually has been hydroelectric power and fossil fuels at 52 per cent and 32.5 per cent respectively (Kingori, 2022). By 2022, the country's solar installation had reached 170 megawatts, with about 66 percent of the amount added to its grid in

2021 alone (Coffey, 2023). The collaboration of the Emerging Africa Infrastructure Fund (EAIF) and the Kenyan government in 2020 was the main reason for the solar energy expansion in 2021 (Coffey, 2023). Inter-country profitable and manufacturing solar inventors are expanding the country's clean energy transition to achieve the 2030 energy supply goal.

Despite the substantial role of infrastructure development in economic growth, Kenya still has signs of infrastructure inadequacy.

1.1.2 Trends in FDI

The magnitude of global FDI inflows has been on a higher record in the last two decades. The highest inflow of 3.13 trillion US dollars was recorded in 2007, while 2003 recorded the lowest inflow of 737.22 billion US dollars. As of 2020, the inflow decreased to 1.28 trillion US dollars from 1.7 trillion US dollars in 2019. The decrease was mainly as a result of the widespread Covid-19 pandemic. In 2021, the global FDI inflow increased to 2.1 trillion US dollars since most economies started opening up from the pandemic.

The trend in FDI as against GDP has fluctuated globally in the last two decades, with 2007 recording the highest percentage of 5.3 percent and 2008 recording the lowest percentage of 1.1 percent. There is a decrease in the trend in 2020 from 1.9 percent in 2019 to 1.5 percent in 2020 mainly because of the global pandemic. The year 2021 had an increased proportion of FDI against GDP at 2.1 percent while the percentage decreased in the year 2022 to 1.9 percent.

From 1970 to 1997, Kenya, Ethiopia, Uganda, and Tanzania had relatively the same trend of FDI inflow, as seen in Figure 1.4.

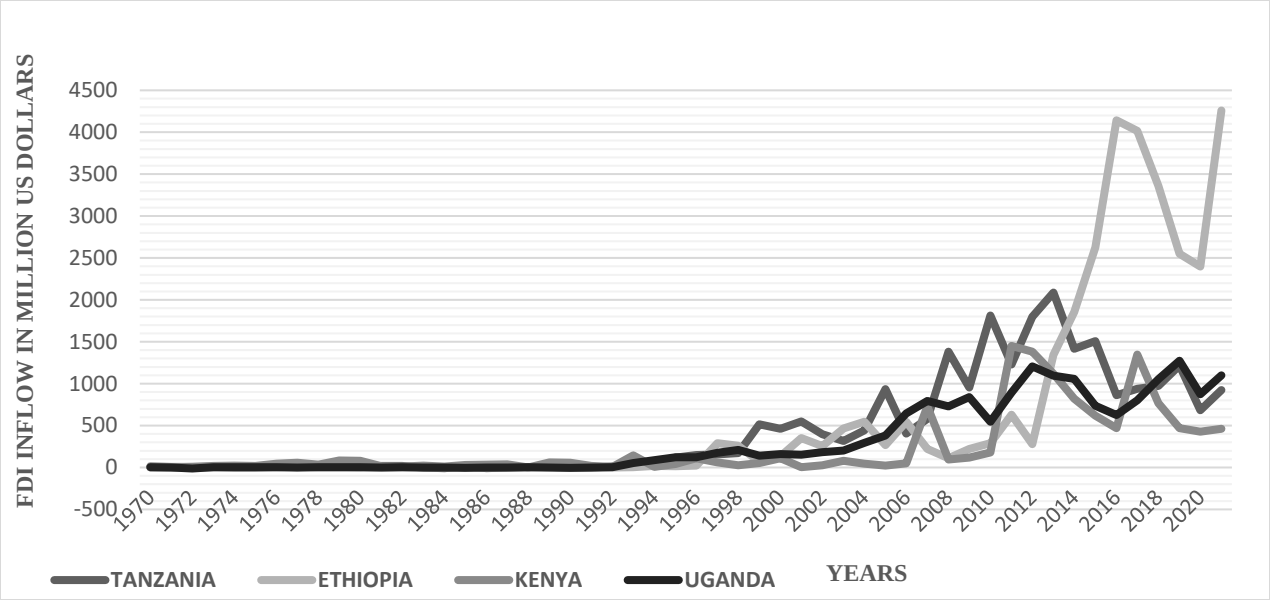

Figure 1.4 Foreign Direct investment inflow in selected East African countries, 1970-2021

Source of data: World Bank, Online Database.

According to Njuguna et al. (2022), Tanzania, Ethiopia, Uganda and Kenya in this order were among the top 20 favorite last stop of FDI in Africa based on the inflows received between the year 2013 to 2015. Tanzania's FDI inflows went to mining of minerals and gas industry. While with limited FDI going to mining, oil and gas exploration, most foreign investment in Kenya and Uganda were in manufacturing and services sectors. Ethiopia's FDI inflows were mostly in manufacturing sector.

From 2005 to 2013, Tanzania became the highest recipient of FDI, except in 2007 and 2011, where Uganda and Kenya were the highest recipients, respectively. FDI inflow in Ethiopia increased from 2013 to 2016 and recorded its highest of 4.142 billion US dollars in 2016. From 2017 to 2020, the Ethiopian trend declined, but it was still the highest recipient compared to the other three countries.

Ethiopia's dominance for several years has been facilitated by investment in the infrastructure sector, real estate, manufacturing, and renewable energy (UNCTAD, 2019). In 2020, there was a

decline in the FDI inflow for all the four countries from the year 2019 mainly because of the widespread of Covid-19 pandemic. However, there was recovery in the FDI inflow for all the countries in the year 2021 where Kenya received 0.463 billion US dollars. Tanzania had 0.922 billion US dollars, while Uganda had 1.1 billion US dollars. Ethiopia dominated the market at 4.26 billion US dollars in the same year.

The trend of foreign direct investment inflow in Kenya have been relatively low and stable from the year 1970 to 2006 when it shot up in 2007, as seen in Figure 1.5.

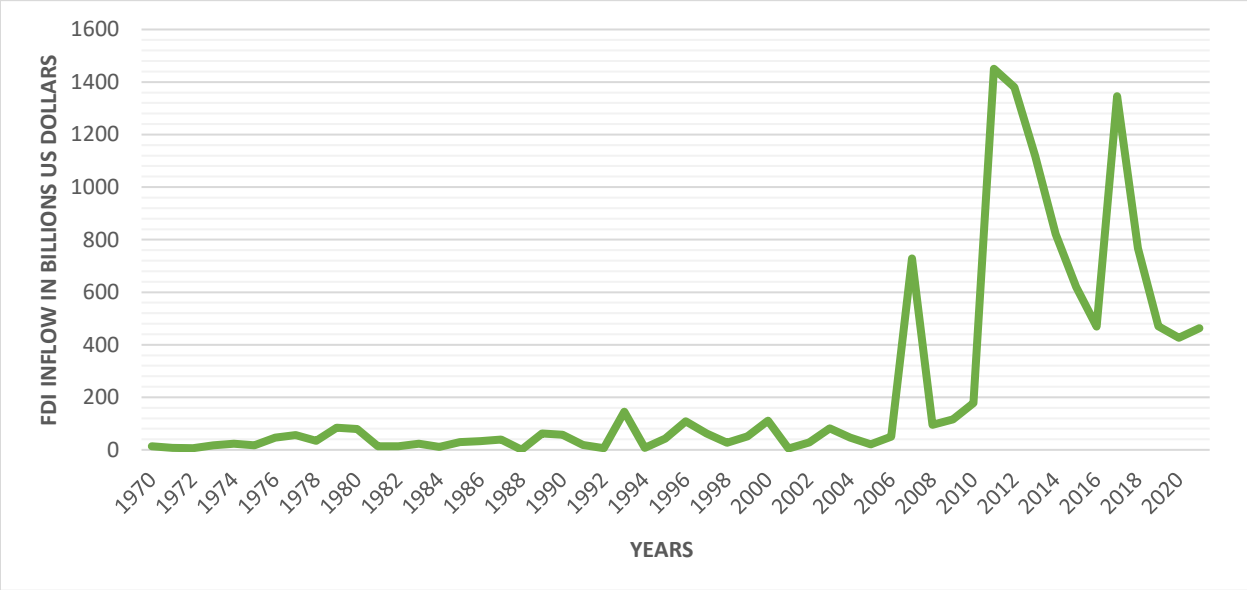

Figure 1.5 Trend in Foreign Direct Investment inflow in Kenya, 1970 - 2021

Source of data: World Bank, Online Database.

FDI inflows declined between the year 2007 and 2008 significantly because of the worldwide financial crisis leading to high global fuel prices. FDI inflows steadily rose from the year 2009 to 2011, reaching the highest mark of 1.45 billion US dollars in 2011, then declined steadily until 2016. The decline in 2016 was mainly attributed to a low level of commodity prices; a problem that affected all commodities dependent economies in Africa (UNCTAD, 2017). The net inflow rose sharply in 2017 to 1.35 billion US dollars, then declined to 0.426 billion US dollars by 2020

due to the global Covid-19 pandemic. There was a slight recovery in 2021 to 0.463 billion US dollars from 0.426 billion US dollars since the economy was steadily recovering from the pandemic.

Implementing the Economic Recovery strategy in 2002 facilitated Kenya's economic growth rate, having come from disappointing economic periods of 1990s (Republic of Kenya, 2003). The reclamation policy was succeeded by Kenya Vision 2030 to spur economic growth by establishing a free-trade zone, terms of trade and business climate improvement, improving infrastructure networks, and commitment to attract FDI to boost industrialization in Kenya (Wekesa et al., 2017).

Therefore, the government prioritized the infrastructure sector to get the first runners-up in budgetary allocation after the education sector through the MTEF (the Republic of Kenya 2007b). From 1971 to 2006, the margin of deviation of FDI inflow has been low, while from 2007 to 2020, the FDI inflow in Kenya has been deviating annually by a more significant margin. This can mainly be attributed to increased infrastructure development that has been evident in the country since the early 2000s (Wekesa et al., 2017).

1.1.3 Trend of Domestic Private Investment in Kenya

Kenya, Uganda, and Tanzania have had relatively similar trend characterizing the domestic private investment against GDP from the year 1990 to 2021, as seen in Figure 1.6.

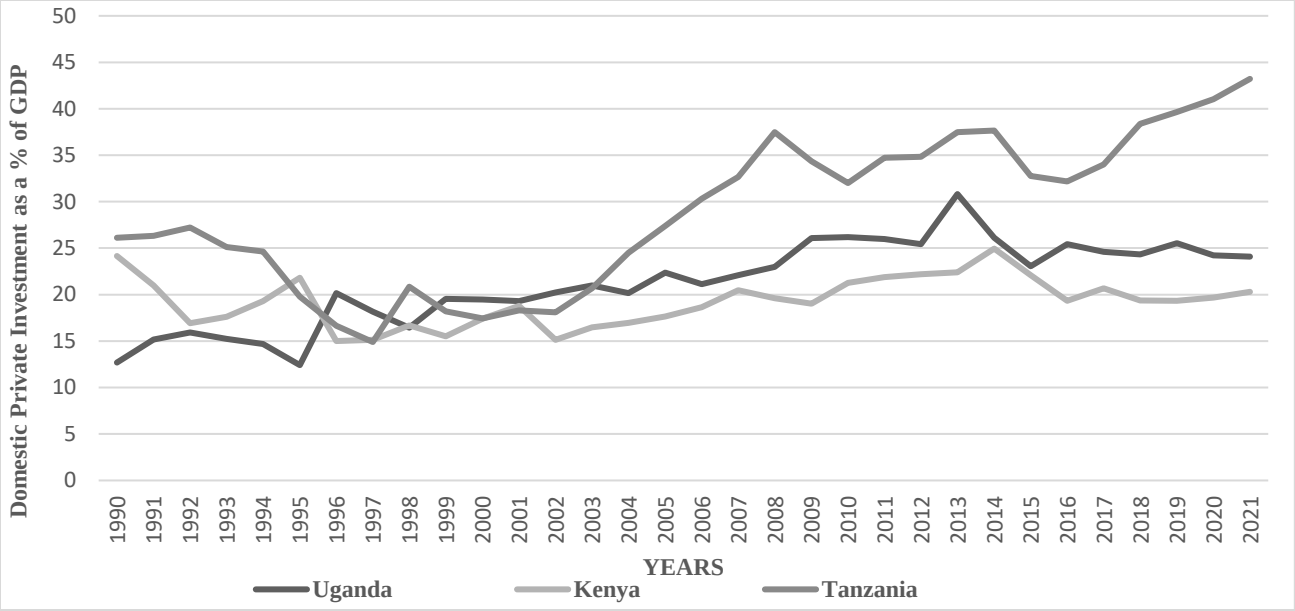

Figure 1.6 Trend in DPI as a percentage of GDP in Kenya, Tanzania and Uganda, 1990-2021

Source of data: World Bank, Online Database.

While Tanzania has dominated the trend from 1990 to 1995 and from 2003 to 2021, Uganda and Kenya have had the same trend from 1996 to 2021, with Uganda being on top of Kenya with relatively same margin annually. Tanzania's growth can be attributed to various government incentives to boost DPIs (Okafor, 2023). Prioritizing the development of infrastructure and political stability, as well as the development of services and tech sectors, has become the main reason for the dominance of Tanzania in comparison to the three nations (Okafor, 2023).

From 1970 to 2005, DPI in Kenya had a low fluctuation annually, with 2005 recording the highest value of KShs 527 trillion while 1973 recorded the lowest value of KShs 203 trillion, as seen in Figure 1.7.

Figure 1.7 Trend in DPI in Kenya, 1970 - 2021

Source of data: World Bank, Online Database.

However, annual DPI values from 2006 to 2021 trended upward steadily, deviating significantly from the mean value between the 1970 to 2005. DPI has been significantly increasing except in 2016 when it decreased to KSh. 1469 trillion, from Ksh 1594 in 2015. There was a slight decrease in 2018 when Kenya recorded KShs 1607 trillion from Ksh 1645 trillion in 2017. The Kenyan government came up with the Investment Climate Action Plan (ICAP) in 2004 to facilitate the operations of private investments in the country. The main purpose of the plans was to review insecurity, vindicate the authorization procedures, and business organization, and, more importantly, improve infrastructure development in the country (Mmeri et al., 2023). Infrastructure development was a significant reason for the change in the DPI trend, as seen from 1970 to 2005, where the margin of deviation was minimal annually, and from 2006 to 2021, where the deviation was more significant (Mmeri et al., 2023).

1.2 Statement of the Problem

Infrastructure development has been prioritized by Kenyan government for more than two decades now since early 2000s. Empirical studies has showed that reliable infrastructure condition the country lowers the operational cost of the enterprises and enhance the investment climate, hence attracting both FDI and DPI in Kenya (Asiedu, 2002; Seetanah, 2009; Rehman et al., 2011; Wekesa et al., 2017; Jaiblai & Shenai, 2019).

However, no study has analyzed whether the growth in infrastructure development is the reason for the structural change in FDI inflow and DPI development in Kenya. Both FDI and DPI in Kenya had a more or less uniform in trend from 1970 to 2006, to a significantly steeper upward trend from 2007 to 2021. This means that there is an observed structural change in both FDI and DPI. Logistic regression was used by the study to explain the shift in the mean values from the low mean observed in 1970-2006 to a higher mean observed in 2007-2021, making this study different from any other study carried out on the subject.

1.3 Research questions

i. What is the effect of infrastructure development on FDI in Kenya?

ii. What is the effect of infrastructure development on DPI in Kenya?

1.4 Objectives of the Study

The general objective is to determine the effect of infrastructure development on FDI and DPI in Kenya. The specific objectives are:

i. To analyze the effect of infrastructure development on FDI in Kenya.

ii. To investigate the effect of infrastructure development on DPI in Kenya

1.5 Significance of the Study

This study will contribute to the fraternity of knowledge on DPI and FDI. It also shows where the country should put effort to attract more economic investment. The result from this study is a

source of required information for implementing national policies to help realize set investment goals.

1.6 Scope of the Study

The study was be constrained from 1970 to 2021 since this is the period when Kenya experienced changes in the DPI and FDI inflow trend. During this period, Kenya implemented various investment policies to attract and boost more investment in Kenya. The study was only be focused on Kenya.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

An overview of the theoretical literature and empirical literature reviewed by previous scholars on the study are well explained in this section. Additionally, the section provides research gap to be filled by this study.

2.2 Theoretical Literature

Various theories that explain the effect of infrastructure development on DPI and FDI in Kenya were reviewed. These theories include flexible accelerator theory on investment, which is the central theory of the study, the Eclectic Paradigm, Tobin's q and the neoclassical theory. The theories are discussed below.

2.2.1 Eclectic Paradigm

The Paradigm was established by Dunning in 1973, 1980, and 1988. It integrates three theories of FDI; Ownership, Location, and Internalization advantages. The theory postulates that firms only embrace FDI when in possession of specific Ownership advantages (O) required to produce products or services in particular foreign Locations (L), and it has been determined that there is no other profitable way of following through the production other than Internalization (I).In this case, ownership advantages refer to the exclusive possession of valuable and unique assets necessary for the production process. The asset gives the foreign company a competitive advantage over other competitors.

Since venturing into foreign markets has various barriers such as language barriers and increased operational costs for multinational companies(MNCs), the MNCs need to possess specific

'elements' that give them an edge over their competitors in order to make a profit. Some of the elements include but are not limited to technological know-how, trademarks, and greater access to financial capital. Ownership of the specific elements enables the MNCs to either make significantly higher profit margins or to substantially lower the MC than competitors in in the foreign market (Dunning, 1973, 1980, 1988).

After the fulfillment of the ownership advantage, foreign firms need to consider the location advantages before embracing FDI. Locational advantages are geographical factors in the potential host countries that give production in those countries a competitive advantage over the MNCs' home countries. The geographical factors are usually immobile and can be either natural or artificial. Their immobility makes it impossible for them to be fully exploited unless a foreign firm partners with the host country. They include factors such as favorable government policies, raw materials, cultural diversity, cheap labor, and technological advancements, amongst others (Rahman et al., 2020).

Under Internalization advantage, the MNCs assess whether it is more profitable to produce their products in-house or to outsource the production process to a local company. In the incident that outsourcing is more profitable, then firms will not opt for FDI. They will either enter into partnerships with local companies in the foreign markets or purchase existing companies in the market. However, if in-house operation is more profitable, then foreign firms will internationalize (Hendriks, 2020).

Although Dunning empirically tested the Eclectic Paradigm Theory, it has some limitations, making it inefficient for this study. Critics have pointed out that the theory is unable to account for the ensuing increases in FDI and that it is operationally impractical since it incorporates way too many variables (Urfa et al., 2021).

2.2.2 Neoclassical Theory

Neoclassical theory (1963) assumes that firms utilize the Cobb-Douglas production technology in maximizing their value/profit. According to the theory, investment is subject to capital stock change over time, i.e., distributed lag expression. Capital stock is contingent upon the output price, output level, tax rate, real interest rate, and user cost of capital (Ngoma et al., 2019). The output price is derived from the cost of investment goods and wages (Ndolo, 2017). As such, profit is maximized under the condition that profit = Sales – Wages –the cost of investment goods. This can be expressed as:

$$\pi = P_t Y_t - P_t^I I_t - N_t W_t \quad \text{..... (2.1)}$$

Where:

π – Profit

P_t – Price of output

Y_t – Output

P_t^I – Price of investment goods

I_t – Investment goods

N_t – Labour force

W_t – Wage rate

t – Time period (the flow of profits is discounted over an indefinite period of time)

The function below gives the value of all ensuing profit flows

$$PV_0 = \sum_0^{\propto} \frac{1}{(1+r)^t}(P_t Y_t - P_t^I I_t - N_t W_t) \ldots\ldots\ldots\ldots\ldots (2.2)$$

The neoclassical model identifies other vital variables, such as output level, tax, and interest rates, which are vital in determining investment decisions (Celik, 2020). However, the theory is marred with several limitations, making it inefficient for this study. The theory assumes that there is no uncertainty such that firms maximize their current value and future profit with clear knowledge of all the values that will be obtained in the future (Girardi, 2021). These assumptions are not valid in a natural business environment since investors occasionally delay making investment decisions due to uncertainty and lack of foresight of how the economic conditions will turn out (Celik, 2020).

2.2.3 Tobin's q Theory

Tobin Q's was put forward by Brainard et al. in 1968 and Tobin in 1969, 1978. The theory states that the Q ratio determines the investment; if the ratio is more significant than one, firms will invest; if it is less than one, there will be no investment (Celik, 2020). In determining the inducement to invest, the theory considers present and future profitability of the firm's capital assets (Celik, 2020). It operates on the rationale that there is no point in making new investments if the cost of replacing the existing investment is higher than that of making the new investments (Celik, 2020). The theory helps predict investment behavior since it evaluates the value of a firm and indicates whether it is under-valued or over-valued based on its valuation to its replacement cost. Under-valued firms have a q ratio of less than one, while over-valued, greater than 1 (Celik, 2020).

However, despite its usefulness in explaining investment, the theory has some glaring weaknesses, making it inefficient for this study. The exact cost required in the computation of the q ratio is hard

to determine due to the existence of different tax policies and depreciation methods. Also, the Q ratio is correlated to many variables, resulting in the problem of multicollinearity when the model is extended in empirical research (Celik, 2020).

2.2.4 Flexible Accelerator Theory

Flexible accelerator theory was first developed by Goodwin (1948) and then later modified by Chenery (1952), Koyck (1954), Lucas (1967), and Gould (1968). The theory is a modification of simple accelerator model, which postulated that change in investment is directly proportional to changes in national output and income (Celik, 2020). The simple version of the theory had a fatal flaw; the model assumed that capital stock adjusted instantaneously to changes in output. The flexible Accelerator solves the problem by introducing the element of time lags in the relationship between investment and changes in output.

According to the flexible Accelerator, an enterprise’s initial stock is influenced by the expectation of future output. The model further acknowledges that the firms' expected level of investment stock fluctuates over the years. The lagging of geometric distribution characterizes the time element of the investment process (Ndolo, 2017). The lagging shows the difference between deviations in demand and new asset accumulations and carters for delays between investment decisions and expenditures (Celik, 2020).

According to the theory, firms' expectation of future output is pegged on the past output of the specific firms, the industries in which the firms are located, or both (Ndolo, 2017). In light of this, firms will consider their past output while investing capital in domestic and foreign markets (DPI and FDI). However, since firms are still determining future demand and the additional costs that arise from immediate payments, the lagged capital adjustment process is essential in explaining

the relationship between output and capital stock (Ndolo, 2017). The flexible accelerator model explaining the relationship is as follows;

$$KS = S(Y, UC, PO) \text{ ……. (2.3)}$$

Where:

KS - Capital stock at equilibrium

Y – Level of Output

UC – User Cost

PO – Output Price

The stock of capital is assumed to depend on previous output, with a geometrically declining weight level (Joyce, 1954). The investment lag is described as follows;

$$Q_t = g(O_t, O_{t-1}, O_{t-2}, O_{t-3}, , , , , , O_{t-n} \text{ …….. (2.4)}$$

According to the theory, capital stock is expanded till the user cost becomes equal to the marginal profit, implying that in terms of DPI and FDI, firms will keep expanding their capital stock until the investment costs become equal to the marginal profits (Celik, 2020). However, since investment in this model is independent of capital prices, critics argue that the model needs a solid theoretical foundation. While this might be true, the model's empirical application is widely supported. Studies reveal that the flexible accelerator model is one of the most used models in applied work compared to all other investment models (Twine et al., 2015). In addition to its popularity in the empirical application, the model also acknowledges that expansions in infrastructure significantly influence investment (Celik, 2020). The strengths of the flexible accelerator model make it the ideal theory for the study.

2.3 Empirical Literature

Critiques of different dissertations conducted on the effect of infrastructure development on FDI and DPI in Kenya are well explained in this section.

Shahbaz et al. (2021) analyzed various factors that determine of FDI growth rate in France. The research employed the SOR unit root test to examine variables' unit root properties and the bootstrapping ARDL cointegration test to test for cointegration between variables, using annual time series data from 1965-2017. A positive relationship was evident between transport infrastructures and, while that between energy and FDI was bidirectional.

Mehmood et al. (2021) analyzed infrastructure development and FDI in China using ARDL and VECM on a 30-indicator composite index of infrastructure index constructed from annual data from 1988 to 2017. Indicators used in constructing the composite index of infrastructure were hinged on energy, transport, Internet & Communications Technology (ICT), and financial infrastructure. The empirical findings from the study showed a very significant effect of infrastructure development on sectorial FDI in the long run. Infrastructure positively impacted sectoral FDI in China.

Nguea (2020) explored the impact of the development of infrastructure on FDI particularly in Cameroon. The aim of the study was to probe into how energy, transport and communication infrastructure affect FDI inflow in Cameroon. The research utilized the ARDL and a VECM using yearly data from 1983-2014. The study found a significant correlation between ICT & energy infrastructure on FDI inflow. ICT positively impacted FDI, while the effect of energy infrastructure was negative. There was no statistical relationship between transport infrastructure and FDI inflow in Cameroon.

Shenai and Jaiblai (2019) analyzed factors determining FDI inflow in SSA economies using yearly data from 1990–2017. The research was based on ten SSA economies; Liberia, Mali, Mauritania, Senegal, Nigeria, Sierra Leone, Ghana, Ivory Coast, Cameroon, and Niger. The dissertation utilized the Unit root test of Stationarity and the ARDL approach to cointegration on a cross-sectional data covering 1990–2017. The research uncovered a significant and direct association between infrastructure and FDI. The dissertation concluded that countries with better infrastructure attracted higher FDI inflows.

Aladejare (2022) conducted a study on human health, development of infrastructure, and FDI inflows to various African regions. The study investigated the impact of human health, development of infrastructure on FDI inflows in Africa's three largest economic regions; COMESA, SADC, and ECOWAS. The dissertation utilized the Dynamic Ordinary Least Squares (DOLS) model to analyze panel data drawn from 40 countries from 1980 – 2017. The research uncovered a significant and direct effect of infrastructure development and FDI.

Kingori (2022) analyzed the effect of infrastructure development on FDI behavior in Kenya. Granger causality test verified the study's null hypotheses. The models were employed on an infrastructure composite index constructed from data from 1970 – 2019. The infrastructure composite index was based on transport, ICT, energy, and water infrastructure. The study uncovered a significant bi-directional association between infrastructure development and FDI in Kenya. Transport and water infrastructure positively influence FDI inflow, while ICT infrastructure negatively impacts FDI in the short run.

Ahmed (2021) studied the determinants of FDI inflow in Kenya. The variables under research were trade openness, interest rate, GDP, rate of inflation, exchange rate, and growth of infrastructure. The dissertation utilized the ARDL Model with a Bound Test for Cointegration on

multivariate time series data for 1970-2020. The survey revealed a significant indirect relationship between infrastructure and FDI inflow in Kenya.

Wekesa et al. (2016) studied the effect of infrastructure development on FDI in Kenya. The desertion strived to investigate the impact of communication, water & waste, transport, and energy infrastructure on FDI inflows in Kenya. Multiple regression model was employed on time series data for 1970 – 2013. The results of the research uncovered a significant and positive relationship between all the infrastructure variables and FDI.

Nyaosi (2011) explored the effect of infrastructure on FDI in Kenya. OLS and ECM models were used to test how the variables are related. The model was employed on a composite index of infrastructure constructed using the principal component analysis (PCA) methodology. The composite index of infrastructure was constructed based on energy, transport, and communication infrastructure using data from 1980 – 2008. The dissertation unveiled a significant and direct relationship between infrastructure and FDI.

Abbas et al. (2022) carried out an empirical investigation of private sector investment sector-wise for a small open economy. The dissertation utilized the ARDL model on data from Pakistan from 1964 to 2015. The research uncovered a significant and positive relationship between infrastructure development and DPI.

Ababio (2019) explored the determinants of DPI, the role of FDI, and the growth of economic development in frontier markets. The research utilized dynamic panel generalized moments (System-GMM) methods on time series data from 20 countries for 2005 – 2014. The 20 countries were frontier markets selected from various geographical regions across the globe, including; Latin America, Africa, and the Mediterranean area of Europe. The dissertation unveiled a significant and positive relationship between infrastructure development and DPI.

Agyei (2019) conducted a study to assess the relationship between public investment and private investment in the SSA. PVAR on panel data from 48 African countries from 1990 to 2009 was employed for the study. The dissertation unveiled an important and positive association between both public & private infrastructure and domestic private investment.

Marbuah and Frimpong (2010) explored the factors determining private sector investment in Ghana. The research embraced the unit root tests for stationarity and ECM within an ARDL model on time series data for 1970 – 2002. The dissertation's results revealed an important positive correlation between DPI and public investment in Ghana. The dissertation defined public investment as an investment in infrastructure, particularly transport, communication, and irrigation projects.

Lelei (2020) probed into how government infrastructural spending affect domestic manufacture performance in Kenya. The dissertation emphasized the effect of ICT, Energy, and Transport infrastructure on DPI in Kenya. The research utilized annual data from 1990 to 2018. Using the OLS method, the multiple linear regression was estimated, and the results showed that energy, ICT, and transport are statistically significant determinants of DPI in Kenya.

2.4 Overview of the Literature and the Research Gap

The four theoretical literature theories reviewed in this study are flexible accelerator theory on investment, which is the central theory of the study, the Eclectic Paradigm, Tobin's q and the neoclassical theory. Studies on the effect of infrastructure development on FDI and DPI have been done in Kenya, regionally, and internationally. While time series data was the primary type of data used for the studies, ARDL was the primary model used in the empirical studies. Although studies have been done on the effect of infrastructure development on FDI and DPI, there is no study that has analyzed whether the growth in infrastructure development is the reason for the structural

change in FDI inflow and DPI development in Kenya. FDI and DPI in Kenya had a more or less uniform in trend from 1970 to 2006, to a significantly steeper upward trend from 2007 to 2021. This means that there is an observed structural change in both FDI and DPI. Logistic regression was used in the study to explain the shift in the mean values from the low mean observed in 1970-2006 to a higher mean observed in 2007-2021, making this study different from any other study carried out on the subject.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The methodology used to achieve the study objectives was the main focus of this section. Research design, theoretical framework, empirical model, definition of variables and their measurements, and data analysis are well explained in this section.

3.2 Research Design

Quantitative research design to analyze the effect of infrastructure development on DPI and FDI in Kenya was used in the study. The design was the most suitable for the study since it shows the causal relationship in the study. The quantitative data was collected from KNBS and World Bank on infrastructure variables, DPI, FDI, and various control variables for 51 years from 1970 to 2021

3.3 Theoretical Framework

The study used Flexible Accelerator model to express the relationships in the study. The model shows that a firm's output level depends on both capital input and the investment climate. According to the model, the relationship between investment and output is based mainly on the climatic condition of the investment in any given country. The appealing element for firms to invest domestically or in foreign countries is the net return on capital invested. The model applies lags in expressing the relationship between capital stock and net operationalization output.

$$KE = K(O, UC, PO) \quad \ldots\ldots (3.1)$$

Where:

KE – Stock of capital at equilibrium

O – Output

UC – User Cost

PO – Price of output

The theory assumes that the decision of the firm towards the quantity of capital stock to invest is determined by past output levels that is declining geometrically.

$$K_t = v(O_t, O_{t-2}, O_{t-3}, \dots, O_{t-n}) \quad \text{(3.2)}$$

Where K_t is the stock of capital at equilibrium at time t.

K_t is expanded until user cost equals to marginal profit. The mathematical demonstration of the model makes it non-generalizable. The model expresses O_t as a function of O_{t-1} and other indices, with the assumption that the present output is being determined by the previous outputs and other variables. Therefore, investment results from the changes in the capital stock, and is expressed as.

$$I_t = K_{t+1} + K_t + \alpha K_t \quad \text{(3.3)}$$

Where:

I_t - is gross investment at time t

K_t - is gross capital stock at time t

K_{t+1} – Capital stock at time t+1

αK_{t+1} – Depreciation of capital at period t, also represented as I_t^r

This means that

$$I_t = I_t^n + I_t^r \quad \text{(3.4)}$$

Where:

I_t^n - is net investment

The stock of capital at equilibrium, KE, is inversely related to the actual capital cost. This is derived from the Cobb-Douglas function expressed as

$$Y = AK^{\beta}L^{1-\beta} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.5)$$

The expansion of the theory leads to the marginal cost, being equals to marginal product. The capital marginal product is therefore expressed as:

$$MPK = \frac{c}{p} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.6)$$

There is no evidenced development in the user cost of capital. Hence the net investment is expressed as:

$$I_t^n = \Delta\text{KE} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.7)$$

The basic accelerator standard is that investment has a relationship with the output. The net total investment is therefore stated as

$$I_t^n = K_t - K_{t-1} = \delta(O_t - O_{t-1}) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.8)$$

The net investment entails both DPI and FDI and is expressed as:

$$I_t^n = I_f^n + I_d^n \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.9)$$

Where:

I_f^n – is foreign direct investment

I_d^n – is domestic private investment

The magnitude of FDI (I_f^n) inflow and the growth in the domestic private investment (I_d^n) in a country is determined by common factors that are mainly in the host country.

$$I_f^n = f(\psi)\ldots\ldots\ldots\ldots\ldots \quad (3.10)$$

$$I_d^n = f(\psi)\ldots\ldots\ldots\ldots\ldots \quad (3.11)$$

Where ψ represent all factors that influence investment development in the country. The main components ψ include: infrastructure development, GDP, inflation rate and exchange rate.

3.4 Model Specification

From equations (3.10) and (3.11), FDI and DPI are a function of the variables denoted as ψ, which represent all variables that influence investment in a country. These variables include infrastructure development (IFD), GDP, Inflation rate (INR), and Exchange rate (ER). Empirical effect of infrastructure development on FDI and DPI has been widely discussed in the literature. With infrastructure development contributing directly to any nation's investment and particularly economic growth (Rehman et al., 2011), the study expects a positive and a significant effect of transport, ICT and energy infrastructure on both FDI and DPI in Kenya.

Growth in Kenyan economic size (GDP) is a prerequisite for the growth of FDI and DPI in the country. A large economy hypothetically increases the feasibility of investments, since it offers economies of scale and the possibility that the goods and services will sell in the host economy market-seeking investment scenarios (Njuguna, et al., 2022).The study expect a positive effect of GDP on DPI and FDI in Kenya. While exchange rate appreciation dampens investment by increasing the importation cost of intermediate inputs, the appreciation increases the demands in both export and domestic markets therefore reducing the growth of both DPI and FDI in an economy. The study expects a negative effect of exchange rate on both DPI and FDI. Relatively low and regulated inflation rate reflects a relatively stable macroeconomic environment, which is

necessary for the growth of investment. The study therefore expects a negative association between inflation rate and the growth of FDI and DPI in Kenya

Equations (3.10) and (3.11) is expressed as:

$$I_f^n = IFD + CVs \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(3.12)}$$

$$I_d^n = IFD + CVs \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(3.13)}$$

Where:

IFD – is infrastructure development

CVs– is control variables.

To fill the study gap on the change in slope of FDI and DPI in the country, the study used logistic regression with reference to Greene (2018). From Figure 1.5 and Figure 1.7, there are evidenced structural changes in FDI and DPI trends respectively. From 1970 to 2006, the trend of FDI inflow in Kenya was relatively low with a very low annual volatility. The mean value of the FDI inflow from 1970 to 2006 was 40 million US dollars. From 2007 to 2021, there was a very high change of annual FDI inflow in the country with a mean of 696.8 million US dollar. Like FDI, the trend in Domestic Private Investment in Kenya has been very low from the year 1970 to 2006, with a mean of KSh. 327.7 billion. From 2007 to 2021, DPI had a significant annual change in the trend, resulting to a higher mean of KSh. 1.38 trillion between the year 2007 to 2021.

Therefore, in this study, the dependent variable was expressed as binary where it took the value of 0 for the low mean observed between the year 1970-2006 and took the value of 1 for the high mean observed between the years 2007-2021.

Letting p = P(Y=1), (1-p) = P (Y=0), the logistic regression model is expressed as:

$$ln\left(\frac{p}{1-p}\right)=\beta_o + \sum_{j=1}^{k} \beta_j X_j \ldots\ldots (3.14)$$

Where β_o is the intercept and β_j is the coefficient of regression of the j^{th} predictor, j= 1, 2... k. Equation (3.14) can be equivalently expressed as

$$P=\frac{\exp(\beta_o+\sum_{j=1}^{k} \beta_j X_j)}{1+\exp(\beta_o+\sum_{j=1}^{k} \beta_j X_j)} \ldots\ldots (3.15)$$

To achieve the logistic regression goal, a model is created that include all predictor variables that are necessary in predicting the response variable. Logistic regression therefore calculate the probability of success over the probability of failure. Odd ratio results are therefore in the form of:

$$\frac{p}{1-p}= \exp(\beta_o +\sum_{j=1}^{k} \beta_j X_j) \ldots\ldots (3.16)$$

The odds ratio which is the descriptive statistic plays a significant role in the logistic regression. The odds ratios describes the strength of relationship between the two binary data set. While each explanatory variable is tested for its statistical significance, the respective odds ratio (OR) for the respective explanatory variable is computed as

$$(OR)_j = \exp(\hat{\beta}_j) \ldots\ldots (3.17)$$

Where:

$\hat{\beta}_j$ is the parameter estimate for the regression coefficient β_j

Odds ratio (OR) therefore estimated the changes in the odds of membership in the target group for a unit change in the predictor.

Maximum likelihood method was used to estimate the model parameters while the validity of the model was done using Wald x^2 and likelihood ratio test. The likelihood for any model is deduced

as the joint probability of the observed outcome as a function of the respective regression model. The coefficients are estimated by maximizing their respective probabilities. The likelihood function for estimating the parameters is expressed as

$\tilde{\beta} = (\beta_o, \beta_1, \beta_2, \beta_3, \ldots, \beta_k)'$ ..... (3.18)

$L(\tilde{\beta}) = \prod_{i=1}^{n} \{p^{yi} (1-p)^{1-yi}\}$ ..... (3.19)

Equation (3.19) is therefore expressed as

$L(\tilde{\beta}) = \prod_{i=1}^{n} \left(\frac{\exp(\beta_o + \sum_{j=1}^{k} \beta_j X_{ij})}{1+\exp(\beta_o + \sum_{j=1}^{k} \beta_i X_{ij})}\right)^{yi} \left(\frac{1}{1+\exp(\beta_o + \sum_{j=1}^{k} \beta_j X_{ij})}\right)^{1-yi}$ ..... (3.20)

Getting the log of the likelihood function facilitates the maximization process to estimate the coefficient. The log likelihood function is therefore expressed as

$Log\ L(\tilde{\beta}) = \sum_{i=1}^{n} (\beta_o + \sum_{j=1}^{k} \beta_j X_{ij})\ yi - \sum_{i=1}^{n} log(1 + \exp(\beta_o + \sum_{j=1}^{k} \beta_i X_{ij}))$..... (3.21)

The log-likelihood equations for estimating $\tilde{\beta}$ is therefore expressed as

$\frac{\partial l(\tilde{\beta})}{\partial \beta_o} = \sum_{i=1}^{n} y_i - \sum_{i=1}^{n} \frac{\left(\exp(\beta_o + \sum_{j=1}^{k} \beta_j X_{ij})\right)}{1+\exp(\beta_o + \sum_{j=1}^{k} \beta_i X_{ij})} = 0$ ……(3.22)

$\frac{\partial l(\tilde{\beta})}{\partial \beta j} = \sum_{i=1}^{n} y_i\, x_{ij} - \sum_{i=1}^{n} x_{ij} \frac{\left(\exp(\beta_o + \sum_{j=1}^{k} \beta_j X_{ij})\right)}{1+\exp(\beta_o + \sum_{j=1}^{k} \beta_i X_{ij})} = 0, \qquad j = 1,2,3 \ldots\ldots k$ ..... (3.23)

In order determine the maximization process of the coefficients, first and second derivatives of the log-likelihood functions are required. The prerequisite and sufficient condition to find the optimal values are obtained if first order condition equals to zero while second order condition is less than zero. The derived log likelihood equations (3.22) and (3.23) was used to model objective one and objective two independently since the two objectives were answered using two different models.

3.5 Definition and Measurement of Variable

The study factored three components of infrastructure. These are: ICT infrastructure, Transport infrastructure and Energy infrastructure. The control variables for the study were GDP growth rate, Exchange rate and Inflation rate. The dependent variables are FDI and DPI. These variables are defined below. The sources of data are also mentioned.

Table 3.1 Model Variables

Variables	Definition and measurement	Source
Energy Infrastructure (EI)	Is the large-scale accessibility and reliability of energy supply and consumption in Kenya. Measured as annual electricity installed generation capacity in megawatts	KNBS
Transport Infrastructure (TI)	Framework that facilitate the transportation in the country as well as across the borders of Kenya. Measured in terms of annual length in kilometers of paved roads in Kenya.	KNBS
Information Communication and Technology (ICT)	Represents the hard-wares, soft-wares and internet connectivity that are necessary for communication services in the country. Measured in terms of annual telephony connections that include mobile cellular and fixed telephone connections in Kenya.	KNBS
Exchange rate (ER)	Rate of exchange of domestic currency to foreign currency. Measured as annual KShs/USD	CBK
Foreign Direct Investment (FDI)	Is where an investor creates a lasting interest over an enterprise in another country. It is represented as binary variable whereby it take the value of 0 for the low mean observed between the year 1970-2006 and takes the value of 1 for the higher mean observed between the years 2007-2021	World Bank

Domestic Private Investment (DPI)	Represents the amount of capital domestic investors invests in their own country. It is represented as binary variable whereby it take the value of 0 for the low mean observed between the year 1970-2006 and takes the value of 1 for the higher mean observed between the years 2007-2021	World Bank
Gross Domestic Product (GDP)	Refers to the measurement of economic growth. Measured in annual percentage	CBK
Inflation rate (IR)	The general rise in prices level in the country. Measured as yearly percentage change of CPI.	CBK

3.6 Data Analysis

From Figure 1.5 and Figure 1.7, there are evidenced structural changes in FDI and DPI trends respectively. The mean value of FDI inflow from 1970 to 2006 was 40 million US dollars, a very low value, due to the low annual trend of FDI inflow in the country between 1970 and 2006. From 2007 to 2021, there was an evidenced change in the FDI trend in the country, resulting to a high mean of 696.8 million US dollar. On the other hand, the mean trend of DPI was KSh. 327.7 billion from 1970 to 2006, due to low DPI trend in the country. From 2007 to 2021, the mean value was KSh 1.38 trillion due to the increasing trend of DPI developments in the country. To answer both the first and second objectives, logistic regression was used where the dependent variables were expressed as binary. On both FDI and DPI equations, the binary dependent variable took the value of 0 for the low mean in the period 1970-2006 and took the value of 1 for the higher mean in the period 2007-2021.

CHAPTER FOUR

DATA ANALYSIS

4.1 Introduction

The analysis of empirical findings and descriptive statistics are presented in this chapter. Summary of descriptive statistics is discussed in Section 4.2 while the analysis of empirical findings is provided in Section 4.3.

4.2 Descriptive Statistics

Descriptive statistics provides summary of characteristics of variables used in the study. Table 4.1 presents the calculated statistics using annual data from 1970 to 2021, a total of 52 observations.

Table 4.1 Descriptive Statistics

Variables	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
Inflation rate	1.55	45.98	11.4	7.97	2.03	6.14
Exchange rate	7	109.64	50.21	35.95	0.07	-1.58
GDP growth rate	-0.8	9.45	4.02	2.41	-0.08	-0.63
Energy Capacity (Megawatts)	153.21	2990	1069.2	766.69	1.13	0.46
Transport (Kilometers)	2936	22583	9053.6	4616.09	1.37	1.83
ICT (Telephony connection)	35.54	52925.44	9366.9	16129.39	1.59	1.12

Source: Author's compilation using study data, 2024.

The mean value of the annual electricity generation capacity in Kenya was 1,069.2 megawatts with a deviation of 766.69 megawatts from the mean. Energy production capacity had a positive skewness with the highest value of 2,990 megawatts recorded in 2021 and a minimum value of 153.21 megawatts in 1970. It is therefore evident that annual electricity generation capacity in

megawatts has grown significantly following the implementation of economic transformation reforms as well as significant government investment in the energy sector.

Annual length of paved roads in Kenya was averaging at 9,053.6 kilometers with the deviation from the mean at 4,616.09 kilometers. The year 2021 showed the maximum length of paved roads in Kenya at 22,583 kilometers while as at 1970, Kenya had the lowest length of paved roads at 2,936 kilometers. The growth in transport infrastructure development in the country has been attributed by increased resources allocation on the department by the various medium-term expenditure frameworks (Republic of Kenya, 2022).

Annual telephony connections' mean statistic was at 9.4 million subscribers, with 2021 recording the highest number of users at about 52.9 million. By 1970, Kenya had the lowest telephony connection users at 35,000 subscribers. The deviation from the mean was at 16.1 million users, with a positive skewness. The entry of more internet service providers in the country by late 1990s created competition to Fortinet; the first internet service provider in the country, and boosted the quality and the supply of internet services in the country. Other variables in the study such as exchange rate, inflation rate and GDP growth rate were used as control variables in the study. All their standard deviations were lower than their respective means showing a lower deviation from the mean of the respective variables.

4.3 Analysis of Empirical Findings

As described in chapter three of the study, logistic regression was applied to achieve the objectives of the study. The results are presented in Sections 4.3.1 and 4.3.2 below.

4.3.1 Effect of Infrastructure Development on Foreign Direct Investment in Kenya

The first objective was to analyse the effect of infrastructure development on foreign direct investment in Kenya. The logistic regression required the study to estimate the non-linear coefficients as shown in Table 4.2. Since the coefficients of the logistic regression are not directly interpreted, the marginal effects were calculated as provided in Table 4.3. The marginal effects show the change in probability of attaining higher FDI given an improvement in infrastructure development as well as changes in other control variables.

Table 4.2 Estimated Logistic Regression: Effect of Infrastructure Development on FDI

Variables	Coef.	Std. Err.	z	P>z
Transport	0.7466	0.6496	1.15	0.25
ICT	2.1892**	1.0266	2.13	0.033
Energy	2.1723**	1.0991	1.98	0.048
GDP growth rate	-2.3018	1.6701	-1.38	0.168
Exchange rate	-2.6573	2.5113	-1.16	0.29
Inflation rate	1.5126	2.0825	0.73	0.468
Constant	-12.5662**	4.4786	-2.81	0.005
Log likelihood = -16.4492 Number of obs = 52 LR chi2(6) = 36.39 (Prob > chi2 = 0.000) Pseudo R2 = 0.5252				

Note: ** Significant at 5 per cent.

Source: Author's compilation using study data, 2024.

As indicated in Table 4.2, Transport infrastructure, ICT infrastructure and Energy infrastructure are having positive coefficients of 0.7466, 2.1892 and 2.1723, respectively. The coefficients of both ICT and Energy infrastructure are statistically significant since they have P-values of 0.033 and 0.048, respectively which are all less than 0.05 at 5 per cent level of significance. The

coefficient of Transport infrastructure is statistically insignificant at 5 per cent level of significance since it has a P-Value of 0.25, which is greater than 0.05.

The study expected positive and significant coefficients for ICT Infrastructure, Transport Infrastructure and Energy infrastructure. The insignificant coefficient of Transport infrastructure might be due to the fact that other means of transport like air and sea were not considered in the calculation of transport infrastructure index. Moreover, as mentioned earlier, most of the FDI inflows in Kenya go to manufacturing and services sectors. Hence, manufacturing sector requires vibrant and efficient energy sector while services sector grows with ICT and digitization of the Kenyan economy as in the case of m-pesa services, a mobile based financial technology (Wachira & Njuguna, 2023)

While GDP growth rate and Exchange rate yield negative coefficients of -2.3018 and -2.6573, respectively, Inflation rate has a positive coefficient of 1.5126. The coefficients of GDP growth rate, Exchange rate and Inflation rate are all statistically insignificant since they have P- Values of 0.168, 0.29 and 0.468, respectively which are all greater than 0.05 at 5 per cent level of significance.

The Pseudo R squared which shows the model's goodness of fit is at 0.53. Therefore, 53 percent of the variables in the model explained FDI. The likelihood ratio statistic of 36.36 is statistically significant since it has a P-value of approximately 0.000, which is lower than 0.05 at 5 percent level of significance. Therefore, the coefficients are jointly significant.

Table 4.3 Marginal Effect of Infrastructure Development and Control Variables on FDI

Variable	dy/dx	Std.Err.	z	P>z
Transport	0.1604	0.145	1.11	0.269
ICT	0.4703**	0.2176	2.16	0.031
Energy	0.4667**	0.2324	2.01	0.045
GDP growth rate	-0.4945	0.3447	-1.44	0.151
Exchange rate	-0.5707	0.5391	-1.04	0.29
Inflation rate	0.325	0.4352	0.75	0.455

Note: ** Significant at 5 per cent.

Source: Author's compilation using study data, 2024.

From the result in Table 4.3 above, the calculated marginal effect of ICT on FDI is statistically significant at 5 percent level of significance since it has a P-value of 0.031, which is less than 0.05. This implies that ICT has a positive and significant effect on FDI. Therefore, increasing the telephony connection by one subscriber will increase the probability of obtaining higher FDI inflow in Kenya by 0.47. The positive and significant effect of ICT in attracting higher FDI is an important indication that ICT is a key channel through which economy can attract investors in the country. This can be attributed to the need for digitization of the business operations that highly depend on the level of ICT development in the host country. The study finding is in line with, Shahbaz et al. (2021), Mehmood et al. (2021), Nguea (2020), Aladejare (2022), Wekesa et al. (2016), Shenai and Jaiblai (2019) and Nyaosi (2011). However, the study contradicts the findings of Kingori (2022), who found a negative effect of ICT infrastructure on FDI. Njuguna et al. (2022) also did not find strong support of ICT in attracting more FDI inflows in Africa.

Energy infrastructure also showed a positive and significant effect on FDI at 5 per cent level of significance since it has a P-Value of 0.045, which is less than 0.05. The positive marginal effect

means that an increase in the energy generation capacity by one megawatt increases the probability of obtaining higher FDI inflow in Kenya by 0.47. Expansion of energy supply, therefore, has a ripple effect on putting Kenya at the destination of foreign investors. While the country relies mainly on hydroelectric power as the main supplier of energy, subsidies on solar installations should be encouraged in the country particularly for the new processing and manufacturing foreign investors.

The study finding is consistent with studies by Mehmood et al. (2021), Aladejare (2022), Shahbaz et al. (2021), Wekesa et al. (2016) and Nyaosi (2011). However, the study contradicts the findings of Nguea (2020), who found a negative effect of energy infrastructure on FDI while Ahmed (2021) found an indirect relationship between energy infrastructure and FDI inflow in Kenya.

From the results, the calculated marginal effect of transport infrastructure is positive but statistically insignificant at 5 per cent level of significance since it has a P-value of 0.269, which is greater than 0.05. While quality transport infrastructure in Kenya will have a positive influence in the FDI inflow in the country, the study has found that there is no evidence that transport infrastructure influences higher FDI inflow in Kenya. The finding is in line with the studies by Nyaosi (2011), Nguea (2020) while it contradicts the studies of Shenai and Jaiblai (2019), Aladejare (2022) and Wekesa et al. (2016) which found a positive and significant effect of transport infrastructure on FDI. All the control variables in study, namely, inflation rate, GDP growth rate, and exchange rate were statistically insignificant at 5 percent level of significance, which implies that there are no evidence that they influence higher FDI inflow in Kenya.

4.3.2 Effect of Infrastructure Development on Domestic Private Investment in Kenya

The second objective was to analyze the effect of infrastructure development on domestic private investment in Kenya. Using logistic regression, the objective was achieved by estimating the non-linear coefficients as shown in Table 4.4, then the marginal effects as provided in Table 4.5. The coefficients of the logistic regression are not directly interpreted. The marginal effects showed the change in probability of attaining higher DPI given an improvement in infrastructure development as well as changes in other control variables.

Table 4.4 Estimated Logistic Regression: Effect of Infrastructure Development on DPI

Variables	Coef.	Std. Err.	z	P>z
Transport	1.9939**	0.8749	2.28	0.023
ICT	2.2935**	0.9362	2.45	0.014
Energy	0.1777	0.8499	0.21	0.834
GDP growth rate	-2.8263	2.0326	-1.39	0.164
Exchange rate	-1.8938	2.1161	-0.89	0.371
Inflation rate	0.9379	1.9543	0.48	0.631
Constant	-13.2280***	4.6288	-2.86	0.004
Log likelihood = -13.024448 Number of obs = 52 LR chi2(6) = 43.24 (Prob > chi2 = 0.000) Prob > chi2 = 0.000 Pseudo R2 = 0.6241				

Note: Significant at 5 per cent; *** Significant at 1 per cent.

Source: Author's compilation using study data, 2024.

As indicated in Table 4.4, Transport infrastructure, ICT infrastructure and Energy infrastructure are having positive coefficients of 1.9939, 2.2935 and 0.1777, respectively. The coefficients of both ICT and transport infrastructure are statistically significant since they have P-values of 0.014

and 0.023, respectively which are all less than 0.05 at 5 per cent level of significance. The coefficient of energy infrastructure is not statistically significant at 5 per cent level of significance since it has a P-value of 0.834, which is greater than 0.05 at 5 per cent level of significance.

While GDP growth rate and Exchange rate has negative coefficients of -2.8263 and -1.8938, respectively, Inflation rate has a positive coefficient of 0.9379. The coefficients of GDP growth rate, Exchange rate and Inflation rate are all statistically insignificant since they have P- Values of 0.164, 0.371 and 0.631, respectively which are all greater than 0.05 at 5 per cent level of significance.

The Pseudo R squared, which shows the model's goodness of fit is at 0.62. Therefore, 62 percent of the variables in the model explained DPI. The likelihood ratio statistic of 43.24 indicates that at 5 percent level of significance, the coefficients are jointly significant.

Table 4.5 Marginal Effect of Infrastructure Development and Control Variables on DPI

Variable	dy/dx	Std.Err.	z	P>z
Transport	0.43445**	0.19618	2.21	0.027
ICT	0.49973**	0.22274	2.24	0.025
Energy	0.03872	0.18722	0.21	0.836
GDP growth rate	-0.6158	0.43404	-1.42	0.156
Exchange rate	-0.4126	0.46747	-0.88	0.377
Inflation rate	0.20435	0.42516	0.48	0.631

Note: ** Significant at 5 per cent.

Source: Author's compilation using study data, 2024.

As shown in Table 4.5 above, the calculated marginal effect of ICT infrastructure on DPI is statistically significant at 5 percent level of significance since it has a P-value of 0.025, which is

less than 0.05. This implies that ICT has a positive effect on DPI, therefore, an increase in telephony connection by one subscriber will increase the probability of obtaining higher DPI inflow in Kenya by almost 0.5. The positive and significant effect of ICT in boosting DPI development is an important indication that ICT is a necessary prerequisite for investment in Kenya. Just as the case of FDI, the need for ICT by domestic private investors can be attributed to the need for digitization of the business operations that highly depend on the level of ICT development in the country. The study supports studies by Abbas et al. (2022), Ababio (2019), Agyei (2019) and Lelei (2020).

The calculated marginal effect of transport infrastructure on DPI is positive and statistically significant at 5 per cent level of significance since it has a P-value of 0.027, which is less than 0.05. This implies that an increase in the length of paved roads in Kenya by one kilometer will increase the probability of higher DPI by 0.43. The findings support the studies by Dumon (2014), Rehman et al. (2011) Abbas et al. (2022), Ababio (2019), Agyei (2019). However, the study goes against studies by Abbas et al. (2022) who found a positive but insignificant effect of transport infrastructure development of DPI in Kenya.

The estimated marginal effect of energy infrastructure on DPI is positive but is statistically insignificant at 5 percent level of significance since it has a P-value of 0.836 which is greater than 0.05. This implies that energy infrastructure does not provide evidence that it is an important determinant of DPI development in Kenya. This result differs significantly from Kazembe and Namizinga (2007). Both established a positive and significant causal relationship between the two variables. However, the study supports Wekesa et al. (2016) that found a positive but insignificant effect of energy infrastructure on DPI in Kenya at 5 per cent level of significance. All the control variables in the model namely: inflation rate, GDP growth rate, and exchange rate were statistically

insignificant at 5 percent level of significance, implying that they do not provide evidence of influencing greater DPI in Kenya.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATION

5.1 Introduction

Summary of the study, conclusion, and recommendation on policies are provided in this chapter. Additionally, this chapter sheds light on contribution to knowledge and potential research areas.

5.2 Summary of the Study

The availability of modernized interconnectivity of infrastructure is a crucial strength for attracting and maintaining most contemporary companies/industries. Infrastructure entails communications, ICT, roadways, water and sanitation, transportation, highways, and ports (Rehman et al., 2011). With five international airports, a competent road transport and quality railway connections, a modern sea port at Mombasa, liberalized energy sector, as well as digital telecommunication, Kenya continues to develop the infrastructure sector to lead in the East and Central Africa region (Kenya Investment Authority, 2022).

Since 2000, the budgetary allocation in the infrastructure sector has been increasing on yearly basis. Empirical studies have showed that reliable infrastructure lowers the operational cost of the business and enhance the investment climate, hence attracting both FDI and DPI in Kenya (Asiedu, 2002; Seetanah, 2009; Rehman et al., 2011; Wekesa et al., 2017; Jaiblai & Shenai, 2019).

However, no study has analyzed whether the growth in infrastructure development is the reason for the structural change in FDI inflow and DPI development in Kenya. Both FDI and DPI in Kenya had a more or less uniform in trend from 1970 to 2006, to a significantly steeper upward trend from 2007 to 2021. This means that there was an observed structural change in both FDI and DPI. The first objective of the study was to analyze the effect of infrastructure development on

FDI while the second objective was to analyze the effect of infrastructure development on DPI in Kenya. The study used logistic regression model to explain the shift in the mean values from the low mean observed in 1970-2006 to a higher mean observed in 2007-2021.

From the results of the study, ICT infrastructure had a positive and significant effect on both FDI and DPI at 5 per cent level of significance. Energy infrastructure had a positive and significant effect on FDI but for DPI, it had insignificant effect. Transport infrastructure on the other hand had a positive and significant effect on DPI but it had insignificant effect on FDI inflow in Kenya. GDP growth rate, inflation rate and exchange rate were used as the control variables in the study and they were not statistically significant in increasing both FDI and DPI at 5 per cent level of significance.

5.3 Conclusion

This study explored the effect of infrastructure development on DPI and FDI in Kenya, with a particular focus on whether infrastructure development is the reason for the structural change in both FDI and DPI trends in Kenya. The study found evidence that some components of infrastructure development are key prerequisites for foreign and domestic investments in Kenya.

The study found that an expansion in ICT sector helps obtain higher FDI. This is an important suggestion that ICT is a key channel through which economy, can fascinate more foreign investors in the country. Energy infrastructure was found to be a significant determinant of FDI inflow in Kenya. Greater and efficient energy supply sources attracts higher FDI in Kenya. Transport infrastructure did not have influence in attracting higher FDI in Kenya. This could be attributed to the nature of FDI in Kenya which is mainly in manufacturing and services sectors, and majorly require energy efficiency and strong ICT support. The control variables, including GDP growth

rate, inflation rate and exchange rate were found to be statistically insignificant, implying that there was no evidence that they influence greater FDI inflow in Kenya.

On the other hand, both ICT and Transport infrastructure were found to be necessary prerequisites for the development of domestic investment in Kenya. Domestic private investment in Kenya is mainly carried out on real estates, social amenities such as schools and hospitals as well as services sectors that directly depend on transport and ICT infrastructure. Energy infrastructure and other variables such as GDP growth rate, inflation rate and exchange rate did not provide evidence of influencing greater DPI in the country. The empirical findings support the move by the Kenya Investment Authority to invest in infrastructure development with the aim of boosting investment in the country. Therefore the study conclude that greater and efficient ICT infrastructure, Transport Infrastructure and Energy infrastructure are prerequisites for higher investment in the country.

5.4 Policy Recommendation

Infrastructure development is crucial in attracting high number of foreign investors and domestic private investors in Kenya. The following policy recommendations arose from the findings of the study so as to boost both FDI and DPI development in Kenya.

Public-private partnership law of 2013 should be enacted upon with utmost urgency in order to attract more FDI, particularly in the infrastructure sector. This has a ripple effect on the DPI and the entire economic development in Kenya. Privatization of various sectors such as energy, ICT, water and sanitation will boost infrastructural development in the country and therefore boosting both FDI and DPI. The company act on business registration services promulgated in 2015 should be well actualized in the country to reduce the bureaucracies involved in the company registrations.

A conducive infrastructural environment for investment should be provided in the country to boost and encourage the upcoming investments in the country.

The results infer that KIA should strive to increase the length of kilometers of tarmacked roads, increase the installation of more energy generation sources and finally, aim at increasing the annual telephony connections in the country, to boost FDI inflow and DPI development. Investing in cyber security measures and cloud networking will give investors confidence in the security of their data hence the urge to invest.

5.5 Areas for Further Research

Effect of infrastructure development on FDI and DPI in Kenya has been analyzed in the study using a probabilistic approach. Carrying out the study with non-probabilistic approach will add significantly to the scope of information of FDI and DPI. The magnitude of fiscal and monetary policies on FDI and DPI will add significantly to the understanding of FDI and DPI. Further research should also be carried out that covers the regional and continental aspect to investigate whether the same factors influencing FDI and DPI growth in Kenya are also felt across the region.

REFERENCES

Ababio, J.O., Aboagye, A., Barnor, C., & Agyei, S., (2019). Drivers of domestic private investment, role of foreign direct investment and economic growth in frontier markets. *International Research Journal of Finance and Economics, 171*. doi: 10.1080/23322039.2022.2132646

Abbas, A., Abbas, Z., & Mustifa, G. (2022). An empirical analysis of sector-wise private investment for a small open economy. *Development Studies Research, 9(1), 21–35.* https://doi.org/10.1080/ 21665095.2022.2032235

Adams, S. (2009). Foreign Direct Investment, Domestic Investment and Economic Growth in Sub- Saharan Africa. *Ghana Institute of Management and Public Administration*. https://doi.org/10.1016/j.jpolmod.2009.03.003.

African Development Bank. (2023). Light Up and Power Africa – A New Deal on Energy for Africa. Retrieve from https://www.afdb.org/en/the-high-5/light-up- and-power-africa-%E2%80%93-a-new-deal-on-energy-for-africa

Agyei, S. K. (2019). Assessing the bi-causal relationship between private investment and public investment in SSA: Evidence from Panel Vector Autoregression Approach. *Journal of Economics and Sustainable Development*, doi.org10.7176/jesd.

Ahmed, A. A. (2021). Factors affecting the foreign direct investment in Kenya (autoregressive distiıbuted lag model ardlm). *Sakarya University Institutional Repository.* Retrieved from https://hdl.handle.net/20.500.12619/96776.

Aladejare, S. A. (2022). Population health, infrastructure development and FDI inflows to Africa: A regional comparative analysis. *Asian Journal of Economic Modelling, 10(3), 192-206.* http://dx.doi.org/10.55493/5009.v10i3.4568

Asiedu, E. (2002). Determinants of Foreign Direct Investment to Developing Countries: Is Africa different? *World Development, 30(1): 107–19.* Retrieved from http://nila.lecture.ub.ac.id/files/2015/03/FDI-in-Africa-WD

Brainard, W. C., & Tobin, J. (1968). Pitfalls in financial model building: Cameroon Case Study. *The American Economic Review, 99-122.* Retrieved from http://www.jstor.org/about/terms.html

Celik, G. S. (2020). The analysis of investment theories and application of Tobin-Q model to second-hand dry bulk and tanker ship investments. Retrieved from https://figshare.utas.edu.au/articles/thesis/The_analysis_of_investment_theories_and_application_of_Tobin-Q_model_to_second-hand_dry_bulk_and_tanker_ship_investments/23252459

Chenery, H. B. (1952). Overcapacity and the acceleration principle. Econometrica: *Journal of the Econometric Society, 1-28.* doi.org/10.2307/2295908

Coffey, C. (2023). Kleinman Center for Energy Policy. Retrieved from https://kleinmanenergy.upenn.edu/news-insights/?exposed_taxonomy_news-types%5B0%5D=78&exposed_related_research_area%5B0%5D=350

David, G. K., & Mitchel, K. (Eds.). (2010). *Statistics for Biology and Health*. Logistic Regression. DOI 10.1007/978-1-4419-1742-3

Dunning, J.H. (1973). Determinants of International Production. *Oxford Economic Papers, 25, 289*. Retrieved from https://www.jstor.org/stable/2662317

Dunning, J.H. (1980). Eclectic Theory of International Production. *Journal of International Business Studies 11(1): 9-31*. Retrieved from https://www.jstor.org/stable/154142

Dunning, J.H. (1988). Eclectic Paradigm of International Production. *Journal of International Business Studies, 19, 1-31*. Retrieved from https://www.jstor.org/stable/154984

Frimpong, J. M., & Marbuah, G. (2010). Determinants of private sector investment in Ghana: An ARDL approach. *European Journal of Social Sciences*, *15*(2), 250-261. Retrieved from https://www.researchgate.net/publication/230886059_The_Determinants_of_Private_Sector_Investment_in_Ghana_An_ARDL_Approach

Gakuo, E.W. (2015). The relationship between government investments in energy infrastructure

And Economic growth in Kenya. Retrieved from http://erepository.uonbi.ac.ke/bitstream/handle/11295/95071/Gakuo_The%20Relationship%20Between%20Government%20Investment%20In%20Energy%20Infrastructure%20And%20Economic%20Growth%20In%20Kenya.pdf?sequence=1

Girardi, D. (2021). The neoclassical theory of aggregate investment and its criticisms. *Economics Department Working Paper Series. 308.* doi.org/10.7275/23485220

Goldbeck, M. & Lindlacher, V. (2021). Digital Infrastructure and Local Economic Growth:

Early Internet in Sub-Saharan Africa. Retrieved from http://www.lindlacher.com/upload/africa_broadband.

Gould, J. P. (1968). Adjustment Costs in the Theory of Investment of the Firm. *The Review of Economic Studies, 35(1), 47-55*. doi.org/10.2307/2974406

Greene, W. (2018). Econometrics Analysis. 8th Edition, Pearson Education Limited, London

Hendriks, G. (2020). Investments in Kenya. *European Scientific Journal, ESJ, 19 (16), 23.* doi.org/10.19044/esj. 2023.v19n16p23.

Jaiblai, P., & Shenai, V. (2019). The determinants of FDI in sub-Saharan economies: A study of data from 1990–2017. *International Journal of Financial Studies, 7(3), 43.* Retrieved from https://ideas.repec.org/a/gam/jijfss/v7y2019i3p43-d256918.html

Jorgenson, D. (1963). Capital theory and investment behavior. *The American Economic Review, 53(2), 247-259.* Retrieved from https://scholar.harvard.edu/jorgenson/publications/capital-theory-and-investment-behavior

Kingori, Z. I. (2022). Effect of infrastructure on FDI behavior in Kenya: Growth Nexus Analysis. Retrieved from https://hdl.handle.net/10500/28923

Koyck, L. M. (1954). Distributed lags and investment analysis. Amsterdam: North Holland Publishing Company. *Theoretical Economics Letters, Vol.5 No.1, February 2, 2015.* Retrieved from https://scirp.org/reference/referencespapers.aspx?referenceid=1400939

Krishnasamy, K., Nair, J. & Baumi, B. (2012) Hydroponic system for the treatment of

anaerobic. *Water and Sanitation*. Retrieved from https://www.researchgate.net/publication/243458834_Krishnasamy_K_Nair_J_and_B_Bauml_2012_Hydroponic_system_for_the_treatment_of_anaerobic_liquid_Water_Science_and_Technology_65_7_1164-1171

Lelei, L.K. (2020) Effect of government infrastructure development expenditure on share

of Manufacturing in GDP in Kenya. *Journal of Economics and Finance, Vol. 11, Issue 4., pp. 46-50.* Retrieved from https://ir-library.ku.ac.ke/handle/123456789/21554

Levendis, J. & Lee, S.H. (2013), "On the endogeneity of telecommunications and

economic growth: Evidence from Asia. Retrieved from https://ssrn.com/abstract=2855966

Limao, N. & Venables, A.J. (2001) Infrastructure, Geographical Disadvantage,

Liquid, Water Science and Technology. *The World Bank Economic Review 15, No. 3(3):451-479.* Doi 10.1093/wber/15.3.451

Lucas, R. E. (1967). Adjustment costs and the theory of supply. *Journal of Political Economy,*

75(4, Part 1), 321-334. Retrieved from https://www.jstor.org/stable/1828594

Mehmood, B. & Siddiqui, W. (2013). What causes what? Panel cointegration approach on

investment in telecommunication and economic growth: Case of Asian countries. *Romanian Journal of Economic Forecasting 16(47):3-16.* Retrieved from https://www.researchgate.net/publication/281069849

Mehmood, F., Atique, M., Bing, W., Khan, H., & Henna, H. (2021). Infrastructure and sectoral FDI in China: an empirical analysis. *Insights into Regional Development*, *3*(2), 160-175. http://doi.org/10.9770/IRD.2021.3.2(1)

Mmeri, N.A., Ongeri, B.O. & Ndolo, D.K. (2023). Effect of Uncertainty on Domestic Private

Investments in Kenya. *European Scientific Journal 19(16):23* http://dx.doi.org/10.19044/esj.2023.v19n16p23

Ndolo, D. (2017). Determinants of Foreign Direct Investment in Kenya. *International journal of social sciences and information technology*. Retrieved from https://www.ijssit.com/main/wp-content/uploads/2020/07/Determinants-Of-Foreign-Direct-Investment-In-Kenya.

Nelson, T. (2018). Effect of Real Interest Rate on Domestic private investment in Kenya.

International journal of social sciences and economic research. Retrieved from https://ijsser.org/more2018.php?id=72

Ngoma, G., Bonga, W. G., & Nyoni, T. (2019). Macroeconomic Determinants of Private Investment in Sub-Saharan Africa. *DRJ's Journal of Economics & Finance*, *4*(3), 01-08. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3465707

Nguea, S. M. (2020). The impact of infrastructure development on foreign direct investment in Cameroon. *Economics Bulletin, Access Econ, vol. 41(3), pages 1113-1124.* Retrieved from https://ideas.repec.org/a/ebl/ecbull/eb-20-00964.html

Njanja, A. (2021). As Africa's digital economy grows, expensive internet hinders investor activity in some countries. TechCrunch. Retrieved from https://techcrunch.com/2022/07/27/as-africas-digital-economy-grows-expensive-internet-hinders-investor-activity-in-some-countries/

Njuguna, A. & Nnadozie, E. (2022). Investment climate and foreign direct investment in Africa: The role of ease of doing business. Journal of African Trade, 9, 23-46. doi.org/10.1007/s44232-022-00003-x

Nyaosi, E. N. (2011). The Effect of Infrastructure on Foreign Direct Investment in Kenya. THE *Kenya Institute for Public Policy Research and Analysis (KIPPRA).* Retrieved from https://kippra.or.ke/wp-content/uploads/2021/02/the-effect-of-infrastructure-on-foreign-direct-investment-in-kenya-dp-127.

Odunga, P. S. (2020). The determinants and impact of foreign direct investment (FDI) in Kenya and Tanzania: an OECD and non-OECD perspective 1996-2016. Retrieved from https://core.ac.uk/download/pdf/334952937.

Rehman, C.A., Akram, M., Ilyas, M. & Alam, H.M. (2011). The Impact of Infrastructure on Foreign Direct Investment: The Case of Pakistan. *International Journal of Business and Management, 6(5): 268–76.* doi:10.5539/ijbm. v6n5p268

Rehman, N. U., Hysa, E., & Mao, X. (2020). Does public R&D complement or crowd-out private R&D in pre and post economic crisis of 2008? *Journal of Applied Economics, Taylor & Francis Journals, vol. 23(1), pages 349-371.* doi: 10.1080/15140326.2020.1762341

Rodrigue, J. & Notteboom, T. (2013). The geography of cruises: Itineraries, not destinations.

Applied Geography 38(1):31–42. doi: 10.1016/j.apgeog.2012.11.011

Salam, U., Lee, S., Fullerton, V., Yusuf, Y., Krantz, S. & Henstridge, M. (2018). Tanzania case

study: Rapid technological change – challenges and opportunities. Retrieved from https://pathwayscommission.bsg.ox.ac.uk/sites/default/files/2019 09/tanzania case study rapid_technological_change.

Seetanah, B. (2009). A Sector-wise Panel Data Study on the Link Between Transport Infrastructure

and Fdi in Mauritius. *Journal of International Development, John Wiley & Sons, Ltd., vol. 22(1), pages 103-123.* doi: 10.1002/jid.1506

Shahbaz, M., Mateev, M., Abosedra, S., Nasir, M. A., & Jiao, Z. (2021). Determinants of FDI in France: Role of transport infrastructure, education, financial development and energy consumption. *International Journal of Finance & Economics*, *26*(1), 1351-1374. doi: 10.1002/ijfe.1853

Shiu, A. & Lam, P. (2008a). Causal Relationship between Telecommunications and

Economic Growth in China and its Regions. doi:10.1080/00343400701543314

Stéphane, (2021). The Impact of Infrastructure development on Foreign Direct Investment in Sub-Saharan Africa. *Journal of Policy Modeling, 31, 939-949.* http://dx.doi.org/10.1016/j.jpolmod.2009.03.003

Tiu, K. (2014). The Role of Transport Infrastructure in Foreign Direct Investment Attractiveness Across ASEAN. Retrieved from https://www.academia.edu/36403893/The_Role_of_Transport_Infrastructure_in_Foreign_Direct_Investment_Attractiveness_Across_ASEAN

Tobin, J. (1969). A general equilibrium approach to monetary theory. *Journal of money, credit and banking, 1(1), 15-29.* https://doi.org/10.2307/1991374

Tobin, J. (1978). Monetary policies and the economy: the transmission mechanism. *Southern economic journal, 421-431.* doi:10.2307/1057201

Twine, E. E., Kiiza, B., & Bashaasha, B. (2015). The flexible accelerator model of investment: An application to Ugandan tea-processing firms. *African journal of agricultural and resource economics*, *10*(311-2016-5623). doi: 10.22004/ag.econ.200590

UNCTAD (2020). World Investment Report 2020: Retrieved from https://unctad.org/publication/world-investment-report-2020

Urfa, A. M., Esin, C. A. N., Beder, N., & Kavgaci, Y. (2021). A Bibliometric Analysis of the Eclectic Paradigm in Turkish Literature. *Istanbul Management Journal*, (91), 25-57. doi:10.26650/imj.2021.91.002

Wachira, G. and Njuguna, A. (2023). Enhancing growth and productivity through mobile money financial technology services: The case of m-pesa in Kenya. *International Journal of Economics and Finance* 15(12), 91 – 105. doi.org/10.5539/ijef.v15n12p91

Wekesa, C. T., Wawire, N. H. & Kosimbei, G. (2017). Effect of Infrastructure Development on Foreign Direct Investment in Kenya. *Journal of Infrastructure Development 8(2) 93–110.* doi: 10.1177/0974930616667875