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Asafo-Agyei, George Obodum-Kusi

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Foreign Direct Investment, Spillover Effects and Economic Growth in Africa

By

George Obodum-Kusi Asafo-Agyei

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Doctor of Philosophy

The Graduate School of Business Administration

University of the Witwatersrand

Supervisor: Professor Odongo Kodongo

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ABSTRACT

This study examined the relationship between Foreign Direct Investment (FDI) and economic growth in Sub-Saharan Africa. The Hansen threshold regression model was used to examine the nature of the relationship between FDI and economic growth as well as the mediating role of absorptive capacity of the selected countries in Sub-Saharan Africa. Battesse and Coelli stochastic frontier was employed to examine efficiency gains from FDI inflows in the selected countries of Sub-Saharan Africa. Pedroni panel cointegration approach was used to assess the relevance of sectoral FDI on sectoral growth of the selected countries in Sub-Saharan Africa. Finally, the study employed OLS for the estimation of spillover effects of FDI inflows on the productivity of domestic manufacturing firms in the selected countries of Sub-Saharan Africa. This study establishes that the relationship between FDI and economic growth of the selected countries in Sub-Saharan Africa is non-linear in nature.

The threshold level in this study has been estimated to be approximately US$ 44.93 per annum. The study also found that inflows into the selected Sub-Saharan Africa countries improve the level of efficiency in the production structure. The study further established that sectoral FDI inflow emanating from primary sources proffer significant effect on the economic growth of the selected countries in Sub-Saharan Africa. Sectoral FDI inflows from secondary sources do not significantly contribute to economic growth of selected countries in the region. However, FDI inflows from tertiary sources exert significant effect on economic growth in Sub-Saharan Africa. Finally, the study revealed that FDI spillover exerts significant effects on domestic manufacturing firms' productivity of the selected countries in Sub-Saharan Africa.

It is recommended that heads of investment promotion agencies of the selected countries should market their economies well to attract the required level of FDI ($44 FDI per capita and beyond) to enhance the growth prospects of those economies. The marketing strategies could for instance take the form of

organisation of international conferences on the prospects of high domestic demand of FDI products, the hospitability and hardworking nature of a country's citizens and to mention a few.

Keywords: Foreign Direct Investment; Spillover effects; Thresholds; Cointegration; Africa

JEL Classification: C24; F21; O55

DECLARATION

I, George Obodum-Kusi Asafo-Agyei, hereby declare that except for references to works which have been duly cited and acknowledged, this study is the result my own endeavour produced from research under supervision towards the award of Doctor of Philosophy at the University of the Witwatersrand, Johannesburg. To the best of my knowledge it contains no material which has been accepted as part of the requirement for the award of any degree in any university.

George Obodum-Kusi Asafo-Agyei

Signed 

On the …22….day of…September…. 2020

DEDICATION

To my lovely Wife, Mrs. Doris Kuffour Asafo-Agyei,,my Cchildren, Zion Kusi Asafo-Agyei and Zabeth Asafo-Agyei

ACKNOWLEDGEMENT AND APPRECIATION

My profound gratitude goes to the Almighty God for his strength and mercies throughout the study period as a PhD student. In a special way, I wish to acknowledge with thanks to efforts of my supervisor Prof. Odongo Kodongo of Wits Business School, who made me believe in my capability of successfully completing this project despite the many hitches. Sir, your professional pieces of advice, encouragement, feedbacks and suggestions for improving the write-ups, checking the consistency, accuracy and coherence of this dissertation despite your busy schedules have borne fruit. May the good Lord bless you eternally.

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Zion and Zabeth Asafo-Agyei, for their support and encouragement throughout my studies. I will forever be indebted to you. I am very grateful to my dad, Nana Kusi Asafo-Agyei who consistently urged me on and provided the needed support. Daddy, I am sure you will be proud of this work. Finally, I wish to express my gratitude to my friends and colleagues who helped in diverse ways to bring this project to a successful end.

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LIST OF ABBREVIATIONS

ABBREVIATION	MEANING
2SLS	Two Stage Least Square
ADL	Augmented Dickey Fuller
BRICS	Brazil, Russia, India, China and South Africa
FDI	Foreign Direct Investment
FSD	Financial Sector Development
GMM	Generalized Method of Moment
MENA	Middle East and North Africa
MFDI	Manufacturing Foreign Direct Investment
MNC	Multinational corporations
MNES	Multinational Enterprises
NEPAD	New Partnership for Africa's Development
SFDI	Services Foreign Direct Investment
SSA	Sub-Sahara Africa

CHAPTER ONE

INTRODUCTION

1.1 Background

The impact of the globalisation process on regions and countries and among different sectors of the economy may vary (Žilinskė, 2010). Unsurprisingly, factors that have been found to impact on trade and foreign direct investment in other developing countries might not have effect on Africa. For instance, an important consequence of globalization, economic openness, which is manifested through increased trade and international capital movement, has had diverse effects on many economies. Whereas world trade has increased five times since 1980s and also trade openness among various developing regions have upstaged that of the advanced countries, its impact on developing countries' economies have been far less impressive (International Monetary Fund, 2015).

For the purpose of this study, the definition of Foreign Direct investment (FDI) is adopted from the World Bank's World Development Report (2007) which defines FDI as an "investment that is made to acquire a lasting management interest (usually at least 10 percent of voting stock) in an enterprise operating in a country other than that of the investor (defined according to residency), the investors purpose being an effective voice in the management of the enterprise''.

Foreign direct investment (FDI) has become an important topic especially in developing countries due to inadequate domestic resources to finance long term development programmes. FDI as a key component of Africa's development process is enshrined in the New Partnership for Africa's Development (NEPAD) which estimates that Africa needs to close the resource gap of $64 billion through domestic resource mobilization and a more conducive environment for FDI attraction

(NEPAD, 2001:37). Again, the experiences of the fast-growing East Asian economies, particularly that of China where technology transfer resulting from foreign industries has enhanced local capacity for growth and development, make the need to attract FDI as a means of technology transfer in developing countries a key policy issue (UNCTAD, 2012). FDI is also viewed as a way of transferring skills and knowledge from one country to another, thereby enhancing the productive capacity of a country through employment creation. This may result in increased trade and welfare improvement leading to economic growth and development (UNCTAD, 2014).

While individual multinational corporations (MNCs) aim at making profit, the impact of MNCs on the development of an economy in general cannot be underestimated. Foreign capital is seen as a means of bridging the savings gap in countries with low levels of savings thereby increasing the amount of savings available for investment. The inflow of foreign capital by MNCs could lead to significant improvements in foreign exchange constraints, transfer of technology and other externalities such as productivity spillover and export.

Investment has been identified as a determinant of economic growth in the neoclassical growth theory of Solow (1956) as well as used in the same context in more recent examination (e.g Audretsch &Keibach, 2005; Mthanti, 2014) where the focus has been on knowledge diffusion and entrepreneurship. FDI can be a tool through which these impacts could be achieved. FDI therefore can complement domestic capital supply in the financing of local investment projects.

There are several factors that can make FDI impact on economic growth. One of those factors is the sector that attracts the FDI and its characteristics. The characteristics of FDI inflow into primary, secondary and services sectors vary greatly because of the kind of activities involved in these areas and therefore are likely to have different impacts on economic growth and development (UNCTAD, 2015). Primary sector involves the extraction and production of raw materials, such

as; farming, forestry, fishing and mining. FDI inflows from this sector tend to be capital intensive with relatively limited linkages with other manufacturing and services sectors. Secondary sector refers to the various activities that are involved in transforming primary sector's activities into finished products. Manufacturing FDI inflows usually have broader linkages with different sectors and activities with the domestic economy. Tertiary sector FDI represents FDI inflows into the services sector of the economy. FDI into the services sector encompasses a wide range of activities which could have varied impact on economic growth and development based on its ability to have the needed forward and backward linkages (Aykut & Sayek, 2007).

Domestic investment is seen as key to the development of every economy because of its importance to domestic capital accumulation. Investments by both domestic and multinational enterprises are critical to capital accumulation which enhances economic growth (Gharagoz and Entezar, 2015). Domestic investment on the other hand, is defined as the private investment in companies, enterprises, and products by individuals or groups who are indigenes of the said country rather than by those of foreign origin. Domestic investment is vital to the development of every country because of its importance to domestic capital accumulation. Investments by both domestic and multinational enterprises are critical to capital accumulation which enhances economic growth (Gharagoz and Entezar, 2015). The effect of FDI on domestic investment, as to whether it complements or substitutes domestic investment, depends to a very large extent on the type of FDI, the domestic environment and the previous trade regime.

The spillover effect of FDI is the indirect or unintentional effects or diffusion of know-how from foreign investors to domestic firms due to FDI in the host economy. The presence of FDI is usually assumed to have an impact on efficiency, productivity and competition on the domestic firms through technology transfer, knowledge, skills and effective competition (UNCTAD, 2005;

Chowdhury & Mavrotas, 2006; Farole & Winkler, 2014). Spillover effects of FDI are since from multinational corporations are considered to possess higher technical production processes and superior organisational abilities (Hymer, 1976).

Spillover effects have been classified into four main categories in the literature. These are; input-output effects, technology transfer, domestic market share effects and labour productivity effects. Spillover effects are sometimes non-existing because of policy failure for FDI attraction and the channels by which FDI affect growth. A host country's ability to derive maximum benefits from FDI spillover on domestic enterprises depends on the potential of the FDI to create spillover, the capacity of domestic enterprises to absorb those spillover and the institutional linkages between these two factors (Paus &Gallagher, 2008).

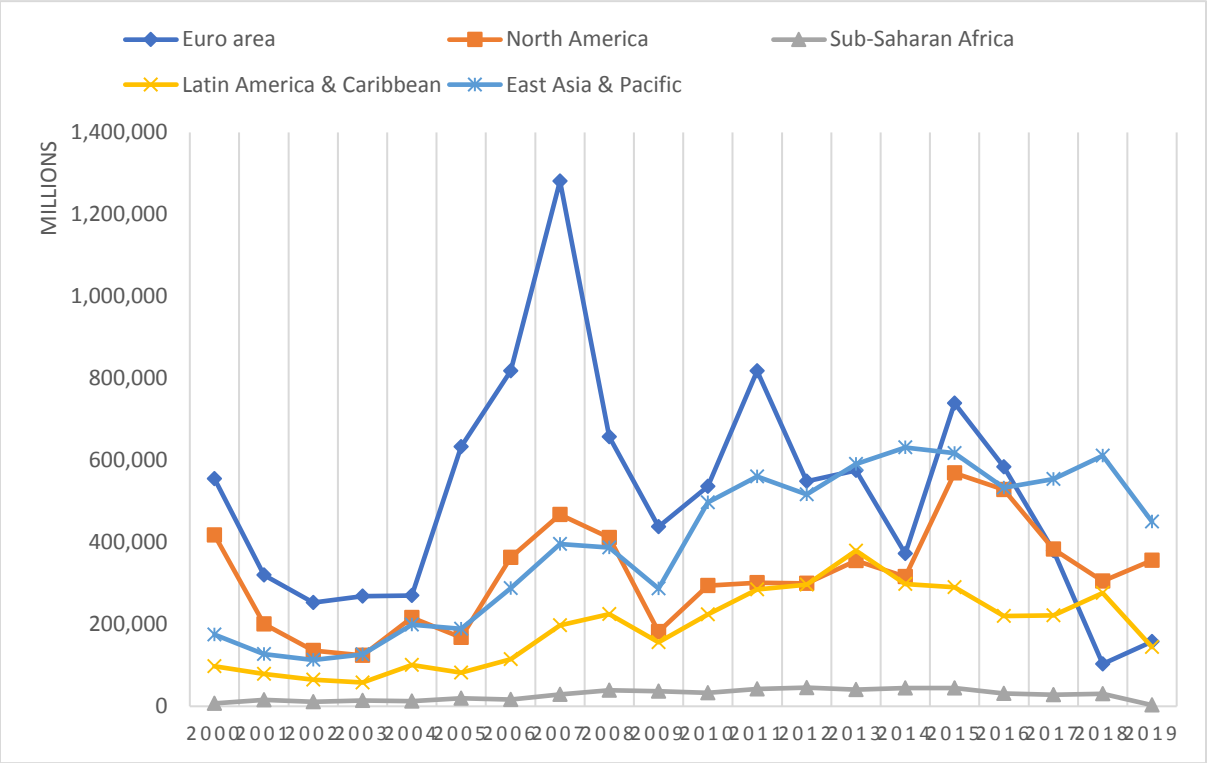
1.2 Economic Reforms and Investment in Africa

According to a World Bank (2015) report on ease of doing business, countries in Sub-Saharan Africa (SSA) were among the top reformers in 2014, having made 75 out of the 230 reforms worldwide. The African continent accounted for 5 of the top 10 reformers in terms of improvement in business regulatory framework and reforms for entrepreneurs. This clearly indicates that Africa is making major strides to improve her business environment for both domestic and foreign entrepreneurs (World Bank, 2015).

Despite strong performance in regulatory reforms, the continent's FDI attraction has remained low with just US$45 billion representing a fall of 10% from the 2018 FDI flow which stood at US$51 billion. Despite a rise in FDI globally by 3% to hit US& 1.540 trillion as against US&1.495 trillion, Africa and for that matter developing economies, saw a fall in FDI flows by 2% (World Investment Report, 2020). Thus, Africa has not performed at par with the rest of the developing regions of the

world by receiving just 6% of all FDI into developing countries. The regional distribution of FDI from 2000-2019 is illustrated in figure 1.1 below.

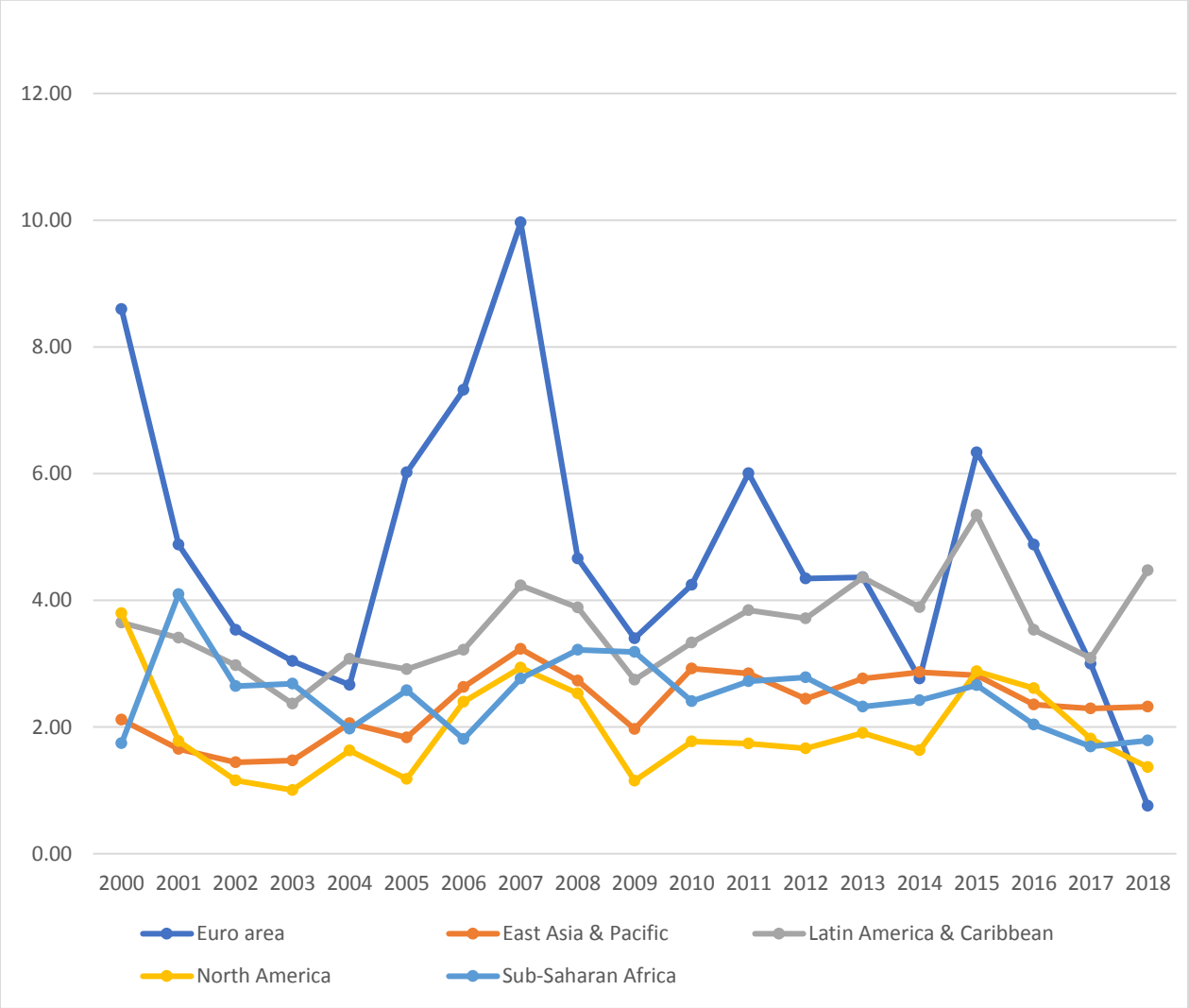
Figure 1.1: Regional Distribution of FDI Inflows 2000-2019



Source: UNCTAD, FDI/TNC database

In Figure 1.2 below, the relationship between GDP growth and FDI is depicted. It is observed that Sub-Saharan Africa has done badly if FDI is measured as a percentage of GDP. Sub-Sahara Africa by 2018 is way above North America and Europe even those data show that developed countries in nominal terms have increased FDI inflows as compared to developing economies (World Investment Report, 2020). The region has been improving in terms of the domestic investment in relation to GDP and it currently sits above that of Europe and Central Asia, and the Latin America and Caribbean.

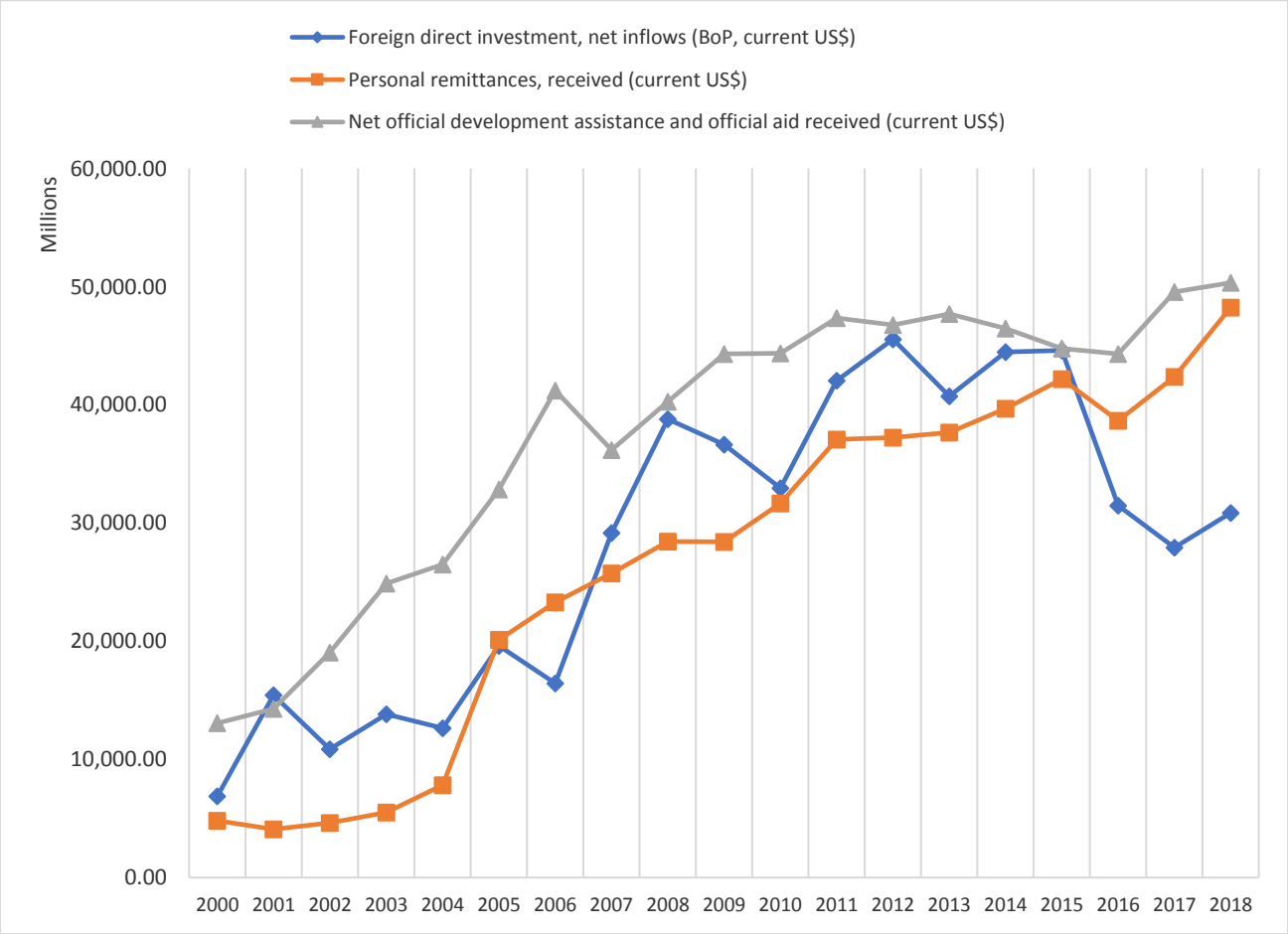
Figure 1.2 Regional FDI as a Percentage of GDP 2000-2019



Source: World Bank-World Development Indicators

Not only is the region lagging in terms of FDI flows into developing countries; an analysis of the relationship between FDI, official development assistance and remittances also points to similar a situation. Whereas remittances and official development assistance have continuously seen an upward surge over the years as depicted in Figure 1.3 below, FDI on the other hand has since witnessed a consistent decline in Sub-Sahara Africa since 2015. These figures illustrate the need to examine the impact of FDI on the region and how to improve FDI attraction.

Figure 1.3: Relationship between FDI, Official Development Assistance and Remittances



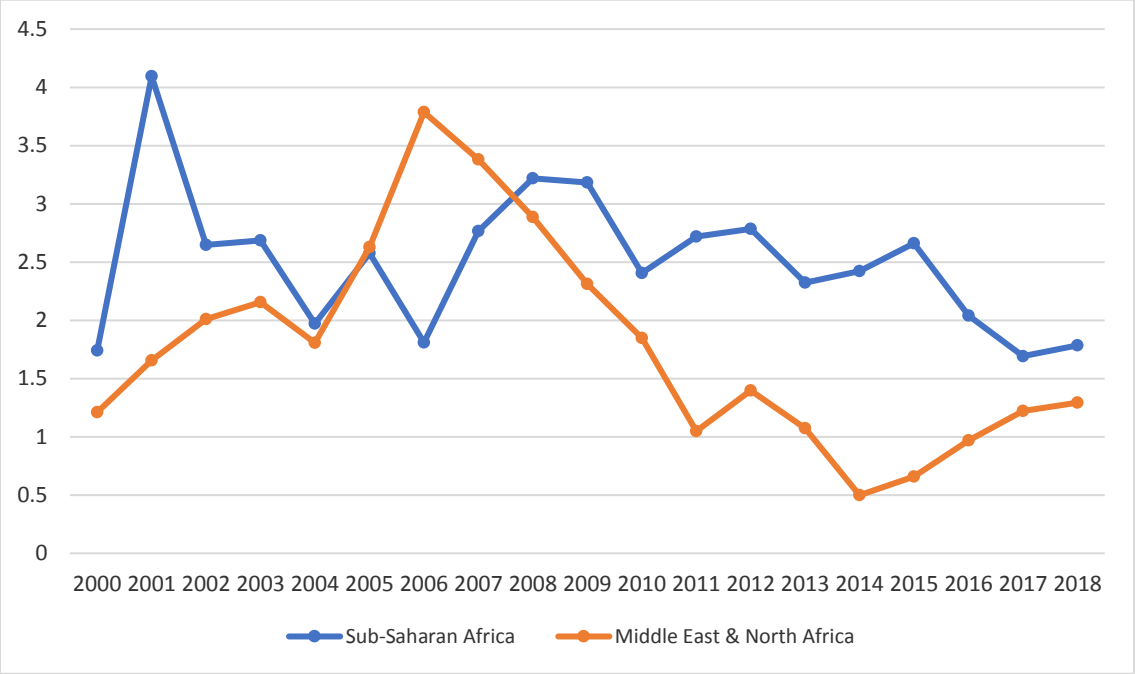
Source: World Development Indicators

As a key component of financial flows in the globalisation process, FDI is seen as a cat\\\alyst for economic growth and development (UNCTAD, 2012). It is also viewed as a means of bridging the resource gap especially in developing countries (Asiedu, 2006). The importance of FDI in developing countries must be understood in the context of inadequacy of resources to finance long term development programmes. Whereas the World Bank (2018) estimates of the need to close the resource gap of about US$ 64 billion, an Africa Development Bank report shows that the continent will need about US$175 billion annually to close the infrastructure gap (AfDB, 2018). A report by United Nations Economic Commission for Africa also highlighted the need to close a resource gap

of about US$ 700 billion for the continent to achieve the sustainable development goals (UNECA, 2015)

FDI inflows into Africa have been fluctuating in recent years. It increased from US$18 billion in 2004 to US$36 billion in 2006. This was apparently caused by improved prospects for corporate profits, a more favourable business environment and increased interest in natural resources (Adams, 2009). However, there has been a decline from US$56 billion in 2012 to US$54 billion in 2014 (UNCTAD, 2015). Similar situation has occurred from 2015 to 2019 where we recorded

Figure 1.4: FDI/GDP for Sub-Saharan Africa and Middle East and North Africa (2000-2019)

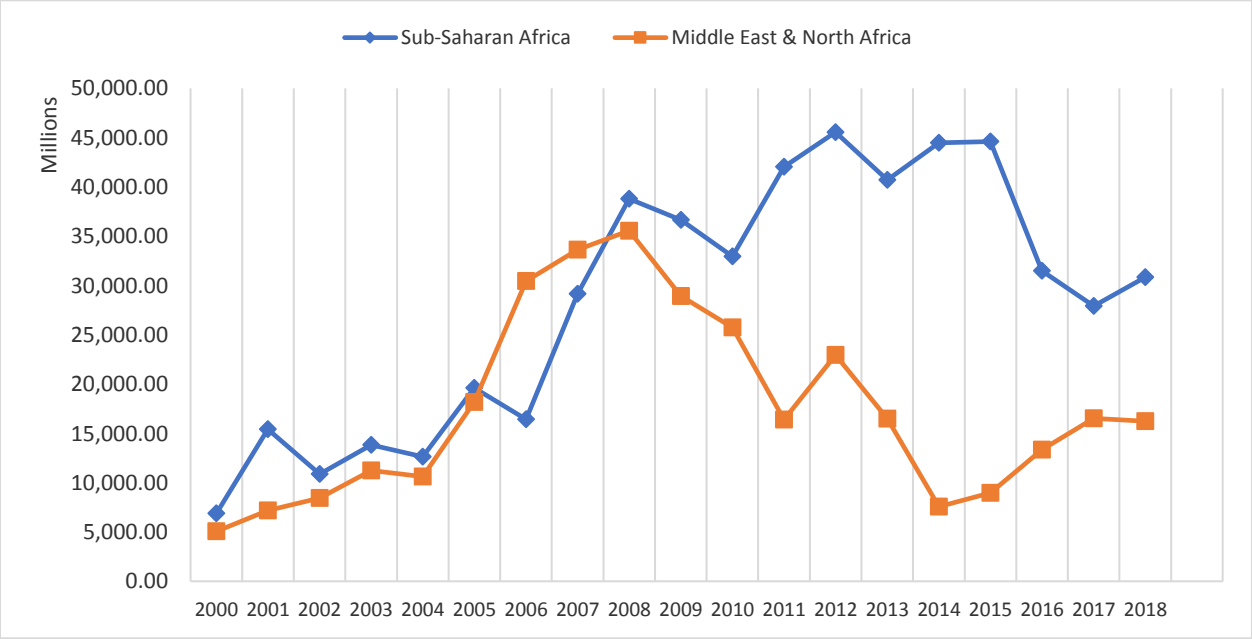


Source: World Development Indicators

This inconsistent FDI performance by SSA countries is illustrated in Figure 1.4. Over the last 15 years, Middle East and North Africa has gradually caught up with SSA countries in terms of FDI as a percentage of GDP.

Although in terms of nominal net FDI inflows Sub-Sahara African countries are still doing better than the North African countries and Middle East as depicted in Figure 1.5, there is still a long way to go if the full potential of FDI into the region is to be realised.

Figure 1.5: Net FDI Inflows for Sub-Sahara Africa and Middle East and North Africa (2000-2018)



Source: World Development Indicator

1.3 Problem Statement

In theory, the role of FDI as a catalyst for economic growth and development has been well documented (Romer, 1993; Apergis et al., 2006). FDI is seen as a means for providing financing, technology transfer, improvement in human capital as well as providing competitive effect which enhances domestic efficiency (Hermes and Lensink, 2003; Adams, 2009). However, empirical findings of recent studies do not provide conclusive evidence of the impact of FDI on the economies of developing countries. For instance, Lumbila (2005), Sylwester (2005) and

Ndikumana and Verick (2008) show that FDI has significant positive effect on economic growth while, Fry (1993) and Hermes and Lensink (2003) find otherwise. Moreover, Adams (2009), Borenztein et al. (1998) and Le Vu and Suruga (2005) suggest that the effect of FDI on economic growth depends on whether the country has minimal level of absorptive capacity (in terms of educated workforce, institutional infrastructure and liberalized markets) that allows it to exploit FDI spillovers.

Although the relationship between FDI and economic growth seems ambiguous, several studies have highlighted the absorptive capacity of the receiving country as critical in determining the impact FDI has on growth. For instance, Borensztein et al. (1998) indicated that the impact of FDI on economic growth is enhanced when FDI is interacted with a certain level of human capital. Similarly, Blomstrom et al. (1994) found the impact of FDI on economic growth to be positive for higher income countries and negative for lower income countries. Balasubramanyam et al. (1996) found trade regimes and trade policies to have influenced the impact of FDI on growth. Alfaro et al. (2006) and Sadik and Bolbol (2003) established that a certain level of financial development is required for FDI to impact economic growth like Massoud (2008) and Chee and Nair (2010). Studies by Li and Liu (2005) also highlighted the relevance of a certain level of technological development whereas Durham (2004) pointed out the need for institutional development. This clearly is an indication that the effect of FDI among regions and sectors may vary significantly.

Contrary to the above arguments, studies by Rodrik (1999), Lyroudi (2004), Carkovic and Levine (2005) and Lipsey (2006) show little or no significant impact of FDI on economic growth when interacted with domestic absorptive capacity. Given the mixed evidence regarding the impact of FDI on different sectors and hence economic growth, the role domestic policies and institutions

play in fostering the relationship between FDI and growth, the debate that arises is how domestic policies and institutions can enhance the development agenda of SSA in the presence of FDI.

Clearly, an examination of these issues would have a huge impact on resource mobilisation and policy direction for the continent. It was therefore imperative for the study to address the following research questions:

1. What are the minimum threshold enabling conditions (e.g. human capital, infrastructure, Institutional development etc) necessary for FDI to have impact on growth in SSA?
2. What is the minimum threshold level of FDI is required for it (FDI) to impact on economic growth?
3. What are the differences in the impact of sectoral FDI on economic on the growth in primary, manufacturing and services sectors in Sub-Saharan Africa?
4. What are the factors that account for the existence or non-existence of spillover effects of FDI on domestic investments among Sub-Saharan African countries?
5. What are the policy implications for Sub-Saharan African governments?

1.4 Research Objectives

Consistent with the research questions, the main objective of this study is to examine the nexus of the relationship between FDI, spillover effects and economic growth in Sub-Saharan Africa. Specifically, this study sought to:

1. Determine minimum threshold enabling conditions (e.g. human capital, infrastructure, Institutional development etc) necessary for FDI to have impact on growth in SSA.

2. Ascertain the minimum threshold level of FDI is required for it (FDI) to impact on economic growth.

3. Examine the differences on the impact of sectoral FDI on growth in primary, manufacturing and services sectors in Sub-Sahara Africa.

4. Identify and evaluate the factors that account for the existence or non-existence of spillover effects of FDI on domestic enterprises in Sub-Sahara African countries?

5. Derive policy implications for Sub-Saharan African governments.

1.5 Justification of the Study

This study has become relevant especially in the face of the need for Africa to close the resource gap by increasing resource inflow which is needed to enhance growth and development in the region. This will help in closing the existing gap in savings and enhance foreign exchange needs of the region. Sub-Saharan African countries have very low-income levels with an average growth rate moving from 2.3% in the 1990s to 5.6% from 2000-2008 (UNCTAD, 2001; UNECA, 2013; Adams et al., 2015). The resource gap has also been highlighted by United Nation's Economic Commission of Africa (UNECA (2015) report to be about $700 billion to enable Africa to achieve the sustainable development goals.

It is reported that, the total FDI inflow channelled into Africa in 2011 and 2013 were $71 billion and $98 billion respectively. Private inflows to Africa also amounted to $68 billion in 2011 and $83 billion in 2013 (IIF, 2013). This inference suggests that FDI is the most reliable source of

capital inflow for growth and development in Africa (UNCTAD, 2019). In this vein, knowledge gathered from this work would further deepen the understanding of the effects of FDI on the region's economy.

FDI is seen as a dependable source of capital inflow that boosts the stock of domestic capital for development. FDI to SSA grew from $8 billion in 2000 to $18 billion in 2004, $51 billion in 2018 and $49 billion in 2019 (World Investment Report, 2020) enabling the minimum threshold levels of FDI to impact and influence Africa in achieving and bridging the development gaps. This work would establish the factors by which this can be achieved.

Also, African countries have long been attractive destinations for FDI because of their vast natural resource endowment. SSA's attractiveness to investors over the past few years have been due to factors such as an emerging middle class, strong economic growth, increasing political stability, improved fiscal and monetary policy and higher return on investment than anywhere in the world (Economist Intelligence Unit, 2012; Adams et al., 2015).

While the available literature has provided numerous studies on the effects of FDI on growth and investment in host-country, there is inadequate literature on the absorptive capacity of a host country and its impact on domestic enterprises which are the key areas addressed by this study. This study has provided adequate knowledge based on empirical evidence to bridge this gap in literature. Evidence is provided from a large cross-country sample (44 countries), spanning the period 1980 – 2015. This study provides a vital piece of information in literature as researchers and research organizations, academic institutions, NGOs and students would find it resourceful to enhance their studies and further research works. It is expected that Governments would rely on this work to review their policy directives on FDI inflows unto the region**.**

1.6 Scope of the Study

The study is in three parts. The first aspect examined the threshold needed for FDI to impact economic growth using various determinants of FDI in Africa using macroeconomic data as published by the various institutions. The empirical analysis covered annual data for the period 1980 – 2015. The data was sourced from UNCTAD investment online database, World Development Indicators from World Bank and the International Financial Statistics from the International Monetary Fund (IMF). The second part evaluated the impact of FDI for different sectors on growth in the region using data from FDI Markets. The last part covers the spillover effects of Foreign Direct Investment on domestic enterprises using micro enterprise data from the World Bank Enterprise database.

1.7 **Organisation of the Study**

The study was organised into seven chapters. This first chapter constituted an introduction to the study which comprised the background to the study, problem statement, research questions, and research objectives, justifications of the study and scope of the study. The second chapter presented the theoretical framework for FDI, review of literature on FDI threshold, sectoral FDI and spillover effects on economic growth in SSA. The next chapter discussed the methodology and the estimation processes for FDI threshold on growth, sectoral FDI and spillover effects. The fourth chapter covered the results and the discussions on the findings from FDI threshold and absorptive capacity estimations. The fifth chapter detailed the discussion and finding relating to the impact of sectoral FDI on economic growth in selected countries. Chapter six extensively examined the

findings on FDI spillover effects on domestic firms' productivity and chapter seven focussed on the research summary, findings, conclusion and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of the relevant literature on foreign direct investment, economic growth and spillover effects of FDI. The chapter will therefore focus on the theories of FDI, theories of economic growth and identify a theoretical framework for the analysis of FDI, spillover effects and economic growth. It will further provide a critical review of the empirical literature on FDI, spillover effects and growth to highlight divergence in the empirical results and the inconclusiveness of the literature on FDI and economic growth.

2.2 Theories of Foreign Direct Investment

According to UNCTAD (2013), developing countries for the first time attracted over fifty percent (50%) of total FDI inflows and Africa on the other hand had seen a consistent growth in FDI flow year-on-year by about five (5) percentage points. Whereas some theories point to the fact that FDI growth is driven by the process of liberalization and entry into international market, none of these theories of FDI can fully explain FDI flows to both developed and developing countries.

Despite the relevance of FDI in the world economy, researchers have argued that there is not a single FDI theory that fully explains why, how and where FDI goes but rather a variety of theoretical assumptions, models and approaches (Blonigen 2006; Faeth, 2009; Vasyechko, 2012). The growing interest by investors in developing countries has raised the debate further and researchers are conducting research on all the possible factors responsible for the emergence of multinational corporations (MNCs) and their impact on the host country.

It must be emphasized that apart from the well-known determinants of FDI that have emerged from theory, others have gone beyond this to look at regional and country specific factors (Vasyechko, 2012). Some studies suggest that FDI inflow to developing countries and for that matter Africa cannot be explained within the general theory and are calling for a new approach to finding determinants of FDI in the region; others argue that an extension of the traditional theories could help in knowing the impact and specific determinants of FDI in developing countries.

There have been several attempts to classify FDI theories into micro and macro principles. Some have classified them according to imperfect market conditions, imperfect capital market and some on non-economic factors. All these classifications tried to achieve the goal of addressing the question of why FDI, where FDI goes, how MNCs can compete favourably in a foreign country and who are the recipients of FDI (Jordaan, 2005). This study will rather look broadly at the various theories and how they help in explaining the questions of why, how, where and who are the beneficiaries of FDI.

2.2.1 Neo-Classical Theory of Foreign Direct Investment

Mundell (1957) modelled FDI into the Neo-Classical theory. He incorporated cross-border capital flows into Heckscher-Ohlin framework that seeks to explain that, factor prices are equalized by the movement of capital between countries. Capital is transferred from the more capital abundant country to the less capital abundant country until returns on capital are equalized when there are barriers to trade and that capital flow and that of goods are substitutes (Mundell, 1957). According to this theory, trade barriers encourage FDI whereas trade liberalization either reduces FDI or increases trade. FDI is therefore a response to distortions in the perfectly competitive equilibrium.

Another attempt was made by MacDougall (1958) which was later revised by Kemp (1964) using a two-country model where one is the investing country and the other is the host. The theory hypothesizes that because price of capital is equal to its productivity, capital will move freely from a capital abundant country to a capital scarce country so that marginal productivity will in turn be equalized between the two counties. According to the MacDougall-Kemp hypothesis, this will bring about efficiency in resource use that will culminate in increased welfare for both the host and the investing country so far as the investing country continues to receive returns on the capital invested in the host country.

However, this view of FDI has been criticized because it recognises the importance of advanced markets and institutions to economic growth. According to Henning (2008), the theory has a significant shortcoming in accounting for natural resources and sustainable development. At best, it tries to explain tariff jumping FDI rather than other forms of FDI. Again, this framework does not make provision for crossflow of FDI, such that a country cannot experience both inflow and outflow of capital. According to some studies (see Jones, 1971; Neary, 1978; Brown et al., 2003; Caves, 2007), capital inflows do affect factor rewards and lead to cross-border flow of capital. This corresponds with the empirical evidence of most developed countries simultaneously sending and receiving FDI inflows (Latorre, 2008). Again, if increased trade barriers lead to greater FDI, then post 1945 trade liberalization should have led to a fall in FDI but the evidence points to the contrary.

2.2.2 Dependency Theory of Foreign Direct Investment

This theory asserts that the underdevelopment of developing countries is mainly because of the exploitation by developed nations. It argues that foreign direct investment is detrimental to the

long-term economic growth and development of developing nations. This theory dates to the writings of Karl Marx's theory of development, underdevelopment and Paul Baran's analysis of economic backwardness and economic growth and more recently by the works of Samir Anim on unequal development (Khan, 2007). Dependency writers view FDI as being harmful to the development of developing countries since it leads to the exploitation of natural resources by developed nations. Developed countries exploit natural resources through international trade which leads to deterioration of terms of trade or by MNCs transferring profit out of developing countries.

It further stated that, part of developed nations wealth was from the extraction of labour and other resources from developing countries which were not compensated, thereby putting developing countries in conditions of continued underdevelopment and poverty. To the proponents of this theory, capitalism based on this form of division of labour brings about distortions, increases uneven distribution of income, and hinders economic growth and development. They therefore advocated for the development of developing countries without the dependence on foreign capital and goods.

The dependency theory made a critical analysis of the development paradigm of developed nations and their regard for FDI as being positive on the host country especially developing countries. It is one theory that highlighted the negative consequences of foreign direct investment. Developing countries adopted the dependency theory in the 1960s and 1970s especially those in Eastern Asia, Latin America and some African countries. This and other reasons led to the adoption of import substituting industrialization by developing countries. However, developing countries have shifted their focus to more liberal policies aimed at attracting foreign direct investment (Kavalski, 2015).

2.2.3 Industrial Organization Theory of Foreign Direct Investment According to the Industrialization theory, FDI is not just about transfer of capital but it entails a package which includes capital, managerial know-how, new product and other potential advantages in an imperfect market. It argues that market imperfection may occur for several reasons which include product differentiation, marketing skills, better access to capital, technological advantage, economies of scale and sometimes government regulation. MNCs that possess these advantages have a competitive edge over other companies in a foreign location and this helps them overcome other challenges and the additional cost of operating in a foreign land.

This theory was initiated by Hymer (1976) based on the assumption of imperfect market system. He argued that global markets are not perfect, and this imperfection confers several comparative advantages to MNCs which give them market power in some markets. MNCs usually have comparative advantage over their local competitors largely due to their size. According to Hymer, a multinational firm is like a typical oligopolistic firm that possesses some sort of superiority and, based on that, looks for control in an imperfect market with the aim of maximizing profit.

He asserts that firms become multinational due to one or several reasons. These include; the need to look for new market for their product, access to cheap raw materials outside their own market, to gain access to new technologies or managerial expertise, to bring about efficiency in production and sometimes for political reasons. In Hymer's view, the firm specific advantage is mainly technology that helps the multinational to produce new products outside the existing ones. Hymer’s aim was to relate FDI to MNCs motives for investing abroad. It must be emphasized that his research provided the foundation for a lot of future theoretical and empirical research on FDI especially in transitional economics. A study by Graham and Krugman (1989) showed how the technological advantage of European firms enabled them to invest in the US market.

The main criticism in Hymer's work, according to Pitelis (2005) concerns the absence of an endogenous theory of growth of the firm and the emphasis of the monopoly attributed to the large MNEs without failing to see their efficiency advantages. As a result of this, some of his later works are criticised; that, his predictions did not necessarily and/or fully follow from his analytical framework but were arguably shaped by 'ideology'.

2.2.4 Product Cycle Theory of FDI

This theory was developed by Raymond Vernon (1966) based on data obtained from US corporate activities. The theory suggests that most products go through a life cycle which can be divided into three stages. The first of these stages was termed as the innovation stage. For firms to be market leaders, they must introduce new products with the help of their research and development division. These products are initially manufactured in the firm's home country primarily for domestic consumption and later exported to other developed countries. At this stage the demand for the product is inelastic because the quality of the product holds sway over price.

The second stage which was termed as the maturing stage is the situation where the demand for a new product has increased tremendously in other developed countries and the product has become price elastic. Competing firms in the host country begin to set in and produce similar products at a lower price because the innovator cost involves transportation and tariff but the rival firms in the host country would have a lower distribution cost. For the innovator to compete with rival firms in the host country, the innovator must set up a production unit in the host country which then helps in eliminating transportation cost and tariff. The product then becomes internationalized and this, according to Vernon, is the major reason for foreign direct investment. A study by Kojima

(1978) alluded to the fact that imposition of tariff encouraged FDI but felt that an entry of foreign capital in a protected industry reduced welfare in the host country.

The third stage is the standardized product stage where the production techniques are no longer the exclusive reserve of the innovator and many rival firms enter the market, thereby, increasing the existing competition. At this stage, price competition becomes very intense it then forces the innovator to shift production to low cost location preferably in a developing country where labour might be cheaper. The innovator then exports the manufactured product back to the home country and other developed countries.

Other researchers such as Globerman (1986) identified a fourth stage called dematuring stage where development in technology and consumers' preference break down the product standardization. This leads to the production of more sophisticated models of the product and at this stage cheap labour may not matter as the product is manufactured in high income countries to meet new technology and consumers' taste. These four stages were explained by Globerman (1986) using the example of the manufacturing of a television set that was first produced in the United States of America and soon other developed countries followed suit. When it became standardized, production was concentrated in Japan due to cheap labour cost. According to him, the dematuring stage was where more sophisticated models were developed and produced in the USA.

The product life cycle theory has attracted several criticisms including the fact that Vernon himself in 1979 indicated that his second stage may be in a developing country and not necessarily in an advanced country because firms may want to take advantage of cheap labour with the narrowing of the technology gap. Others have argued that with the changing international environment different stages of the product life cycle may not necessarily follow the same order. The

assumption of export threat causing firms to set up subsidiaries in other countries may not always be the case; otherwise all US firms may have set up subsidiaries in other countries they export to (Bhagwati, 1972). Furthermore, the second and the third stages are contradictory because the second stage is anti-trade oriented whereas the third stage is trade oriented. There are also areas where American firms do not possess the technological advantage but may have made substantial investment outside the country. Despite these limitations, the theory managed to explain certain types of investments made by US firms in Western Europe in between 1950 and1970 (Denisia, 2010).

2.2.5 Internalization Theory of FDI

The internalization theory was developed by Buckley and Casson (1976) to explain why multi-national companies (MNCs) will invest in other countries. This theory is based on market imperfection model and states that market imperfections are greater in international business so MNCs have greater incentive to coordinate the economic activities between countries. MNCs are efficient response to international market imperfections because they help reduce the cost of international transactions and increase resource allocation and coordination efficiency.

A study by Coase (1937) also pointed to the fact that firms bypass the regular market and use internal prices to overcome transaction costs associated with technology and external supplies. According to this theory, when external supplies, production, and distribution become imperfect and inefficient, then MNCs can invest in foreign countries to create their own supply, production and distribution streams.

There are a lot of advantages associated with such move by MNCs including; avoiding search and negotiating costs; costs of moral hazard (especially actions by external partners); litigation and contract violation costs and government interventions. MNCs could also get a better application

of cross-subsidization, predatory pricing and transfer pricing whiles controlling market and supply outlets.

Critics argued that intra-firm transaction costs may not necessarily be low (especially if subsidiaries are in an unfamiliar environment) and that transaction cost may generally be high. If transfer of intermediate inputs involves substantial medication of well-established practices, then transaction cost will be high (Kogut & Parkinson, 1993).

2.2.6 Eclectic Paradigm Theory

Dunning (1993) describes eclectic paradigm is a mixture of three theories of foreign direct investment based on market imperfection. These are industrial organization theory, internalization theory and location advantage theory. The eclectic paradigm states that the stock of foreign capital and assets of multinational enterprises (MNEs) are a combination of ownership advantage (O), the location advantage (L) and internalization (I). According to him, O-L-I advantages vary from country to country and so FDI will go where these advantages are more pronounced.

Ownership advantage (O) refers to intangible assets that are the exclusive reserve of the company and could be transferred within MNEs at low cost leading to higher income or reduced cost for the firm. According to Dunning (1993), firms have their own advantages that help them to have competitive advantage in a foreign market and using these advantages ensures higher marginal profitability or lower marginal cost. According to this theory, three specific benefits accrue from ownership advantage, namely;

- Monopoly advantage in the form of privileged access to market through ownership of natural resource, patent or trademark;
- Technological knowledge and innovation activities;
- Economies of scale, scope and greater access to financial capital;

Location advantage (L) on the other hand refers to certain costs associated with a specific location which gives MNEs advantages such as cost of real wages and barriers created to restrict imports. According to Denisia (2010), the advantages for each country can be classified into the following:

- The economic benefits of factors of production, cost of transport and others;
- Political advantages-government policies in relation to FDI flows;
- Socio-cultural advantages include distance between the two countries and cultural diversity

The advantage which is realised from internalization (I) refers to the firm's inherent flexibility and capacity to produce and market through its internal subsidiaries. Cross border internalization would be higher the more firms want to engage in foreign production rather than offering –their rights under license and franchise. These factors are important in determining the extent and the pattern of FDI.

2.2.7 Currency Based Theories

There are studies based on the imperfect foreign exchange and capital market to explain FDI. Aliber (1971) postulated that internalization of firms can be explained by the relative strength of currencies. According to him, MNEs emanating from strong currency countries are able to acquire a large portion of income generating assets of a weak currency country and thereby monopolizing certain production units to its advantage. Empirical tests have shown that FDI in USA, Canada, and United Kingdom are consistent with this theory. Froot and Stein (1989) were also of the view that depreciation in the real value of a county's currency lowers the wealth of domestic residents as against the wealth of foreign residents. This results in the acquisition of domestic firms' assets by their foreign counterparts. He also found this to be one of the determinants of foreign direct investment in the USA.

Caves (1988), explains that there are a lot of ways through which exchange rate influences FDI. He asserts that exchange rate impacts on cost and revenue stream of firms, domestic currency depreciation inflates import bills and diminishing the net income of firms that import intermediate and other materials. But exports will expand with depreciation of domestic currency, leading to a rise in income. He further stated that depreciation of domestic currency will lead to capital gain and foreign capital will flow into the country as it becomes cheaper for foreign firms to hold domestic assets. The major criticism of this theory is that it has not been widely tested to know its generalisability.

2.3. Relationship among FDI, Domestic Investment, and Economic Growth

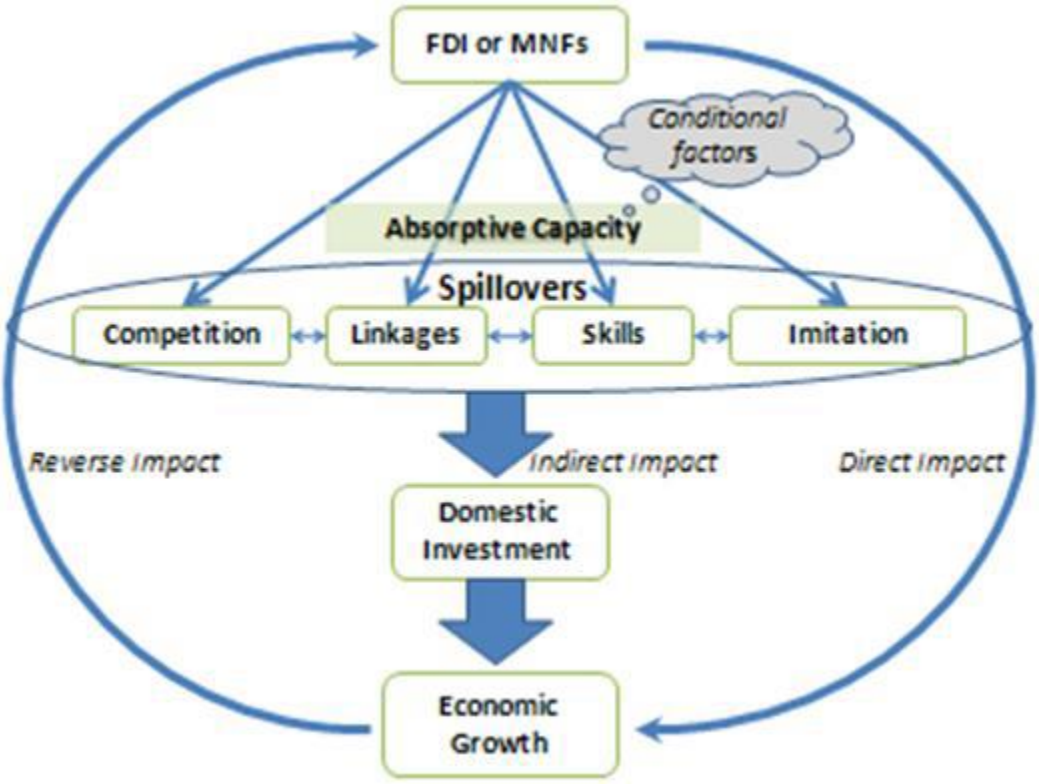
2.3.1. Theoretical Review

Capital accumulation is usually referred to as the amassment of objects of value, the increase in wealth or the creation of wealth. This postulates that the formation of capital is a pre-requisite for economic growth and development (Nowbutsing, 2009)[1]. This study focuses on the relationship of FDI (or foreign capital formation) on a host country's domestic investment and growth outcomes. In this regard, there is a large body of literature on the channels through which FDI connects economic growth. The channels can be observed in Figure 2.1.

Figure 2.1 shows the relationship between FDI and growth according to Nowbusting (2009). The direct impact is seen in the arrows flowing directly from FDI to growth. This is the impact that the neoclassical theory seeks to explain. The neoclassical theory on growth indicates that long term growth is driven by exogenously determined technological progress and growth in labour force.

[1] According to Nowbusting, 2009, capital formation is required to ensure economic growth in that additional production requires extra investments to increase production scale.

Figure 2.1 Relationship between Foreign Direct Investment and Economic Growth



Source: Nowbutsing (2009)

The nature of the relationship is decomposed into three main impacts, namely: (1) the *direct impact*; (2) the *indirect impact*; and (3) the *reverse impact*. The *direct impact* is shown by the arrow flowing directly from FDI to growth. In a production function, i.e. Q = f(L, K), this implies that FDI directly causes output through amassment of tangible assets (or increase in K). The *direct impact* of FDI is explained using the

Nowbusting (2009) explains that in a typical production function, the direct impact of domestic investment on FDI Q = f (L, K). FDI may impact on output through the accumulation of tangible assets, which simply implies an increase in K. In this regard, FDI and domestic investment contribute to capital stock and technology directly to affect long-term growth in the neoclassical

growth model. Identifying the direct impact only does not give a full understanding of the FDI-growth nexus. Thus, it is important to see beyond the direct impact of FDI and Figure 2.1 explains the indirect and reverse impacts in some detail.

The indirect impact of FDI is represented by the arrows from the FDI to the four absorptive capacity variables[2]. The ability of FDI inflows to generate spillover depends largely on its effects on absorption capacity[3] variables such as imitation, linkages, skills, and competition (Nowbusting, 2009). Total spillover generated by FDI is assumed to depend on the absorption capacity[4] which is determined by a cloud of conditional factors. Human capital development, managerial know-how and FDI spillover indirectly affect growth in the neoclassical growth model (Iamsiraroj & Ulubasoglu 2015). The indirect impact is established through the spillover effects to domestic investment to growth, and the reverse impact which generally occurs when growth in turn affects the inflow of FDI into an economy.

While FDI and domestic investment impact on long-term growth at least from the neoclassical theory viewpoint, their impact in practice is still an empirical question. This is partly explained by the neoclassical model that postulates that, the effect of FDI on growth depends to a very large extent on technological gap between the investor's country and the host country. Thus, according to neoclassical theory capital will flow to the host country in search of higher returns. Interestingly, approximately two-thirds of the world's FDI were among developed countries though this trend is

[2] The ring of spillover shows a strong positive relationship among those four channels of spillover. (Nowbutsing, 2009)

[3] According to Ducheck, 2013, "absorptive capacity is defined as the ability of a firm to recognize the value of new external information, assimilate it, and apply it to commercial ends".

gradually changing with developing countries currently receiving more than half of FDI inflows (Razin & Sadka, 2007).

The impact of either FDI or domestic investment on economic growth or growth of FDI and domestic investment can be positive or negative based on the variables being affected (Lipsey, 2002). There could also be a situation where there is no relationship among economic growth, domestic investment and FDI.

2.3.2 Empirical Review

The literature on the relationship among FDI, domestic investment, and economic growth is quite recent, though a lot of studies have either examined the relationship between FDI and growth or FDI and domestic investment. However, recent studies have examined FDI, domestic investment and growth together to have a comprehensive understanding of these three variables. A lot of these studies have come up with contrasting findings as to whether FDI influences economic growth and domestic investment or economic growth rather engineers the inflow of FDI and enhancing domestic investment.

There have been studies done to examine the dynamic linkages among the FDI, economic growth, and domestic investment. For instance, Agarwal (2000) conducted a study on the impact of FDI on economic growth in South Asian economies. The empirical outcomes of this study revealed a positive association between domestic investment, FDI, and GDP. The study further revealed that, although FDI has an impact on domestic investment, part of this could be attributed to the restrictions on ownership of foreign companies in the countries understudy. This is because in most Southern Asian countries, foreign firms are not allowed to hold 100 percent equity, and this could partially explain the relationship between FDI and domestic investment. The paper also indicated that FDI had an insignificant effect on growth prior to 1990s but has positive and

significant effect in the 1990s. The research covered the period 1965-1996 for five (5) Southern Asian countries using fixed effect estimation method. Ghazali (2010) also analyzed the relationship among FDI, domestic investment and economic growth in Pakistan for the period 1981-2008. His empirical findings indicated that FDI, domestic capital stock, and economic growth have long-run relationship and the causality analysis show bidirectional causality between FDI and domestic investment. Similar results were obtained by Allah et al. (2014) for the period 1976 – 2010 using cointegration approach on Pakistan. However, a unidirectional causality is found between FDI and economic growth and all these findings show that FDI supports both domestic investment and economic growth in Pakistan.

It is significant to note that Pakistan was among the five (5) countries studied by Agrawal (2000). However, the country specific study identified a bidirectional causality between FDI and domestic investment and also found a long run relationship (Allah et al., 2014;Ghazali, 2010) among the variables showing that results are likely to be mixed if different approaches are used and country specific study may have a different impact as against panel studies.

Lautier and Moreaub (2012) investigated the impact domestic investments have on foreign direct investment with a sample of 68 developing countries over the period 1984-2004. The results indicated that lagged domestic investment has a strong impact on FDI inflow in the host country. The findings suggest that domestic investment could be used as a catalyst to attract FDI inflow and hence investment promotion policies should target also the domestic firm's efficiency, which could easily enhance the ability of the host country in attracting FDI inflows.

On the other hand, Tang et.al. (2008) investigates the causal linkage between FDI, domestic investment, and economic growth in China from 1988-2003 using error correction model (ECM), variance decomposition, and impulse response function analysis. The study found no evidence of

FDI crowding-out domestic investment but rather has complementary effects on domestic investment in China. The authors suggested that FDI provided solutions to shortage of capital during China's economic reforms era and stimulated domestic investment through technology diffusion and the expansion of the export industries.

Lean and Tan (2010) examined the dynamic linkages among FDI, domestic investment, and economic growth in Malaysia from 1970-2009 using vector error correction model. The findings suggested a long-run relationship among FDI, domestic investment, and economic growth such that FDI has a positive effect on domestic investment. This implies that FDI impacts on growth positively and crowds-in domestic investment.

A study by Ahmed et al. (2015) on the impact of FDI on domestic investment in Uganda for the period 1992-2012 indicates a neutral effect of FDI on domestic investment at the national level. However, out of nine sectors considered two sectors had crowding-in effect of FDI on domestic investment three had neutral effects whereas four had crowding-out effect. The study further revealed that past economic growth rates do not impact on FDI inflow.

In a study based on the Economic and Monetary Union of West Africa (WAEMU), Fahinde, Abodohoui, and Su (2015) analysed the effects of external financial flows on domestic investment by categorising financial flow into FDI, Official Development Assistance (ODA) and remittances from migrants. The study was conducted based on Agosin and Mayer (2000) framework for testing crowding-out and crowding-in. Using the generalised method of moments estimation technique for a panel of WAEMU countries for the period 1996-2011, the authors established that FDI crowds-out domestic investment in both the short-run and long-run. In the same vein, ODA crowds-out local investment but remittances do not have significant crowding-out effect on domestic investments in the Union. A similar study on Economic Community of West African

States (ECOWAS) by Eregha (2011) using a panel co-integration analysis on the dynamic linkages between FDI and domestic investment in ECOWAS countries for the period 1970 – 2008 revealed that FDI inflow substitutes domestic investment in the ECOWAS region. The paper also found out that export enhances domestic investment whereas imports affect domestic investment negatively. This suggests that policy makers in the ECOWAS region should do targeted FDI to reduce its impact on domestic investment.

Ghura and Goodwin (2000) applied a panel data for the period 1975 – 1992 to investigate the determinants of domestic private investments in Sub-Saharan Africa (SSA), Latin America and Asia. They found that public investment and credit to private sector stimulate private domestic investment but found no evidence of real GDP growth being significant in determining private investment in SSA. Similarly, studies by Quattara (2004) on the determinants of domestic private investments in Senegal for the period 1970 – 2000 found that the impact of credit to the private sector is negative. However, public investments, foreign aid flows, and real income positively affect domestic private investment.

Morrissey and Udomkerdmongkol (2008) in their studies on 13 Latin American countries, five African countries, 10 European countries, eight Asian countries, and eight Caribbean countries found evidence of crowding-out of domestic investment by FDI. The study further revealed that crowding-out effect is greater in countries with high governance score. The study used four governance measures which included voice and accountability, regulatory country, political stability and control of corruption. The study concluded that private investment is more important than FDI in terms of contribution to total investment.

Acar, Eris and Tekce (2012) studied the relationship between FDI and domestic investment in selected countries in the Middle East and North Africa (MENA) region for the period 1980 – 2008

using dynamic panel GMM techniques. The evidence showed that FDI crowds-out domestic investment in the region. Agosin and Mayer (2000) assessed the extent to which FDI in developing countries crowds-in or crowds-out domestic investment using panel data for the period 1970 – 1996. The model was run on three developing regions of Africa, Asia and Latin America. The results found evidence of strong crowding-in effect of FDI on domestic investment in Asia but weak in Africa; however, strong crowding-out of domestic investment by FDI in Latin America.

On the other hand, studies by Ndikumana and Verick (2008) on the two-way linkage between FDI and domestic factor markets established that FDI crowds-in domestic investment and there is a strong impact of private investment on FDI. The study suggests that African countries will benefit from measures aimed at promoting domestic investment. This is because a strong domestic investment performance will serve as a sign of high return, which could lead to attraction of more FDI.

A study by Eregha (2011) for African countries reveals that although the FDI inflow to ECOWAS is low, FDI has a positive impact on domestic investment and economic growth. The study also adds that FDI inflow primarily depends on the country's policies, infrastructure, institutions, reliability, and consistent financial sector. The bivariate and multivariate estimations of this study also pointed that FDI crowds out the domestic investment. On the contrary, Omri and Kaouli (2014) studied the relationship between FDI, domestic capital and economic growth for 13 MENA countries for the period 1990 – 2010 using growth and simultaneous equation models. The results showed that there is bidirectional causality between FDI and economic growth but a unidirectional relationship between FDI and domestic capital running from FDI to domestic capital.

Adams (2009) found that domestic investment has a positive and significant effect on economic growth but FDI impact on economic growth is only positive when OLS was used as the estimation

method. The study further indicated that FDI has an initial negative effect on domestic investment and positive effects subsequently. The study focused on sub-Saharan Africa for the period 1990 – 2003 and suggested that a targeted approach to FDI attraction is critical since the current and lagged FDI were found to have a net crowding out effect. The paper used both OLS and fixed effect estimation methods. Clearly, the study highlighted some of the major defects in the existing studies. It showed that the estimation method is as significant as the variables of interest. Also, the time frame could have significant impact on the results achieved and the set of countries used.

2.4 Empirical Literature on Determinants of Foreign Direct Investment

The empirical literature on the determinants of foreign direct investment for the purpose of this study would be classified into those for developing countries and studies on the continent of Africa.

2.4.1 Determinants of Foreign Direct Investment in Developing Countries

An analysis of the determinants of FDI by Blonigen and Piger (2011) using Bayesian statistical techniques found that relative labour endowment, gross domestic product, cultural distance factors and regional trade agreements had positive impact on FDI. However, multilateral trade openness, host country business cost, host country institutions and infrastructure were found to be determinants that had a weaker relationship with FDI. This indicates that some variables that other studies consistently found to be significant were not robust.

Addison and Heshmati (2003) researched into the new global determinants of FDI flow into developing countries, the importance of information communication technology (ICT) and democratisation. Using panel data techniques for a large pool of developing countries, the study concluded that democratisation and ICT increases the inflow of FDI into developing countries. It is therefore imperative that current efforts at increasing democratic practices as well as ICT

infrastructure and training in developing countries must be vigorously pursued if these countries are to attract FDI into their economies.

Wilhelms and Witter (1998) assessed the determinants of net FDI inflow in 67 emerging countries between 1978 and 1995using the framework developed by Wilhelms which is the institutional FDI fitness theory that explains that FDI is determined by institutional variables such as laws, policies and their implementation than intransigent fundamentals. The results show that market variables and government are the most important determinants of FDI inflow. The implications are that investors seek stability, transparency, clear-cut and consistently implemented regulations to individually negotiated privileges. Hence, policy makers should be more concerned with institutions, policies, laws and their implementation than mundane factors such as population size and socio-cultural issues. Similarly, Stefanovic (2008) presented a paper on the analytical framework of FDI determinants, implementation of OLI model by stressing that FDI is a key factor in economic development than bank debts or portfolio investment. The foundation of the analysis was based on Dunning's eclectic paradigm of OLI model. The findings suggest that since foreign firms usually possess both the ownership advantage (O) and internalization advantage (I), the key factor in determining FDI is the location advantage (L) of the host country. The study concluded that location factors that are derived from policy and institutional factors are keys to determining FDI inflow.

2.4.2 Determinants of Foreign Direct Investment in Africa

In discussing the determinants of FDI inflows to Africa, Anyanwu (2011) uses a panel of seven five-year non-overlapping windows for the period 1980 – 2007 to indicate that natural resource endowment (especially oil) attracts huge volumes of FDI inflow. Other determinants of FDI that were found to be positive included international remittances, government consumption, and

openness to trade and market size. However, the study found financial development to have a negative impact on FDI flows into Africa. Nunnenkamp (2002) wrote a paper on the determinants of FDI in developing countries and assessed whether globalisation has changed the rules of the game. The study suggested that little has changed since the 1980s as traditional market-related determinants are still dominant factors that determine FDI and highlighted that only the availability of local skills has gained prominence.

Asiedu (2002) attempted to critically examine the FDI determinant in developing countries and questions whether Africa is different. The paper explored the factors that have positive and significant influence on FDI in developing countries for that of SSA. The findings indicated that openness to trade promote FDI to both SSA and non-SSA but less robust for SSA. However, returns on investment and better infrastructure have positive impact of FDI to non-SSA but have no significant impact on FDI to SSA. The study concluded that policies that have been successful elsewhere may not be equally successful in Africa. On the other hand, a study by Bartels el al. (2008) on the determinants and location decisions of FDI in sub-Sahara Africa revealed that investment decisions on SSA are mainly grounded on political economy that ensures transparent legal framework and sound investment environment. Other factors that are considered include international trade agreements and production inputs.

Djokoto and Dzeha (2012) reviewed recent literature on factors that determine FDI inflows into Ghana. The study revealed that inflation, exchange rate and its volatility, democracy, size of government, trade and previous FDI are significant in determining FDI inflow into Ghana.

2.5 Empirical Literature on Foreign Direct Investment and Economic Growth

2.5.1 General Studies

Pegkas (2015) assessed the relationship between FDI and economic growth for the Eurozone countries from 2002 to2012. The paper adopted a panel co-integration technique for the study and found a positive long-run relationship between the variables. Using both fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS) methods, the study concluded that stock of FDI positively and significantly affect economic growth in the Euro zone member countries. However, Abbes et al. (2015) undertook a study on the relationship between FDI and economic growth for 65 countries using panel Granger causality test and co-integration approaches. The conclusion was that, there is a disparity between the results of the Granger and the co-integration approaches in terms of the relationship between FDI and economic growth. The study suggested that countries should prioritize the allocation of resources toward FDI since there is a unidirectional causality from FDI to economic growth. The studies by Abbes et al. (2015) improved on the study by Pegkas by also examining the direction of causality using Granger causality test.

Herzer (2008) uses a panel data for 14 developed countries for the period 1971 – 2005 and report a positive long-term effect of FDI on domestic production. The study further revealed that there is a long run two-dimensional causality between domestic production/output and foreign direct investment.

Baharom and Thanoon (2006) undertook a study on the relationship between FDI and economic growth in East Asian countries and concluded that FDI promotes economic growth both in the short run and long run. The study further revealed that countries that have been able to attract substantial FDI have shown better growth results than those that do not attract enough FDI.

Vu and Noy (2009) used industrial data for six countries of OECD to establish the relationship between FDI at the sectoral level and economic growth in industrialised countries. The study found that FDI has a positive impact on economic growth, but the effect is different in different sectors and among different countries. Whiles this study was restricted to just six countries in the OECD, a similar work was done by Iamsiraroj and Ulubasoglu (2015) where the study analysed the relationship between FDI and economic growth. Using 108 published studies for the period 1970 – 2009 for over 140 countries, it was established that FDI impacts on economic growth. The study further argued that regional differences rather than country differences and contemporaneous FDI are critical for economic growth and not past FDI. The results also showed that trade openness and financial development are important indicators for growth.

Carkovic and Levine (2005), using a panel data based on the homogeneity of the coefficient of lagged dependent variables assumption, assessed the relationship between FDI and economic growth for developing countries. The research revealed that FDI does not have significant effect on economic growth. However, a research by Melnyk, Kubatko and Pysarenko (2014) suggests that FDI has a significant influence on economic growth.

Neto and Veiga (2013) examined the impact of FDI on growth through technology diffusion and innovation covering 139 countries for the period 1970-2009. The results showed that technology diffusion and innovation have positive impact on productivity which also impact on growth. Similarly, Azman-Saini et al. (2010) reviewed the linkages between FDI, economic freedom, and economic growth in 85 countries using generalised method of moment-system estimator. The findings indicated that the impact of FDI on economic growth depends to a large extend on the level of economic freedom.

Contessi and Weinberger (2009) found positive relationship between FDI and growth but caution that the relationship between these two variables depends on the composition of the group of countries, the period under consideration and the quantitative technique used. Unsurprisingly, Aitken and Harrison (1999) indicated that competition by FDI enterprise with their domestic counterparts may harm economic growth. In the same vein, Boyd and Smith (1992) indicated that FDI may distort the functioning of the domestic market and where financial sector is undeveloped may cause decline in economic growth.

The role of human capital development in establishing a positive relationship between FDI and economic growth is well acknowledged in the literature. For instance, Borensztein, Gregorio and Lee (1998) investigated the effect of foreign direct investment on economic growth for industrial countries and 69 developing countries using seemingly unrelated regression (SUR) technique for the period 1970 – 1989. The study found evidence of FDI having a significant effect on growth and suggested further that the impact of FDI on productivity requires a certain minimum threshold of stock of human capital and that FDI complements domestic investment. Similarly, Li and Liu (2005) examined whether FDI affect economic growth using a panel of 84 countries over the period 1970 – 1999. The study applied both single equation and simultaneous equation techniques. The results indicated that there exists a significant endogenous relationship between them and that FDI promotes growth through interactive terms. The interaction between human capital and FDI was found to exert strong positive impact on economic growth whereas that of technology gap and FDI exhibits a significant negative influence on economic growth. Using stochastic frontier model, Wijeweera, Villiano and Dollery (2010), estimated the relationship between FDI and economic growth for the period 1997 – 2004. The study found evidence of FDI impacting positively on growth in a situation where the labour force is highly skilled and pointed out that, gains from trade also impact positively on growth however corruption effects growth negatively.

Fortanier (2007) on the other hand investigated not just the relationship between FDI and economic growth but rather focused on the role characteristics of FDI by analysing the differences in growth consequences of FDI on different countries. The study examined six major outward FDI countries and 71 host countries for the period 1989-2002. The results suggest that growth consequences of FDI differ by country of origin and that these countries have effect on the host country's characteristics.

A study by Agrawal el al. (2000) on the impact of FDI on 5 economies in southern Asia uses panel data from India, Pakistan, Bangladesh, Sri Lanka, and Nepal. The findings suggest that FDI impact on economic growth was negative prior to 1980, strong positive in the late eighties and nineties and less positive in the early eighties. In contributing to the debate on whether FDI contributes to development, Narula and Driffield (2012) indicated that although FDI and development are interrelated, countries that had taken a general approach towards FDI as a determinant of development have not achieved much result. This is because the content of the FDI is as important as the absorptive capacity, institutional development as well as the economic stability of the host country.

2.5.2 Country Specific Studies

Louzi and Abadi (2011) examined the nature of the FDI-growth nexus in Jordan using data from 1990 to2009. The study utilised cointegration and error correction techniques to assess a two-way linkage between FDI and economic growth and established that FDI does not exert independent effect on economic growth, but growth was found to have a positive impact on the inflow of FDI. The paper suggested that government policies should be directed at improving the local environment to achieve growth and enhance the attraction of FDI. However, Feridun and Sissoko (2011) using a similar approach, examined the impact of FDI on economic growth in Singapore

for the period 1976-2002 using Granger causality and vector auto regression as the estimation techniques. The study found evidence of a unidirectional causality from FDI to growth and hence concluded that FDI impacts on economic growth in Singapore.

This is an indication that even country specific studies with similar methodological approaches could generate different results in terms of direction of the relationship between FDI and growth. This could be explained by the period of the study and the variables included in the estimation (Contessi & Weinberger, 2009).

Interestingly, country specific studies using sectoral data to examine the impact of FDI on growth have also produced mixed results. For instance, Alfaro (2003) investigated the relationship between FDI and economic growth using cross- country sectoral data set for the primary, manufacturing, and services for the period 1981-1999. The study concludes that the effect of total FDI on growth is ambiguous just as evidence from the service sector FDI on growth. However, FDI in the primary sector tends to have a negative impact on growth but manufacturing FDI has a positive effect on economic growth. Similarly, work by Khaliq and Noy (2007) on the impact of FDI on growth in Indonesia for the period 1997-2006 using sectoral data set showed that FDI has a positive impact on growth at the aggregate level. But the results at the sectoral level showed little impact of FDI on growth with mining and quarrying having negative impact on growth.

The inclusion of export as an explanatory variable for the relationship between FDI and growth has shown that export impacts positively on FDI and growth. Xing and Pradhananga (2013) and Kohpaiboon (2008) studied the relationship between FDI and growth in China and Thailand respectively, showed that growth impact on investment tend to be higher under export promotion regime compared to import substitution regime.

2.5.3 Studies on Developing Countries

Encinas-Ferrer and Villegas-Zermeno (2015) analysed the impact of FDI on economic growth in Brazil, China, Peru, Mexico and South Korea using Granger causality test. The results showed that FDI has much significant effect on economic growth. Similarly, Basu et al. (2003) concluded that there is long-run bidirectional causality between FDI and growth for a relatively open economy and for a closed economy it runs from growth to FDI. The study covered 23 developing countries for the period 1978-1996 using panel co-integration and causality test. On the other hand, a study on 24 developing countries by Nair-Reichert and Weinhold (2001) found that FDI has a significant effect on economic growth.

Bengoa and Sanchez-Robles (2003) examined the relationship between economic freedoms, FDI, and growth for 18 Latin American countries cover the period 1970-1999. The conclusion was that FDI has a significant effect on economic growth and further suggested that human capital development, liberalisation and economic stability are keys in attracting FDI.

Alfaro et al. (2004) undertook a study on the linkages between FDI, financial market, and growth in developing countries for the period 1975-1995. The results show that countries with well-developed financial markets have had FDI significantly affecting economic growth and that the role of FDI alone on economic growth is still ambiguous. There is a similar study by Herzer et al. (2008) on 28 developing countries on the positive FDI growth relationship hypothesis that has been documented in the literature. The study examined the limitations of this hypothesis and used co-integration to examine these specific countries on the FDI-growth relationship. The study found that most of these countries do not have FDI effecting economic growth in the short run or long run. Again, there is no single country where FDI has a positive impact on economic growth in the long run. The study further revealed that the relationship between FDI and economic growth, education, openness of the economy, and financial development is ambiguous.

Basu and Guariglia (2007) examined the relationship between FDI, inequality and growth using 119 developing countries. The study concluded that FDI promotes economic growth and inequality since FDI tends to promote industrial growth as against agriculture growth thereby reducing agriculture share of GDP. This sets in the issue of dual economy, where industrial growth is attained but agriculture sector diminishes. Although different methodologies were employed, there is a confirmation of other studies at the country level (Alfaro, 2003; Khaliq & Noy, 2007).

Katerina, John, and Athanasios (2004) assessed the effects of foreign direct investment on economic growth in transitional economies using Bayesian analysis and found that FDI does not have any significant impact on economic growth in transition economies.

2.5.4 Studies on African Countries

Adams and Opoku (2015) investigated the relationship between FDI and economic growth in 22 sub-Saharan African countries using generalized methods of moment estimation technique for the period 1980-2011. The study looked at how regulatory system affects the relationship between FDI and economic growth. The findings were that FDI and regulation do not exert individual significant effect on economic growth but the interaction between FDI and regulatory regime has a positive effect on economic growth in those 22 countries. There is a manifestation of the need for African countries to improve their regulatory regime if FDI is to have a meaningful impact on economic growth.

On the contrary, studies by Nahidi and Badri (2014) on the relationship between FDI and economic growth for MENA countries for the period 2005-2010 found evidence of a positive and significant impact of FDI on economic growth.

Adams (2009) researched on the impact of FDI on domestic investment and economic growth for the period 1990-2003 on Sub-Sahara Africa using both ordinary least squares estimates and fixed

effect estimation. The study concluded that FDI has a positive and significant effect on economic growth only in the OLS estimates and not the fixed effect estimates. Adams (2009) suggested that Africa needs a targeted approach to FDI attraction. This supports that the method used and the estimation techniques employed are of critical importance if the debate on the relationship among critical variables like FDI, domestic investment, and economic growth is to be settled.

At the country level where country specific details are examined the results sometimes suffer the same defect of not being able to bring finality to the debate on the impact of FDI on growth. This could probably be due to different time frames and estimation techniques (Contessi & Weinberger, 2009). For instance, a study by Umoh, Jacob and Chuku (2012) investigated the relationship between FDI and economic growth in Nigeria using data from 1970-2008. The study focused on whether a bi-directional relationship exists between the two variables using simultaneous equations. The results showed that there exists contemporaneous bi-directional causality between FDI and economic growth. That is, FDI does have a significant effect on economic growth and economic growth does affect the level of FDI inflows. Similarly, Antwi and Zhao (2012) found evidence of a long-run causal relationship existing between FDI and economic growth in Ghana using data from 1980-2010. However, the study suggested that the short-run relationship between economic growth and FDI is not robust. Meanwhile,, Olumuyiwa (2013) using Granger causality test to examine the relationship between FDI and economic growth in Nigeria disaggregating the data into pre and post deregulation era, found evidence of economic growth influencing FDI in pre-deregulation era but no causal relationship in post deregulation era.

A study on Sub-Saharan Africa by Sukar, Ahmed, and Hassan (2007) found evidence of a significant positive effect of FDI on economic growth for the period 1975-1999 and argued that domestic conditions are critical in FDI impacting on growth.

Ndambendia and Njoupouognigni (2010) assessed the impact of foreign aid and FDI on economic growth for 36 Sub Saharan countries for the period 1980-2007 using Pesaran et al. (1999) dynamic panel data of mean group, pooled mean group estimator and dynamic fixed effects. The results suggested that both foreign aid and FDI impact on economic growth, however the aid effect is low compared with FDI. Similarly, Sackey el al. (2012) analysed the impact of FDI on growth in Ghana for the period 2001-2010 and found evidence of FDI impact on economic growth in the long run and suggested that continuous effort should be made by policy makers to reform the Ghanaian economy and its foreign policy to gain more benefits from FDI.

Similarly, a review of few countries in Sub-Sahara Africa that have been able to attract substantial FDI by Basu and Srinivasam (2002) found that political and macroeconomic stability, as well as structural reforms are key in attracting FDI into Africa and suggested that current efforts at improving leadership, promotion of democracy, overcoming social and political strife, stable exchange rate, good monetary and fiscal policies, as well as efforts to remove structural constraints must be sustained if Africa is to attract huge FDI inflows.

Getinet and Hirut (2006) conducted a study on the impact of FDI on growth and its determinants for the period 1974-2001 in Ethiopia. The findings showed that real GDP growth, export orientation and liberalisation had positive impact on FDI, and poor infrastructure and macro-economic instability have negative impact on FDI. The implication is that economic growth, liberalisation of the economy, improved infrastructure and macroeconomic stability are critical in attracting FDI into Ethiopia.

Beyond the limited number of years for most of the studies on Africa except for Adams and Opoku (2015), some studies were also limited in terms of the number of countries understudied. Varied degrees of gaps exist in terms of weaknesses of the various methodology used. In analysing long

and short run relationships, the long run integration of the variables is as critical as the direction of causality (Pedroni, 1997).

Some of the studies on developing countries have had FDI to impact positively on economic growth mostly when FDI interacts with another variable. For instance, Carkovic and Levine (2005) and Borensztein el at. (1998) indicate a minimum threshold of human capital is required if FDI is to positively impact on growth. Alfaro et al. (2004) used financial development as the interactive variable for FDI to impact on economic growth and suggested that the impact of FDI is experienced if there is a certain level of financial development. Export has sometimes also been used in this regard (Kohpaiboon, 2008; Xing &Pradhananga, 2013)

Clearly, studies on the African continent have not placed much emphasis on how certain interactive variables such as financial development, human capital development, export, and economic freedom can impact on the relationship between FDI and economic growth.

It is also important to highlight that several panel studies might have issues with parameter endogeneity, omitted variables, model specification problems, and sometimes measurement errors and these issues ought to be recognised when dealing with such studies (Rodrik, 2005). There is also the issue of pooling a number of countries together without regards to their level of development. Studies by Blonigen and Wang (2005), Contessi et al. (2008) and Contessi and Weinberger (2009) have all raised this issue. For example, Contessi et al (2008) established that FDI into developed countries is pro-cyclical whereas that of developing countries are mostly counter-cyclical and suggested that pooling such countries together might not show any cyclical patterns. This has not been considered in most of the studies on the continent in terms of their level of development since it also affects the influence FDI, domestic investment and growth could have on each other. Contessi and Weinberger (2009) suggested that panel data technique might not be

the reason for the relationships that have been established in the literature but rather the pooling of countries with different levels of development and wealth might have caused the empirical ambiguity in the literature. Studies by Blomstrom, Lipsey and Zejan (1994) established that FDI had no significant effect on growth in lower income developing countries as opposed to upper middle-income developing countries.

2.6 Empirical Literature on Foreign Direct Investment and Economic Growth through an Interactive Term (Threshold Effects)

This section is dedicated to the examination of the relationship between FDI and economic growth through threshold effects. It will assess the empirical studies that have examined the impact of FDI on growth through growth-enhancing variables.

2.6.1 Worldwide Studies

Jyun-Yi and Chih-Chiang (2008) used threshold regression techniques to dissect whether the effect of foreign direct investment (FDI) on economic growth is dependent on various factors. A sample study of 62 countries from 1975 to 2000 revealed how unclearly FDI alone contributes to economic growth. However, the effect of FDI was not realised to have positive effect on growth when countries have a certain level of human capital and GDP. Krogstrup and Matar (2005) examined the growth in the Arab World by engaging the four (4) different aspects of the absorptive capacity for FDI. The outcome from the study was geared towards a specific measure of the absorptive capacity. Although the average Arab country does not stand to gain from FDI, the costly financial incentives to attract more FDI will be useless if not welfare reducing.

Again, Jyun-Yi and Chih-Chiang (2012) applied a threshold regression model developed by Hansen (2000) and Caner and Hansen (2004) to prove that FDI has adverse effect on income distribution of host countries with low levels of absorptive capacity., research proved otherwise.

This paper shows that there is little effect of FDI on income inequality in a country with better absorptive capacity.

Zekarias (2016) examined the effect of foreign direct investment on economic growth using institutional variables in the MENA region. The study used an income level for middle and high-income groups. The study employed the GMM system which revealed that FDI contributes to economic growth using data from 1980-2013. Institutional development plays a role in the effect of FDI on economic growth. With five regions (SSA, MENA, Europe, Asia, and America) in perspective, results of their study show that, the role of institutional performance cannot be ruled out in FDI promoting economic growth.

Doucouliagos and Ulubasoglu (2006) assessed the effect of economic freedom on economic growth. Meta-analytic techniques were employed to reveal a positive impact of economic freedom on economic growth. There was a positive indirect effect of economic freedom on economic growth through stimulation of physical capital. However, controls for physical capital caused specification bias which affected the literature and the panel data on 82 countries from 1970 to1999 led to smaller estimates of the impact of economic freedom on economic growth. Similarly, Haan and Sturm (2000) studied the relationship between economic freedom and economic growth. They concluded that economic freedom is realized as a factor promoting economic growth based on diverse measures of indicators from country to country. Greater economic freedom breeds economic growth.

In the case of the five (5) BRICS countries, that is, Brazil, Russia, India, China, and South Africa, Haydaroglu (2016) proved that there is a positive and significant relationship between economic freedom and economic growth. It was deduced that FDI can promote Economic Growth through Economic Freedom. Moreover, Azman-Saini, et al., (2010) study results based on the generalized

method-of-moment estimator considering 85 countries, show that FDI does not affect economic growth directly. Alternatively, the effect of FDI on economic growth depends largely on the level of economic freedom of the host country. In addition, Bengoa and Sanchez-Robles (2003) explored the relationship between economic freedom, FDI and Economic Growth. A sample of eighteen (18) Latin American countries covering the period 1970-1999 was analysed. It was noticed that, there is a positive correlation between FDI and economic growth and, economic freedom in the host country thus, a positive FDI inflows determining factor.

Surprisingly, a study by Durham (2004) that uses data on 80 countries from 1979 to1998 examined the effect of foreign direct investment and equity foreign portfolio investment (EFPI) on economic growth. The outcome showed that FDI and EFPI do not have direct positive effects on growth. However, the effects of FDI and EFPI may depend on the absorptive capacity of the host country. The shape of the financial institutional development based on the empirical studies using the extreme bound analysis (EBA) showed significant results on growth.

Research has proven that the benefit associated with FDI can be actualized by host nations when those nations attain some level of financial growth. This notwithstanding, there has not been an examination on how FDI, financial growth/development and real output relate to one another (Chien-Chiang & Chun-Ping, 2009). One imperative factor as far as international economic integration is concerned, is FDI. FDI ensures inter-transfer of new technological advancements and technical abilities among countries. It can serve as a source of funds and a means of promoting SMEs. FDI can eventually have diverse positive economic impacts on countries. For FDI to occur there must be some mutual benefits between the multinational companies seeking to invest and the host nations (Tuluce & Dogan , 2014).

Aurangzeb and Stengos (2014), studied the role of foreign direct investment in a dualistic framework, imploring a smooth coefficient semi-parametric approach. The study revealed that the relationship between FDI and economic growth cannot be overlooked taking into consideration the dualistic growth framework, splitting the economy into exports and non- exports sectors. Therefore, the higher the levels of FDI inflows, the higher the productivity in the exports sector and vice versa. Aizenman and Noy (2006) were able to determine a strong linear relationship between trade and FDI when they attempted to critically look out for how FDI correlates with international trade. This study adopted a decomposition method with a cross-examination of feedback between the two variables.

Alfaro et al. (2010) deduced that a rise in FDI leads to an increase in growth in countries with developed financial markets. The study by Kottaridi and Stengos (2010) also made a support to the existing literature on foreign direct investment (FDI) and economic growth nexus by complementing past empirical and conventional wisdom in arriving at some interesting results. They came up with the idea that, the non-linear effect of human capital in the presence of FDI inflows is pleasing in the middle-income countries.

2.6.2 Developing Countries

Borensztein et al. (1998) in their analysis on data on FDI flows from industrial countries to sixty-nine (69) developing countries over the last two decades employed a cross-country regression framework to evaluate the effect of foreign direct investment on economic growth. The researchers concluded that, economic growth is influenced by FDI, if the availability of the advanced technologies has enough absorptive capability. Interestingly, policymakers place greater significance on FDI in advancing development in developing countries than the link among FDI, economic development, and human development. Reiter and Steensma (2010) on their study to

appreciate these relationships established that FDI inflows are strongly positive and more correlated to enhancing human development when FDI policy restricts foreign investors from entering some economics sectors. Also, when it distinguishes against foreign investors comparative to domestic investors.

Recent studies have been devoted to the impact of FDI on economic growth. Li and Liu (2005) addressed this issue in both single equation and simultaneous equation system techniques. The study relied on a panel data for eighty-four (84) developing countries over the period 1970-1999. The interaction of FDI with human capital exerts a strong positive effect on economic growth in developing countries whereas FDI with the technological gap has a negative impact.

Despite the plethora of FDI-growth studies, research by Beugelsdijk et al. (2008) investigated the impact of FDI on host country economic growth by differentiating between the growth effects of horizontal FDI and vertical FDI. After the examination of US MNEs activity into forty-four (44) host countries over the period 1983-2003, with traditional total FDI figures as a benchmark, it was noticed that, the horizontal and vertical FDI have positive and significant growth effect in developed countries and no significant effects in developing countries.

Potential Granger causality among the real GDP, real exports, and inward FDI in least developed countries for the period 1970-2009, was investigated into by Tekins (2012). The study employed economic modelling which is based on SUR systems and Wald Tests with country specific bootstrap critical values. Utilizing a panel data approach, the outcome indicated direct, one-period-ahead, unidirectional causality from exports to GDP, from FDI to real exports, and from real exports to FDI among the least developed countries.

Although FDI flows have become increasingly significant for many developing countries, Herzer et al. (2008) undertook a study challenging the widespread belief that FDI has a positive impact on economic growth in developing countries. Employing FDI-led growth hypothesis for twenty-eight (28) developing countries using the cointegration techniques on a country-by-country basis, the researchers reported that, there exists negative unidirectional long-run effect from FDI to GDP. They further found that, between the growth impact on FDI and the level of per capita income, education, degree of openness, and financial market development in developing counties, there is no clear relationship.

Foreign Direct Investment flows into developing countries globally have greatly increased since 1990s. Demir (2016) in his paper found evidence on the effects of bilateral FDI flows on institutional development gaps between countries and whether such effects are conditional on the direction of flows. The bilateral FDI flows between 134 countries and a variation of institutional development measures during 1990-2009 period implies that there is no significant effect of directional FDI flows and no strong evidence of any munificent effects of bilateral FDI flows from developed or developing countries to developing countries.

In revisiting the FDI flows in developing countries, Basu and Guariglia (2007) researched on the interactions between FDI, inequality and growth, both from an observed and a theoretical perspective. The results received using a panel of 119 developing countries shows that FDI promotes both inequality and growth and this go a long way to reduce the share of agriculture to GDP in a beneficiary country. A growth model of a dual economy was set up in which the agricultural sector implores a diminishing returns technology whereas FDI is the engine of growth in the industrial sector. Thus, the predictive model which was the main model became consistent with the stylized facts observed in the analyzed data.

A paper by Qaiser et al. (2011) revealed that there is a positive and significant relationship between GDP and FDI. This relationship was tested using several appropriate regression models. Similarly, a research by Gudaro, et al. (2010), aimed to examining the impact of FDI on economic growth considering the link between FDI and GDP a case study of Pakistan, proved that there is a positive and significant relationship between GDP and FDI while realizing a negative and significant relationship between GDP and inflation. FDI is therefore an important factor for economic growth in developing countries.

Malaysia has a consistent performance of GDP from the period of 1970-2010. However, in the year 2009, inflow of foreign direct investments declined. Tanggapan et al. (2011) investigated the location advantage channels and its threshold value that can influence the inflow of foreign direct investment into Malaysia. Using FDI as an interactive term, as well as an independent variable, it was revealed that, all interactive term variables become insignificant towards economic growth whereas, without integrating interactive terms; all the location advantage channels were able to inspire economic growth. The research therefore supports that certain value of location advantage channels are imperative as a prerequisite for FDI to have a constructive effect on the economic growth in Malaysia. Also, employing cross-country data between 2004 and 2013, it was realized that FDI could not have an independent effect on the growth of D8 countries (Esfandyari, 2015).

2.6.3 Africa

In discussing the foreign direct investment and economic growth through an interactive term to Africa, Raheem and Oyinlola (2013) studied the relationship between FDI and economic growth taking into account the influence of an interactive capacity of financial sector development (FSD). Experiential analysis on three financial sector development indicators would ensure that, positive association between FDI and economic growth is achieved once all the considered threshold levels

are exceeded. The policy implication of this study is that, policies directed toward FDI would incorporate FSD and not in isolation. On the other hand, Okafor et al. (2015) critically examined the impact of all four locational motives of FDI in Sub-Sahara African (SSA) countries for the period 1996-2010. The empirical analysis engaged the techniques of pooled OLS, Fixed Effects, and GMM. The results showed that, efficiency and strategic asset seeking factors stimulate FDI activities in SSA. Also, when the data was analyzed separately, a statistical test confirmed structural and behavioural differences in FDI determinants between SSA sub-regional groups. Again, there were market and efficiency seeking in West and Central SSA while FDI in South and East Africa was best explained by efficiency seeking factors. Policy implications were derived based on the findings. These include trade liberation and trade diversification, control of corruption and productive investment in infrastructure and support for human capital accumulation.

Fedderke and Romm (2006) analysed the growth impact and the determinants of FDI in South Africa. The study estimated the model of locational choice in FDI between domestic and foreign alternatives as well as a standard spillover model of investment. A positive technological spillover from foreign and domestic capital resulted in a complementary foreign and domestic capital in the long run. It was observed that the FDI was horizontal rather than vertical due to its capital intensiveness in South Africa. From the empirical findings, it was seen that the policy must be directed towards the reduction in both direct and strong political risk, protecting property rights, enhance market size, as well as moderation, lower corporate tax and promote full integration of the economy in South Africa into the global economy. On the other hand, Gui-Diby (2014) observed the impact of FDI on economic growth in Africa and presented approximations based on the panel data of fifty (50) African countries for the period of 1980-2009. FDI inflows had an important impact on economic growth in the African region while the low level of human resources

did not limit the impact of FDI. The results from the paper retained the System Generalized Method of Moment (System GMM) estimators as Blundell and Bond (1998) proposed.

One of the most pressing issues in the economic literature in host countries is the interaction between FDI, trade openness, and economic growth. Belloumi (2014) examined this issue for Tunisia's suffering from unemployment and lack of technological progress. Applying the bounds test on data from 1970 to 2008, the results suggested that the variables of interest are bound together with FDI as the dependent variable in the long run. This assures the existence of a long-run relationship. There is no significant effect of FDI on economic growth, from economic growth to FDI and that on trade in the short run. The empirical results also failed to detect positive spillover externalities for the host nation from FDI.

With macroeconomic data of 27 Sub-Saharan African (SSA) countries and six measures of governance, Ajide et al. (2014) attempted to answer the question as to whether institutional management impacts FDI on economic growth. Their findings showed that proper governance has a strong impact on FDI in promoting economic growth. Asiedu et al. (2015) constructed a theoretical model that examines the relationship between HIV/AIDS and foreign direct investment. Evidence from forty-one (41) countries in the Sub-Saharan Africa demonstrates that HIV/AIDS has adverse effect though decreasing on FDI such that even when HIV/AIDS exists at a rate as low as 0.1%.

Clearly, studies on the continent have not placed much emphasis on the relation between private capital flows and economic growth. Abbloyor et al. (2014) scrutinized the relationship between private capital flows and economic growth in Africa during the period 1990-2007. Employing a panel instrumental variable generalized method of moments (IV-GMM) estimator, empirical relation estimation for arbitrary heteroscedasticity and endogeneity were allowed. It was therefore

concluded that, although private capital flows have negative impact on economic growth, countries with strong domestic financial markets gain more by being able to transform these negative impacts into positive ones.

According to Gui-Diby and Renard (2015), there is no significance impact of FDI on the industrialization of the data panel of 49 countries over the period of 1980-2009. It was viewed that, the role of FDI in the transformation agenda in Africa must be prudently analyzed to maximize the impact of these capital inflows.

Cleeve et al. (2015) investigated the role of human capital on FDI inflows to Sub-Saharan Africa. They reported no indication of the increasing significance of human capital on FDI over time, possibly imitating the type of FDI flowing into SSA when a panel data for the period 1980-2012 was engaged to evaluate if changing skill needs stimulus FDI inflows.

2.7 Review of Sectoral Foreign Direct Investment

Foreign direct investment has been viewed as a variable affecting economic growth directly and indirectly during the past few decades. In this section, a wide range of literature on the global economy, especially foreign direct investment, economic growth, and the relationship between them will be examined under various sub-sections namely; primary, manufacturing and service

2.7.1 General Sectoral Review of Foreign Direct Investment

In a widely cited work, Noy et al. (2006) examined the impact of FDI inflows to China and Vietnam. Their work was the first to use sectoral FDI inflow data to assess the sector-specific impact of FDI on growth as preceding empirical works failed to reach a consensus. The outcome of the two developing-transition economies revealed that, FDI has a statistically significant positive effect on economic growth functioning directly and through labour productivity.

Interestingly, the effect was different across economic sectors, with the manufacturing sectors appearing to gain almost very high growth benefit from sector specific FDI.

Within a new growth framework, Doytch (2015) investigated the sectoral FDI cycles in South and East Asia economies. A dynamic panel Blundell-Bond GMM methodology was employed to analyze the inflows of FDI in extractive industries, manufacturing and services in addition to aggregate FDI. Fifteen (15) economies during the period 1980-2011 were selected. They found proof of countercyclical behaviour of services FDI and a cyclical behaviour of both extractive industries FDI and manufacturing FDI. Shapiro and Globerman (2003) applied a time-series data to estimate the FDI flows in Canada to determine the degrees to which Canadian FDI policies affect these flows. Based on the period 1950-1995, they established a policy framework that suggests that general policies are less likely to deter FDI flows than are sector-specific policies. Also, public policies to some degree have been significant in determining capital flows with effects not identical.

However, as in most other papers, Alfaro (2003) revealed that the benefits of FDI vary across sectors by dissecting the effect of FDI on growth in the primary, manufacturing and services sectors using a cross-country data for the period 1981-1999. Foreign direct investments in the primary sector tend to have a negative effect on growth whereas the effect of foreign direct investment in manufacturing is a positive one. The service sector's effect is abstruse.

A study by Vu and Noy (2009) using cross-country regressions and sectoral data for a group of six country members of the OECD were employed. They identified a positive or no statistical discernible effect on economic growth directly and through its interaction with labour. In contrast, the effects seem to be very different across countries and economic sectors. Aykut and Sayek, (2007) postulate that as the share of the manufacturing sector in FDI flows increases, there is a

positive effect on economic growth whiles, as the share of primary or services sector FDI increases, there is a negative effect on economic growth. Cross-country data between 1990 and 2003 was engaged.

As Benigno et al. (2015) highlighted in their studies the stylized facts characterizing periods of exceptionally large capital inflows in a sample of seventy (70) middle and high-income countries over the last thirty-five (35) years, 155 episodes of large capital inflows were noticed, and these events were convoyed by an economic boom and followed by a slum. Again, there was a capital and labour shift out of the manufacturing sector at the time of the episodes of large capital inflows; although it may seem natural to argue that FDI can deliver prodigious advantages to host countries. Iram and Nishat (2009) studied results based on the ADF and PP unit root tests taking into account over the period of 1972 to 2008, indicating that in the long run, manufacturing foreign direct investment (MFDI) and services foreign direct investment (SFDI) significantly affect economic growth. In addition, Iran and Nishat (2009) showed that in the short run, both MFDI and SFDI do not significantly affect economic growth when they both empirically explored the impact of services and manufacturing FDI on economic growth in the presence of macroeconomic instability and privatization. Moreover, forward linkages from FDI in services explain seven percent (7%) of the observed increase in Chile's manufacturing users' total factor productivity. It also offers opportunities for straggler firms to catch up with industry leaders. These results came up when Fernandes and Paunov (2012) probed the impact of substantial foreign direct investment inflows in producer service sectors on the total factor productivity of Chilean manufacturing firms.

In examining how FDI in the manufacturing and the service sectors promote economic growth, evidence from Latin America-Caribbean, Europe and Central Asia proved that FDI in both sectors

shot up economic growth. However, non-financial service FDI poses a threat to the manufacturing industry (Doytch and Uctum, 2011).

Moreover, Tuan and Ng (2003) with evidence from manufacturing and service joint ventures in China, using core-periphery relation-based study through gravity model analysis involving a database of 37,742 firm level manufacturing and service joint ventures, proved that FDI is heavily promoted by agglomeration economics thereby enhancing economic growth. This is irrespective of the industry type being it manufacturing or service. China's economic strategy of granting equal trade opportunities to all countries since the 1980s has attracted heavy FDI in the country.

Although foreign direct investment is seen to have a positive effect on economic growth, however, when considering the different average growth performance across sectors, the favourable impact of FDI is no longer ostensible. Khaliq and Noy (2007) examined the influence of foreign direct investment on economic growth using comprehensive sectoral data for FDI inflows to Indonesia over the period 1997-2006. The probable fallouts across different sectors appear that the configuration of FDI matters, for its effect on economic growth have significant influence with mining and quarrying revealing a robust negative effect of FDI inflows.

Ullah et al. (2012) reconnoitred the role of FDI on sectoral growth of Pakistan's economy with special reference to agriculture and industrial sectors for the period of 1979 to 2009. Two Stage Least Square (2SLS) techniques were used to evaluate the role of FDI on sectoral growth. Ascertaining the stationary condition of the variables with the Augmented Dickey Fuller test, the paper established a significant negative impact of FDI on growth of the agricultural sector. Industrial sector is positively affected by FDI and this effect is indicated to be statistically insignificant.

One of the most pressing issues in the economic literature is the role of sectoral FDI in promoting agriculture and improving food security. Slimane et al. (2016) employed fifty-five (55) developing countries in a panel framework over the 1995-2009 period. Their outcome expressed the different effects FDI has on food security. In addition, they realized the significant FDI's spillover through the agricultural production to food security.

Doytch and Narayan (2016) observed the link between FDI and Energy demand. With seventy-four (74) countries over the period of 1985 to 2012, they disaggregated FDI inflows into mining, manufacturing, total services and financial services components to scrutinize their impact on renewable and non-renewable industrial energy. Blundell-Bond dynamic panel estimator allowed the researchers to come out with the idea that the effects vary in magnitude and significance by sectoral FDI. They therefore concluded that, non-renewable sources of energy have a consumption-reducing effect whereas with reverence to renewable energy, there was an energy consumption-augmenting effect.

Kippenberg's (2005) study aimed to analyze the foreign direct investment influence on the industrial structure of the host economy through linkages to the Czech Republic. He showed the linkages proving a strong influence on the sectoral composition of the economy and again supporting the manufacturing and labour intensive-industry's progress.

In evaluating the impact of FDI and foreign trade on wages, a study was constructed in the Central and Eastern European Countries during the post-transition era. Using econometric analysis based on one-digit level panel data for the manufacturing sector, it was deduced that in the short-run FDI has a positive effect on wages fuelled by capital intensive and skilled labour, and in the medium-run FDI turns to have a negative effect on wages. It was however proven that foreign or international trade has no effect on wages according to Onaran and Stockhammer (2008). A study

on how Japan chose to locate their manufacturing and non-manufacturing firms in Europe taking into consideration the period between 1970 and 1994 by Gross et al. (2005), showed that Japanese firms are mostly located in areas where their firms already exist. Evidence gathered from the Japanese investment in Europe shows that FDI in one sector attracts FDI in another.

Based on time series data on employment in different components of organized sector in India by Chakravarty and Mitra (2009), there was a realization that the industry still powers the growth of every economy. The study was undertaken through the vector auto-regression (VAR) framework considering the manufacturing, construction and service sectors of the economy as far as the industry is concerned.

2.7.2 Review of Sectoral FDI in Africa

Determining the sectoral inflow of FDI and economic growth in Nigeria, Obayori et al. (2016) point out that, inflow of FDI in manufacturing, telecommunication and oil have impact on Nigeria's economic growth. Posu, et al. (2007), in their study evaluate Nigerian's aggregate flows of FDI. They employed time-series data for the period 1970-2003 and adopted the Ordinary Least Square technique to probe the impacts of foreign direct investment flows on the outputs of some selected sectors in the Nigerian economy. Relating the parsimonious form of analysis of general-to-specific in the analysis of the model, it was found out that, FDI flow was substantial to sectoral growth of the mining and quarrying, and the transportation and communication sectors whereas it was not momentous to the growth of the agriculture, forestry, and fishery sector.

2.8 Review of Literature on FDI Spillover Effects on Domestic Enterprises

Despite numerous advantages FDI inflow may have on an economy, there are still a few concerns by countries seeking to attract FDI. Two of these concerns are the amount, type and the use of the FDI which may not benefit many compared with other alternative resource allocations. The other

concern is the anxiety of the receiving country that those foreign firms may have more bargaining power than domestic firms (Dunning, 1981). Foreign direct investment (FDI) is believed to bring positive spillovers to domestic firms in the local economy. Most developing countries lack technology capability and FDI can serve to facilitate technology transfer and reduce the technology gap between developing countries and industrial countries. FDI could also generate an impact on local economies through, for instance, increased competition, technology spillover from subsidiaries of multinational corporations to local indigenous firms and the transfer of knowledge.

The spillover effects of FDI on domestic enterprises is structured on the realization that FDI spillover is conditioned by the spillover potential of foreign investors, the absorptive capacity of domestic agents and the interaction of these two factors (Paus and Gallagher, 2008). Foreign investor FDI spillover potential is a necessary condition but it is not enough to achieve overall spillover on the host country. The extent of the impact of spillover is determined by the capacity of local agents to absorb the spillover and how the two agents that being foreign investor potential and the absorptive capacity of the domestic agents determine (Farole & Winkler, 2014).

There are various channels through which the spillover effects of FDI can be achieved. This includes but not limited to backward and forward linkages, including supply chain. There are also competitive effects where local firms and their foreign counterparts may compete for market share within the domestic economy. Technological effect is achieved through the demand by multinational companies for high quality input and services which gives local supplies incentives to upgrade their technology and finally knowledge transmission from foreign firms to local firms through labour turnover (Paus & Gallagher, 2008). These channels through which FDI spillover effects are achieved are usually influenced by the characteristics of both domestic and foreign firms in addition to most countries' institutional framework (Farole & Winkler, 2014).

One of the areas through which FDI spillover occurs is where there's a knowledge transfer from FDI firms to domestic enterprise through new technology. Other forms include backward and forward linkages between MNCs and the domestic firms. Domestic firms could serve as input supply for foreign firms and foreign firms' production of goods and services could be used as efficiency-enhancing inputs by domestic industries. Finally, multinational companies could increase the number of people employed in the host country thereby helping increase the speeding on domestically produced goods and services (Gallagher & Zarsky, 2007).

Farole and Winkler (2014) developed a conceptual framework based on the earlier works of Paus and Gallagher (2008) to depict the various mediating factors for FDI spillovers. They identified degree and structure of foreign ownership, FDI motive, global production and sourcing strategy, technology intensity, FDI home country, entry mode and length of pressure to contribute to FDI spillover potential. The characteristics absorptive capacity of domestic firms included technology gap, research and development, scale, human capital, exporting, firm location, competition, type of ownership and sector dynamics channels through which knowledge differs from profit firms to domestic firms depends on the factors at the host country and its institutional framework. These factors include; the host country's labour market regulation, intellectual property, leaving and innovation, infrastructure, access to finance, competition, institutional governance, investment and individual policy (Farole & Winkler, 2014)

These factors tend to be interdependent and operate in a dynamic way, hence the interaction between the FDI spillover potential of foreign firms and the absorptive capacity of domestic firms are key in achieving successful FDI spillover effects.

2.8.1 Studies on FDI Spillover on domestic Enterprises

The empirical literature on spillover effect of FDI on domestic firms is mixed. Cave (1974) in his pioneering study on the effects of horizontal spillover found evidence of positive spillover effects.

Gorodnichenko, Svejnar, and Terrell (2014) examined FDI spillover effect on 17 transition economies using firm level data for the period 2002-2005. The study also examined how the spillover varies in terms the source of the FDI, sector and firm level characteristics. The results indicated that backward linkage has always had a positive effect on productivity but the same cannot be said of horizontal and forward linkages as they have not shown consistent effects. Dong and Barcena-Ruiz (2015) researched into the role played by firms' strategic investments in capacity. The work considered two markets and two firms with excess capacity and two types of FDI that is vertical and horizontal. They study concluded that firms that make strategic investment in capacity influence vertical FDI but discourage horizontal FDI. The study further noted that policy makers should be mindful when considering investment in capacity as it affects different types of FDI differently.

Newman et al. (2015) examined the relationship between productivity and FDI inflow into the domestic economy using a survey of 4000 manufacturing firms in Vietnam. The study separated the productivity gains along the value chain in Vietnam and tried to identify indirect vertical spillover in the manufacturing sector. The results clearly indicated there are direct productivity gains within the value chain between the foreign firms and domestic enterprises. The study further asserted that there is a forward linkage for the domestic firms in terms of inputs from the foreign companies. Similarly, Merlevede, Schoors and Spatareanu (2014) investigated the relationship between domestic productivity and foreign direct investment in the Romanian domestic manufacturing companies over the period 1996-2005. The study found out that the entry of foreign

firms had an initial negative impact on domestic competitors, output and subsequently followed by a positive effect. The study further claimed that on the effect of foreign firms on local suppliers, the foreign firms enhanced the productivity of local firms initially and later realised a decline in productivity of local suppliers.

A similar study by Javorgk (2004) on Lithuania on backward and forward spillover based on input output data found evidence of both horizontal and backward spillovers but no evidence of forward spillovers. On the other hand, a study by Havranek and Irsova (2011) found positive and significant backward spillover effects from foreign firms on domestic suppliers in the upstream sectors and less positive effects on locals in the downstream sectors. The study however found no evidence of horizontal FDI spillover taking into accounts 3,626 estimates from 55 studies.

Some studies have shown ambiguous results on the spillover effects on domestic productivity. Gorg and Greenaway (2004) in a meta- analysis of the spillover literature indicated that the methodology used, to a large extent determines the findings and suggested that cross–sectional studies tend to find statistically significant evidence of positive spillover effects. Paus and Gallagher (2008) in an examination of the literature concluded that panel data are more likely to have negative spillover effects on domestic productivity as compared to regressions based on cross–sectional data which tends to be positive.

The country and industry specific case studies on FDI spillover affects especially the mechanism through which spillover occurs tend to present more positive results though the results are mixed. Gallagher and Zarsky (2007) found positive evidence for both vertical linkage and horizontal inter–industry linkages. There are studies in these areas especially in East Asia. Studies by Ernst (2003) and Phillips and Henderson (2009) illustrated how the Malaysian electronic sector failed to develop a domestic base FDI spillover from the low–value firms.

In contrast, Moran (1998) and Wong (2003) found evidence of how vertical spillover was achieved in the Singapore electronic sector through the development of competitive domestic supplier based on FDI in the 1970's and 1980's. Likewise, Amsden and Chu (2003) vertically examined how the partnership between MNCs and domestic firms in the 1960's and 1970's in Taiwan and China helped develop a strong domestic competitiveness in the electronics sector. Studies on Mexico, Costa Rica and Malaysia showed a missing link between the high–tech FDI and the development of the domestic sector suppliers of the electronic sector largely due to requirements and strategies adopted by the FDI firms (Gallagher & Zarsky, 2007; Paus &Gallagher, 2008; Phillips &Henderson, 2009).

Pojar (2012) undertook a study on the influence of FDI on firm's performance in Central and Eastern European countries. The study was based on firm level dataset for 13 countries. The results showed that FDI generates positive externalities on domestic enterprises in the host country, which means that the average positive spillover effects outweigh the competitive effect. The research concluded that the institutional environment coupled with low level of bureaucracy attract FDI.

Tong and Hu (2003) found evidence of positive spillover effects on domestic enterprises in China's manufacturing firms. The research used firm level industrial data to estimate the relationship between the intensity of foreign presence and the level of performance of domestic firms in China. It also concluded that the larger the technological gap, the larger the potential for technological spillover. Similarly, Lin and Cheung (2004) researched into the spillover effects of FDI on innovation in China using provincial data from 1995-2000 and found evidence of positive effects of FDI on domestic patents. The spillover was found to be stronger for minor innovations, hence this shows the demonstration effect of FDI.

Hongyu, Meiyue, and Yang (2011) assessed the spillover effects on the manufacturing industry in China. The results showed that FDI has significant and positive spillover effects on both state-owned and non-state-owned companies. The study further revealed that FDI from Hong Kong, Macao and Taiwan had positive effects on privately-owned companies and negative effects on government-owned companies. Similar results were achieved by Du, Harrison, and Jefferson (2011) in their study on spillover effects and its implications on China's special characteristics, having found a positive and significant spillover effect on domestic firms through backward linkages especially between foreign buyers and local suppliers.

The difficulties with measuring FDI spillover characteristics were highlighted in the study of Javorcik and Spatareanu (2005) which concluded that a cautious approach should be adopted when concluding on the spillover effects of FDI on domestic enterprises since it is difficult to disentangle the various effects, especially the composition of FDI inflows and various country characteristics that could affect the phenomenon.

In assessing the productivity spillover from foreign firms on domestic enterprises in Vietnam, Thanh and Hoang (2009) using panel data set covering the period 2003-2007 from Vietnam's enterprise survey data at firm level, found evidence of a positive productivity spillover effects on domestic enterprises. The study however concluded narrowing the technological gap and an upgrade of labour quality of domestic firms could help them maximise the benefits of FDI.

Similar works have been done by Grima, Gong, and Görg (2008) on the linkage between inward FDI and innovative activity in China. The evidence showed that inward FDI at the sectoral level is positively associated with domestic innovative activity.

Vahter and Masso (2006) researched on the effects of both inward and outward FDI on productivity in the manufacturing and services sectors of Estonia. Using a panel data, the results showed that there are not much spillover effects of outward or inward FDI in Estonia, suggesting that there is a substantial heterogeneity in the spillover findings on different sectors and different model specifications.

Technology spillovers from FDI have been widely discussed in the literature. First, it is well established that the technology transfer provided by the US multinational enterprises (MNEs) contribute to the productivity growth in DCs but not in LCDs. When US MNEs decide to penetrate a new market through directly investing in the country, they tend to bring with them more sophisticated technology of which a country needs to reach a minimum human capital threshold level to benefit from the technology transfer. These came up when Xu (2000) in his work examined US multinational enterprises (MNEs) as a conduit of international technology diffusion in 40 countries from 1966 to 1994. Generated positive effects of FDI spillovers are often offset by negative effects on the competitiveness of national firms. However, spillover effects in terms of technological know-how and knowledge help the invention of robust innovativeness growth, both horizontally and vertically (Munteanu, 2015).

Four studies were introduced relating to multinational enterprises in four developing countries: Ivory Coast, Mexico, Morocco and Venezuela. Harrison results showed that, there is no evidence of pollution havens and that, multinationals raise wages for local workers. The study again finds the technology transfer generally being restricted to the joint ventures that receive foreign equity participation (Harrison, 2012).

A study by Amann and Virmani (2014) analysed the "feedback effect" of foreign direct investment on total factor productivity (TFP) growth in emerging economies via technology spillovers across

borders. The analysis of the research and development spillovers from 18 emerging economies into 34 OECD countries over the 1990-2010 period and the support from country- specific bilateral elasticities proved that, FDI enhances productivity growth with the impact much larger when R & D intensive developed countries invest in the emerging economies than the other way round. A plant-level study covering U.K. manufacturing firms from 1973 through 1992 was used (Haskel et al., 2002).

There was an investigation of whether spillovers associated with one firm's export activity reduce the cost of exporting for other firms. In their study, two sources of spillovers were recognized. Employing the panel data on Mexican manufacturing plants, evidence of spillovers from multinational enterprises was established but not from the general export activity (Aitken et al., 1997).

Almfraji and Almsafir (2014) reviewed studies on the relationships between FDI and economic growth from 1994-2012. Their findings confirmed that, FDI-growth relation is significantly positive but negative and even null in some cases. This work hypothesizes the effects on technology transfer and spillovers depriving from ownership sharing of foreign multinational affiliates. Do establishments with minority and majority ownership differ in terms of productivity levels? And does the degree of spillover differ with the degree of ownership in the FDI? Trying to answer these questions, Blomstrom and Sjoholm (1999) employed unpublished Indonesian micro data and their results revealed that, foreign establishments have similarly high levels of labour productivity and that, domestic establishments benefit from spillovers.

The ownership structure in foreign investment projects affects the extent of vertical and horizontal spillovers from foreign direct investment (FDI) as illustrated by Javorcik and Spatareanu (2008). The illustration was based on the Romanian firm-level data set and the outcome suggested that,

the vertical spillovers relate to projects with shared domestic and foreign ownership but not with fully owned foreign subsidiaries.

Using data from World Bank survey of 1500 firms in five cities in China, Hale and Long (2006) examined whether the presence of foreign firms creates technological spillover on domestic firms in China. The study found evidence of positive technological spillover for more advanced firms but none or negative spillover for less advanced firms. The results suggest the movement of highly skilled workers from foreign firms to local firms and a high degree of externalities within the skilled labour force thereby highlighting the importance of a well-functioning labour market in facilitating technology transfer.

Javorcik and Spatareanu (2011) in their work used a firm-level panel data from Romania to examine whether the origin of foreign investors affects the degree of vertical spillovers from FDI. They realized that, there is a positive association between the presence of American companies in downstream sectors and the productivity of Romanian firms in the supplying industries, whereas there is no significance in the case of European affiliates. In addition, the results also pointed out that Romanian firms in sectors whose products are expensive to transport, gain more from downstream presence of American affiliates than Romanian firms in sectors with low shipping costs. On the contrary, no such pattern is established for European affiliates.

Considering the endogeneity of input choices, simultaneity bias, and clustering errors, their analyses proposed that positive spillovers from FDI arise from forward linkages where domestic firms purchase high-quality intermediate goods from foreign firms in the upstream sectors. They reported that domestic firms differ significantly in the extent to which they benefit from FDI when Xu and Sheng (2012) used firm-level census data to examine the spillover effects of FDI on domestic firms in the Chinese manufacturing industry between 2000 and 2003.

Considering the question whether differences in technical efficiency of Mexican plants in part is derived from spillover efficiency associated with foreign direct investment, Blomstorm and Persson (1983) in their work measured technical efficiency using labour productivity and related this to capital intensity, labour quality and scale of production. The empirical evidence from the study indicated that there is a spillover of technical efficiency.

2.8.2 Studies on FDI Spillover Effects on Domestic Enterprises in Africa

Seghir (2012) assessed the impact of FDI on innovation in Tunisia's high-tech industries through spillover channels with a panel data model. The results indicated that the spillover effects of FDI are not significant. The evidence showed that the effect of horizontal spillover on domestic firms is negative; however, domestic firms gain spillover effects through vertical linkage on technological transfer.

Some studies have also been done in relation to the apparel sector in Africa especially in Madagascar, Losotho, and Swaziland. These studies have shown that these countries have a higher FDI spillover potential than Asian producers. However, these countries could not develop the potential of domestic apparel sector because of lack of appropriate linkages between domestic firms and MNCs. This has been attributed largely to the Asian companies' global sourcing strategies and division of labour between their global head offices and globally dispersed manufacturing plant. That is, high value activities take place in their global head offices and not the manufacturing plants thus making it difficult for the necessary FDI spillover linkages to be created (Morris, Staritz, &Barnes, 2011; Staritz & Morris, 2012; 2013).

Morrisey (2012) raised issues when debating on FDI in Sub-Saharan Africa. The study suggested that there are very few linkages between FDI and domestic investment and hence FDI spillover is

almost non-existent in Africa. The study suggested that most FDI into the continent are in the extractive sectors where there are very little or no value addition hence not much linkages and spillovers could be expected. The study concluded that for the continent to realise more linkages and spillover effects of FDI, countries in this region must develop a comprehensive industrial policy that will be able to provide incentive for spillovers and that spillover implies learning; that, econometric analysis of spillover does not critically examine learning.

A critical examination of the literature has shown that with exception of Farole and Winkler (2014), which covered about 25,000 manufacturing firms in 78 developing countries, most of the other studies have been restricted to either a specific country or a small number of countries and firms.

Secondly, a lot of the studies limited their assessment to a single mediating factor. Studies by Gertler (2009) focussed on absorptive capacity. The only two studies that have focussed on all the three characteristics are Havranek and Irsova (2011) and Farole and Winkler (2014) who analysed the role of foreign investor and host country's characteristics in addition to the mediating factors.

From the literature, though some studies have been done mostly on developing countries, the results remain ambiguous (for instance, Gorg & Greenway, 2004; Hanranek & Greenaway, 2004; Lipsey & Sjoholm, 2005) meaning that theoretical spillover may not necessarily be translated into actual FDI spillover, hence the need to examine some of the factors that account for the differences.

Amendolagine et al. (2013) explored the determinants of backward linkages of foreign manufacturing firms in 19 Sub-Saharan African countries. They highlighted on the micro and macro level factors that contributes to more interactions between foreign subsidiaries and local firms. Their outcome showed that, the presence of a local partner in the ownership structure and a

final market orientation are the higher local linkages. In conclusion, they agreed to the notion that good institutions are pre-conditions for boosting the linkages generated by foreign firms. Simultaneously, more light was shed on firm-level data across 77 developing countries to evaluate how the constraints related to investment climate hamper foreign direct investment. They saw that, physical infrastructure problems, financial constraints, and institutional problems discourage FDI. Finally, exporter foreign firms are more constrained in their activities than the firms supplying the domestic market (Kinda, 2010).

This paper employs firm-level data from Kenya, Tanzania, and Zimbabwe to consider the importance of productivity externalities of FDI to local firms, in terms of both intra-industry and inter- industry spillovers. Managi and Bwalya (2010) revealed evidence in support of intra-industry and inter-industry productivity spillovers from FDI for Kenya and Zimbabwe.

Haddad and Harrison (1993) used a unique firm-level dataset to test for spillovers in the Moroccan manufacturing sector. They reported that, the diffusion of productivity is smaller in sectors with more foreign firms. Nevertheless, the hypothesis that foreign presence accelerated productivity growth in domestic firms during the second half of the 1980s was precluded. Moreover, they rejected the possibility of a downward bias in estimating technology spillovers for the reason being that, foreign investors may be attracted to protect domestic markets.

Ordinary least square (OLS) regression analyses was conducted to determine if FDI has developed a source of spillover effects on host country's economic growth and value-added activities in manufacturing products. Some studies have explored the relative importance of MNEs as sources of knowledge and technology spillovers for the SSA countries and established that the variables do not always exert a positive effect on economic and manufacturing growth activities in Sub-Saharan Africa.

Bartels et al. (2014) studied the characteristics of location specific factors (LSFs) in Sub-Saharan Africa (SSA) regarding inward FDI by MNEs. They found the most important factors, influencing the political-economy and trade dynamics of host to FDI. They considered the exploratory factor analysis (EFA) of 758 MNEs in 2003, 1216 in 2005 and 2402 in 2010 to compare the variability in LSFs in 10, 15, and 19 SSA countries respectively. Morris and Staritz (2012) concluded that FDI in the apparel sector has provided for many low-income countries (LICs) an access into apparel exporting and generated employment openings for low-skilled labours.

Few of the studies have focussed on Africa as a continent with its unique characteristics in terms of FDI inflows and its domestic economy. Doing so helps in addressing the critical needs of the continent and how FDI potential, its mediating factors and the continent's own characteristics impact on FDI spillover effects. There will also be an assessment at both the regional levels and within the various income groups to draw the necessary conclusion on the continent.

2.9 Conclusion

The literature on the determinants of FDI has focussed greatly on classification of the determinants into various forms. For instance, Tsai (1991) classified the determinants into supply side effects and demand side effects; Ahmed el at. (2005) examined it based on the country specific push and pull factors. Nunnekamp (2002) based his classification on traditional and non-traditional determinants of FDI. Similarly, the relationship between FDI and growth in developing countries has mostly dwelt on the direct relationship between the variables. For instance, studies by Iamsiraroj and Ulubasoglu (2015), Ghazali (2010), Nahidi and Badri (2014), Antwi and Zhao (2012), Sukar, Ahmed and Hassan (2007) and Abbes el at. (2015) identified FDI to have direct positive relationship with economic growth. Other studies did find mixed results on FDI impact

on economic growth (Adams, 2009; Encinas-Ferrer &Villegas-Zermeno, 2015; Herzer et al., 2008Narula & Driffield, 2012).

However, some recent studies have identified absorptive capacity of the host country as a key factor in determining the impact of FDI on growth. Some of the determinants of FDI that have also been identified as factors that enable FDI to impact on growth include human capital development (Borensztein el at., 1998), financial development (Alfaro el at., 2006; Massoud, 2008), trade regime (Balasubramanyam el at., 1996), technological development (Li & Liu, 2005), regulatory systems (Adams & Opoku, 2015), and economic freedom (Azman-Saini et al., 2010).

This study will examine a comprehensive review of domestic economy's absorptive capacity, the relationship between FDI and growth instead of focussing on just one threshold variable as most studies did. It will also focus on empirically estimating the quantum or the level of these variables needed for foreign direct investment to impact on economic growth.

This study will further focus on a comprehensive assessment of all identified factors that can interact with FDI to achieve economic growth and will also evaluate the threshold level needed for the determinants of FDI to impact on FDI to achieve economic growth in Sub-Saharan Africa. This, when realised will help policy makers on the continent to formulate policies that will impact on the threshold levels needed for FDI to have the desired impact on economic growth and development.

Again, most of these studies on the relationship between FDI and economic growth have focussed on FDI as one whole variable instead of also examining the different types of FDI and the sectors these FDI go into and their impact on growth. This is significant because FDI could have varying effects depending on the characteristics of the sector it is found (Aykut & Sayek, 2007; UNCTAD,

2015). The conditions needed for FDI to impact on growth in different sectors may also vary. It is in this light that an assessment of the impact of sectoral FDI on economic growth in Sub-Sahara Africa will help to identify how FDI into the various sectors impact on growth and development of the region. This will help bring clarity on why FDI into the region has been found to have had ambiguous effect on the economies within the region and address the policy challenges we have to have a targeted approach towards FDI attraction.

Some studies have questioned the existence or otherwise of FDI spillover (see for instance Morrisey, 2012). Again, much of the work has been on individual countries (Morris, Staritz & Barnes, 2011; Seghir, 2012; Staritz & Morris, 2013) thus losing out on the broader picture of its impact on the whole continent. Whilst some country specific studies allow for a detailed examination of country specific factors, a broader study on the continent helps in generalising the results and in reducing country bias. Many of these studies remain very ambiguous whether they were qualitative or quantitative. There is also a significant gap in the body of literature on how FDI spillover exists on the continent and how it impacts on domestic enterprises, especially in relation to the ongoing processes of improving the domestic environment for both local and foreign investments. Gaps have also been identified in the literature on spillover effects especially on which type of FDI has the potential to generate these effects and the role that the domestic environment and domestic enterprises can play in making the potential spillover work in the host country.

In revisiting the determinants of FDI in Africa, there are several issues that are of concern to this study especially looking at the level of technological development that has evolved over the last decade. A lot of interesting variables must be considered in assessing determinants of FDI in Africa. Although Asiedu (2002) suggested that factors that might have contributed to FDI inflow

elsewhere may not impact on FDI attraction on the continent, various developments have evolved since that study. For instance, economic freedom on the continent has improved significantly (World Bank, 2014). The level of technology has also been enhanced over the last decade leading to the influx of several mobile telecommunication networks across the continent. It is also equally important to note the regional dynamics of FDI inflow, as well as the level of development of different countries in the region as suggested by Contessi and Weinberger (2009), if we are to settle the debate on the determinants of FDI in Africa.

Most of the studies have not looked at the peculiarity of Africa as a continent except for Asiedu (2002), and Bartel et.al. (2008). Even those that looked at the continent have produced mixed results. Again, most of the studies on Africa do not to include Northern Africa which is also significant in terms of FDI attraction into the continent.

This study intends to bridge these gaps that exist especially in relation to Sub-Saharan Africa by examining both theoretical and quantitative underpinnings of these issues by broadening the context of FDI spillovers to help gain deeper understanding of FDI and benefits on the region.

CHAPTER THREE

MODELLING FDI THRESHOLD, SPILLOVER EFFECTS AND ECONOMIC GROWTH

3.1 Introduction

This chapter explored the conceptual framework on threshold effects of FDI on economic growth, sectoral FDI impact on economic growth, and the spillover effects of FDI on domestic enterprises. It also took a critical look at the methodology for assessing the impact of these variables.

3.2 Objective One and Estimation Technique

The first objective of the study is to ascertain the minimum threshold level of FDI required for it (FDI) to impact on economic growth. To achieve this, first, a model is built to establish non-linear relationship and the estimation technique required to estimate the non-linear relationship between economic growth and FDI then follows.

3.2.1 Theoretical and Empirical Model for Objective One

In the theoretical literature, models have been developed to explain the process of long-run growth of an economy. The Solow growth model is the fundamental neoclassical growth theory that a number of competing models are based on. The premise of the Solow Growth model is that, capital accumulation is the fundamental factor for short run variations in the level of output but cannot account for a sustained growth of output. Thus, in the long-run, the growth of an economy is exogenously determined by technology (Solow, 1956).

Several issues have been raised about the adequacy of the model especially in explaining long-run growth of an economy. First, the model assumes that there is diminishing return to capital such that growth of the economy is proportional to growth of technology, which is exogenously

determined. The assumption of homogenous capital has raised concerns since capital is seen as heterogeneous. Moreover, the model treats the causes of technical progress as exogenous. This assumption has been relaxed in alternative models which treat the fundamental factor believed to be for long-run growth (technology) as endogenous to the growth processes giving rise to the currently dominant "endogenous growth models" (Barro & Salai-Martin 1995; Romer, 1986; 1990; 1994). Thus, the fundamental factors that account for variations in the level of technology constitute potential factors for explaining long-run growth of an economy. For instance, government policies that can exert significant (positive or negative) effect on the level of technology, which in turn stimulates long run growth in the economy, are among potential growth-enhancing factors. Therefore, to examine the relationship between foreign direct investments (FDI) and economic growth, this study presented the theoretical model within the framework of the neoclassical endogenous growth model.

Starting with the neoclassical production, the production function is specified as follows:

$$Y = AF(K, L) \tag{1.1}$$

where Y, A, K, and L denote level of output, level of technological progress, stock of domestic capital and labour respectively.

As indicated earlier, the advent of endogenous growth theory has opened a way by which policy can influence growth and, for that matter, FDI (De Mello, 1997; Borensztein et al., 1998). De Mello (1997) has provided extensive transmission mechanisms through which FDI affects growth in an economy.

The augmented production function is specified in equation 1.2 as follows:

$$Y = AF(K, L, FDI) \tag{1.2}$$

FDI denotes foreign direct investment and the other variables (A, K, L, and F) are as previously defined. Since this study is on economic growth, the augmented aggregate production function must be converted to growth rate of per capita output equation. To achieve this, the study employs Cobb-Douglas production technology with constant returns to scale, thus,

$$Y = AK^{\alpha_1}(FDI)^{\alpha_2}L^{1-\alpha_1-\alpha_2} \tag{1.3}$$

In most of the cross-sectional and panel empirical studies on economic growth Barro, 1996; Omri & Kahouli, 2014), output per capita, rather than the aggregate output is employed to account for differences in population across countries. Thus, equation (1.3) is transformed to obtain the per capita output function.

$$\frac{Y}{L} = AK^{\alpha_1}(FDI)^{\alpha_2}\frac{L^{1-\alpha_1-\alpha_2}}{L} \tag{1.4}$$

$$\frac{Y}{L} = AK^{\alpha_1}(FDI)^{\alpha_2}L^{-\alpha_1}L^{-\alpha_2} \tag{1.5}$$

$$\frac{Y}{L} = A\left(\frac{K}{L}\right)^{\alpha_1}\left(\frac{FDI}{L}\right)^{\alpha_2} \tag{1.6}$$

Denoting $\frac{Y}{L}$ by y, $\frac{K}{L}$ by k and $\frac{FDI}{L}$ by fdi and inserting these variables in equation (1.6) gives equation (1.7):

$$y = Ak^{\alpha_1}fdi^{\alpha_2} \tag{1.7}$$

Taking natural logarithm and time derivative of each variable yield growth rate of output per capita function.

$$Lny = LnA + \alpha_1 \ln k + \alpha_2 Lnfdi \quad (1.8)$$

$$\frac{\dot{y}}{y} = \frac{\dot{A}}{A} + \alpha_1 \frac{\dot{k}}{k} + \alpha_2 \frac{\dot{fdi}}{fdi} \quad (1.9)$$

Let $g_y = \frac{\dot{y}}{y}$ $g_k = \frac{\dot{k}}{k}$ $g_{fdi} = \frac{\dot{fdi}}{fdi}$ $g_A = \frac{\dot{A}}{A}$

Making the relevant substitutions, equation (1.10) is derived:

$$g_y = g_A + \alpha_1 g_k + \alpha_2 g_{fdi} \quad (1.10)$$

The inclusion of FDI flows in an augmented production function such as equation (1.10) presents some problem. The study considered domestic investment to GDP ratio as a proxy for the growth rate of domestic capital per capita. Thus, equation (1.10) is modified by replacing capital per capita by investment to GDP ratio to obtain equation (1.11):

$$g_y = g_A + \alpha_1 \dot{i} + \alpha_2 g_{fdi} \quad (1.11)$$

Where $\dot{i}$ is domestic investment to GDP ratio which is used as a proxy for growth rate of domestic capital per capita.

Equation (1.11) shows that growth rate of output per capita depends on domestic investment to GDP ratio and foreign direct investment per capita. FDI is associated with productivity spillover which results in increasing returns to domestic production. FDI is expected to add to existing stock of knowledge in the recipient economy through labour training and skill acquisition and diffusion on one hand and through the introduction of alternative management practices and organisational arrangements (De Mello, 1997) on the other hand. Even without significant physical capital accumulation, FDI can also be expected to promote knowledge transfers, in the case of, for

instance, quasi-investment arrangements such as leasing, licensing and start-up agreements, management contracts and joint ventures in general (De Mello &Sinclair, 1995).

From the theoretical framework, both FDI and domestic investment are the key determinants of economic growth hence the empirical model could derive:

$$g_y = g_A + \alpha_1 \dot{i} + \alpha_2 g_{fdi} \quad (1.11)$$

To control for other variables that affect economic growth, this study followed the methodology employed by Omir and Kahouli (2014), which focused on the determinants of growth rate of factor productivity. The factor productivity equation is specified below:

$$g_A = \beta_O + \beta_1 g(HC) + \beta_2 (INF) + \beta_3 (OPEN) + \beta_4 (GOV) + \varepsilon \quad (1.12)$$

Where HC is human capital, INF represents percentage change in consumer price index used here to measure inflation, OPEN is trade openness/GDP and GOV as government expenditure/GDP ratio.

Substituting equation (1.12) into equation (1.11) in a panel data form gives equation (1.13):

$$g_{y_{it}} = \gamma_O + \gamma_1 gfdi_{k\,it} + \gamma_2 \dot{i}_{it} + \gamma_3 g(HC)_{it} + \gamma_4 (INF)_{it} + \gamma_5 (OPEN)_{it} + \gamma_6 (GOV)_{it} + g_{yit-1} + \varepsilon_{it} \quad (1.13)$$

i-represents the number of countries included in the study and t shows the period of study which is from 1980-2015.

The implication is that inflation (monetary policy), trade openness (trade policy) and government expenditure to GDP ratio (fiscal policy) may exert significant influence on growth of output. Human capital development which is denoted HC and is estimated using the ratio of secondary school enrolment and tertiary enrolment to total population seeks to assess the effect of human capital on growth. It is expected that an improvement in human capital development would lead to an increase in growth (Boreinszten el. at., 1998). INF represents percentage change in consumer price index. Open, INF, HC, and GOV have been redefined as X in equation 2.14 and in the subsequent equations; an increase in this variable has a negative effect on growth. Higher inflation is associated with lower growth because lower real balances reduce the efficiency of factors of production, and because there may be a link between government purchases and the use of the inflation tax (Bruno & Easterly, 1998; Fisher, 1983). OPEN which represents openness of the African economy is measured by the addition of import and export as a ratio of GDP. The openness of an economy has been shown in the literature to have significant and positive impact on growth (Edward, 1998). This is especially so for countries which can export more as they generate the needed foreign exchange and employment in the export sector which in the long run contributes to economic growth. GOV/GDP captures government expenditure to GDP ratio. Government expenditure could be productive or non-productive. Productive government spending includes spending on property rights enforcement as well as activities that enter directly into the production function (Barro, 1990). Non-productive government expenditure has no direct effect on private-sector productivity but does lead to a higher income tax rate. Since individuals retain a smaller fraction of their returns from investment, they have less incentive to invest, and the economy tends to grow at a lower rate.

Political risk is measured by political stability and absence of violence which includes measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism.

3.2.1.1 Threshold Testing

Theoretically, it is expected that the inflow of foreign direct investment will exert significant effect on economic growth in the host countries. However, Nguyen et al. (2017) suggest that the scale of FDI inflows into a country needs to be appropriate to its absorptive capacity. Thus, a significant amount of FDI inflow must be met to proffer the growth-enhancing benefits. This thesis therefore hypothesizes that there is a threshold level of FDI beyond which it would have a significant effect on the economic growth of the host country. Thus, the study modifies the model by accounting for threshold effect of foreign direct investment on economic growth, by adjusting equation (1.14) to account for the threshold effect following the methodology of Hansen (2000). First, let the set of control variables be denoted by X (X= HC, INF, OPEN, GOV). Thus,

$$g_{y_{it}} = \gamma_O + \gamma_1 X + \gamma_2 gfdi_{k\,it} + \gamma_3 \dot{i}_{it} + \varepsilon_{it}\ q_i \leq \gamma \qquad (1.14)$$

$$g_{y_{it}} = \phi_O + \phi_1 X + \phi_2 gfdi_{k\,it} + \phi_3 \dot{i}_{it} + \nu_{it}\ q_i > \gamma \qquad (1.15)$$

where q_i is called the threshold variable and is used to split the sample into two groups, which may be called "regimes".

To write the model in a single equation, define the dummy variable $d_i(\gamma) = \{q_i \leq \gamma\}$ where $\{.\}$ is the indicator function and set $fdi_{k\,it}(\gamma) = fdi_{kit} d_i(\gamma))$, so that (1.14) – (1.15) equal

$$g_{y_{it}} = \lambda_O + \lambda_2 I(gfdi_{kit} \leq \gamma) + \lambda_3 I(gfdi_{kit} > \gamma) + \lambda_4 X + \lambda_5 \dot{i}_{it} + \varepsilon_{it} \qquad (1.16)$$

where I is an indicator function for the two regimes related to the quantum of FDI inflows.

Equation (1.16) allows all the regression parameters to switch between the regimes.

There are a lot of characteristics that are not uniform across the African countries. Thus, the study controls for these unique characteristics. These are political risk, institutional quality, infrastructure development and financial development. This gives,

$$g_{y_{it}} = \lambda_O + \lambda_2 I(gfdi_{kit} \leq \gamma) + \lambda_3 I(gfdi_{kit} > \gamma) + \lambda_4 X + \lambda_5 \dot{i}_{it} + \lambda_6 polrisk_{it} + \lambda_7 Iq_{it}$$

$$\lambda_8 Infrs_{it} + \lambda_9 M2/GDP_{it} + \varepsilon_{it} \quad (1.17)$$

where polrisk is political risk, Iq is institutional quality measures, and Infrs is infrastructure development.

Similarly, for each individual country, the estimation equation (1.17) is expressed as

$$g_{y_i} = \lambda_O + \lambda_2' I(fdi_{kt} \leq \gamma) + \lambda_3 I(fdi_{kt} > \gamma) + \lambda_4 X_t + \lambda_5 \dot{i}_t + \lambda_6 polrisk_t + \lambda_7 Iq_t$$

$$\lambda_8 Infrs_t + \lambda_9 M2/GDP_t + \varepsilon_t \quad (1.18)$$

3.2.2 Estimation Technique for Objective One

The procedure to estimate the non-linear relationship is to estimate equation (1.18) by Two Stage Least Square method and then computing the residual sum of squares (RSS), Alkaike Information Criteria (AIC) for the different or chosen threshold levels of the various control variables. The threshold estimate of the various control variables is found by selecting the one that minimizes the sequence of the RSS and AIC and thus maximizing the R^2.

3.2.3 Data Source

The study employed an unbalanced data for 44 countries in Africa for the period 1980-2015. These countries and the period were chosen based on data availability. Data were sourced mostly from World Bank's World Development Indicators and UNCTAD investment databases. Country risk data were sourced from political risk service (PRS) data.

3.3 Objective Two and Estimation Technique

The second objective of the study is to determine minimum threshold enabling conditions (e.g. human capital, infrastructure, Institutional development etc) necessary for FDI to have impact on growth in SSA. To achieve this, the empirical model for the objective is modified to account for threshold enabling conditions necessary for FDI to have impact on growth in Africa and the estimation technique required to estimate the threshold enabling conditions of FDI then follows.

3.3.1 Empirical Model for Objective Two

Findlay (1978) argued that the technology gap between countries plays an important role in the determination of the impact of FDI on the domestic economy. The argument is that the larger the technology gap, the greater the benefit from FDI. Glass and Saggi (1998) agree to the importance of the technology gap between the two economies involved; however, they argue the exact opposite. They argue that the smaller the technology gap, the greater the ability to benefit from the transferred technology. That is, the greater the gap, the lower the ability of the host country to absorb the incoming technology since it lacks the human capital, networks and general infrastructure to make use of such technologies. This introduces the notion of *absorptive capacity.* Thus, *absorptive capacity* refers to an economy's readiness or ability to appropriate the positive externalities of FDI. Absorptive capacity factors mediate FDI spillovers and influence an economy's ability to absorb the knowledge and technology spillovers. Human capital, financial development, trade openness, quality of institutions, and infrastructure are all examples of absorptive capacity factors examined previously by the literature. Thus, this study defined the absorptive capacity in terms of human capital, financial development, trade openness the initial level of technology relative to the best level of technology in Sub-Saharan Africa and infrastructure

where infrastructure is defined in terms of government expenditure. Thus, equation (1.18) is modified to account for the role of absorptive capacity of the countries in absorbing the benefits of foreign direct investment. This is done by interacting the absorptive capacity variables with the foreign direct investment (Hansen, 1999). Let V represent the absorptive capacity variables such as human capital, financial development, trade openness, initial level of technology relative to the best level of technology and government expenditure. Thus, equation 1.18 is re-specified to show the interaction between FDI and absorptive capacity variables.

$$g_{y_{it}} = \lambda_O + \lambda_2^{'} fdi_{kit} I(V \le \gamma) + \lambda_3 fdi_{kit} I(V > \gamma) + \lambda_4 \dot{i}_{it} + \lambda_5 X + \lambda_5 politicaldummy + \lambda_6 M2/GDP + \varepsilon_{it} \quad (2.1)$$

The implication is that inflation (monetary policy), trade openness (trade policy) and government expenditure to GDP ratio (fiscal policy) may exert significant influence on growth of output. Human capital development which is denoted HC and is estimated using the ratio of secondary school enrolment and tertiary enrolment to total population seeks to assess the effect of human capital on growth. It is expected that an improvement in human capital development would lead to an increase in growth (Boreinszten el. at., 1998). INF represents percentage change in consumer price index. Open, INF, HC, and GOV have been redefined as X in equation 2.14 and in the subsequent equations; an increase in this variable has a negative effect on growth. Higher inflation is associated with lower growth because lower real balances reduce the efficiency of factors of production, and because there may be a link between government purchases and the use of the inflation tax (Bruno & Easterly, 1998; Fisher, 1983). OPEN which represents openness of the African economy is measured by the addition of import and export as a ratio of GDP. The openness of an economy has been shown in the literature to have significant and positive impact on growth (Edward, 1998). This is especially so for countries which can export more as it generates the

needed foreign exchange and employment in the export sector which in the long run contributes to economic growth. GOV/GDP captures government expenditure to GDP ratio. Government expenditure could be productive or non-productive. Productive government spending includes spending on property rights enforcement as well as activities that enter directly into the production function (Barro, 1990). Non-productive government expenditure has no direct effect on private-sector productivity but does lead to a higher income tax rate. Since individuals retain a smaller fraction of their returns from investment, they have less incentive to invest, and the economy tends to grow at a lower rate.

Political risk is measured by political stability and absence of violence/terrorism which includes measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism.

3.3.2 Estimation Technique for Objective Two

We obtain the estimators of the threshold values of the enabling conditions of FDI using the two-step method proposed in Hansen (1999); thus, we first calculate slopes for each regime using the ordinary least squares (OLS) method; then compute, in the second step, the sum of squared residuals (RSS). The threshold estimate (η) is found by selecting the one that minimizes the sequence of the RSS and the Akaike Information Criteria and therefore maximizes the R-squared. To check whether the identified threshold effect is significant, Hansen (1999) proposes a likelihood ratio test which employs the bootstrap procedure to obtain the requisite asymptotic distribution(s) to calculate p-values. Hansen (2000) has developed the asymptotic distribution theory for threshold regression estimates.

3.3.1.1 Efficiency Gains from FDI in Sub-Saharan Africa

The stochastic frontier approach for estimating technical efficiency is based on the idea that an economic unit may operate below its production frontier due to errors and some uncontrollable

factors. A study of the frontier started with Farrell (1957) which suggested that efficiency could be measured by comparing realized output with the maximum attainable output. Later, based on Farrell's efficiency notion Aigner et al. (1977) and Meeusen and van den Broeck (1977) independently proposed stochastic frontier models (Emvalomatis, 2009). Developing countries, particularly African economies have received inflow of foreign direct investment recently. How efficient these foreign direct investments have been in stimulating the levels of real GDP is a question of empirical quest. This study proposed the assessment of efficiency gains from foreign direct investment on the African economies. The study employed panel data stochastic frontier estimation. The study adopted the approach of Battesse and Coelli (1995) since it endogenises the technical inefficiency in production. In other words, the approach adopted stochastic technical inefficiency, thus accounting for the potential sources of the technical inefficiency in production. The model is specified below:

$$y_{it} = f(x_{it}^{'}\beta') + \varepsilon_{it} \qquad (2.1.1)$$

x_{it} is a vector of production inputs and other explanatory variables, and β' is a vector of parameters to be estimated. ε_{it} is composite error term comprising classical error term and the error term associated with technical inefficiency of production. That is,

$$\varepsilon_{it} = v_{it} - u_{it} \qquad (2.1.2)$$

where v_{it} is the classical error term and u_{it} is the error term associated with technical inefficiency of production. Battesse and Coelli (1995) assume that the classical error term follows conventional normal distribution with zero mean and constant variance whiles the error term associated with technical inefficiency are non-negative random variables which are assumed to be independently distributed, such that u_{it}, is obtained by truncation (at zero)[5] of the normal distribution with mean,

[5] The point of truncation is reached when $z_{it}\delta$ tends out to be $-z_{it}\delta$.

ϕz_{it}, and variance, σ^2. The given assumption about the error term associated with technical inefficiency makes it endogenous. That is, the technical inefficiency error term is a function of the vector of explanatory variables. Hence, the conditional mean of the technical inefficiency is specified below:

$$u_{it} = \phi' z_{it} \qquad (2.1.3)$$

Where z_{it} is a vector of explanatory variables accounting for the technical inefficiency of production and ϕ' is a vector of parameters to be estimated.

Presenting models (2.1.1) and (2.1.3) in a more specific form, equations (2.1.4) and (2.1.5) are derived respectively:

$$g_{y_{it}} = \gamma_O + \gamma_1 gfdi_{k\,it} + \gamma_2 \dot{i}_{it} + \gamma_3 g(HC)_{it} + \gamma_4 (CPI)_{it} + \gamma_5 (OPEN)_{it} + \gamma_6 (GOV)_{it} + g_{yit-1} + \varepsilon_{it} \quad (2.1.4)$$

$$u_{it} = \phi_0 + \phi_1 fdi + \phi_2 cpi + \phi_3 hc + \phi_4 openness + \omega_{it} \qquad (2.1.5)$$

The expected signs of the explanatory variables in equation (2.1.4) are consistent with those explained in the threshold model. For the technical inefficiency model, the study controls for other explanatory variables following the methodology of Wijerewaa (2010) which includes corruption perception index (cpi), openness and human capital (hc) in equation (2.1.5). It is expected that the inflow of foreign direct investment will reduce the level of inefficiency in the economy thus expected to have an inverse relationship with technical inefficiency. Higher value of cpi indicates cleaner administration, therefore expected to have negative association with technical inefficiency. Openness of the economy is also expected to have negative effective on technical inefficiency likewise human capital.

3.3.1.2 Estimation Technique

The method of maximum likelihood is proposed for simultaneous estimation of the parameters of the stochastic frontier and the model for the technical inefficiency effects.

3.4 Objective Three and Estimation Technique

The third objective of the study is to examine the differences on the impact of FDI on growth of primary, manufacturing and services sectors in Africa. To achieve this, first a model is built to examine the differences on the impact of FDI on growth of primary, manufacturing and services sectors in Africa and the estimation technique required to estimate these non-linear relationships then follows.

3.4.1 Theoretical and Empirical Model for Objective Three

The framework is developed in the context of endogenous growth model and the growth accounting procedure ascribed to Solow (1957) and Denison (1962). The growth accounting decomposes each factor input contribution to the overall growth of the economy, hence,

$$Y = AF(K, L, FDI) \tag{3.1}$$

Foreign direct investments are potentially channelled into the three basic sectors of the economy, namely, primary, secondary, and tertiary sectors. Thus, this is disaggregated into primary sector FDI, secondary sector FDI and tertiary sector FDI. Thus, equation (3.1) is adjusted to capture the sectoral FDI.

$$Y = AF(K, L, FDI_P, FDI_S, FDI_T) \tag{3.2}$$

where FDI_P denotes foreign direct investment in the primary sector of a given economy, FDI_S denotes foreign direct investment in the secondary sector of a given economy, and FDI_T denotes foreign direct investment in the tertiary sector of a given economy. Deriving the output per labour function, equation (3.2) is derived:

$$Y/L = AF(K/L, FDI_P/L, FDI_S/L, FDI_T/L) \quad (3.3)$$

Let y = Y/L, k = K/L, fdi_P = FDI_P/L, fdi_S = FDI_S/L, and fdi_T = FDI_T/L, and substituting these into equation (3.3) yields equation (3.4)

$$y = Af(k, fdi_P, fdi_S, fdi_T) \quad (3.4)$$

Taking total derivative of equation (3.4), equation (3.5) is derived:

$$dy = (\partial f/\partial k)dk + (\partial f/\partial fdi_P)dfdi_P + (\partial f/\partial fdi_S)dfdi_s + (\partial f/\partial fdi_T)dfdi_T + f(.)dA \quad (3.5)$$

Multiplying both sides of the equation by 1/y, the right side of the equation by k/k, fdi_P/fdi_P,fdi_S/fdi_S, fdi_T/fdi_T, A/A and rearranging terms yields equation (3.6):

$$\frac{dy}{y} = \left(\frac{\frac{\partial f}{\partial k}}{y}\right)k\frac{dk}{k} + \left(\frac{\frac{\partial f}{\partial fdi_P}}{y}\right)fdi_P\frac{dfdi_P}{fdi_P} + \left(\frac{\frac{\partial f}{\partial fdi_S}}{y}\right)fdi_S + \left(\frac{\frac{\partial f}{\partial fdi_T}}{y}\right)fdi_T\frac{dfdi_T}{fdi_T} + \frac{dA}{A} \quad (3.6)$$

dA/A is the Solow's residual which measures the rate of technological progress. Let g_y be the growth rate of output per capita, g_k be the growth rate of capital per capita, g_{fdip} growth rate of primary sector foreign direct investment per capita, g_{fdis} growth rate of secondary sector foreign direct investment per capita, g_A be the growth rate of technology, λ_{ky} be the share of capital per capita in output, λ_{kfdi_p} be the share of primary sector foreign direct investment per capita in output, λ_{kfdi_s} be the share of secondary sector foreign direct investment per capita in output, and λ_{kfdi_t} be the share of tertiary sector foreign direct investment per capita in output. Substituting these into equation (3.6), equation (3.7) is derived as:

$$g_y = \lambda_{ky}g_k + \lambda_{fdi_p}g_{fdi_p} + \lambda_{fdi_s}g_{fdi_s} + \lambda_{fdi_t}g_{fdi_t} + g_A \quad (3.7)$$

In the framework of endogenous growth model, growth rate of technology can be endogenised, thus, equation (3.8) is derived:

$$g_A = \delta_O + \delta_1 g(HC) + \delta_2 (CPI) + \delta_3 (OPEN) + v \quad (3.8)$$

Substituting equation (3.8) into equation (3.7) gives equation (3.9)

$$g_y = \phi_1 + \phi_2 g_k + \phi_3 g_{fdi_p} + \phi_4 g_{fdi_s} + \phi_5 g_{fdi_t} + \phi_6 g(HC) + \phi_7 (CPI) + \phi_8 (OPEN) + v \quad (3.9)$$

The study also controls for unique characteristics of the countries under study. Thus, the study controls for political risk dummy, corruption perception index, civil strife dummy, colonialism dummy, and financial development.

$$g_y = \phi_1 + \phi_2 g_k + \phi_3 g_{fdi_p} + \phi_4 g_{fdi_s} + \phi_5 g_{fdi_t} + \phi_6 g(HC) + \phi_7 (CPI) + \phi_8 (OPEN) + poldummy + corrup + cistrifdummy + coldummy + credit/GDP + v \quad (3.10)$$

In specific terms, various components of FDI namely: primary, secondary and tertiary will be included and estimated differently. This could be derived from equation (3.9) as equations 3.11, 3.12 and 3.13

$$g_y = \phi_1 + \phi_2 g_k + \phi_3 g_{fdi_p} + \phi_4 g(HC) + \phi_5 (CPI) + \phi_6 (OPEN) + poldummy + v + corrup + cistrifdummy + coldummy + credit/GDP + \varepsilon_{it} \quad (3.11)$$

$$g_y = \phi_1 + \phi_2 g_k + \phi_3 g_{fdi_s} + \phi_4 g(HC) + \phi_5 (CPI) + \phi_6 (OPEN) + poldummy + corrup + cistrifdummy + coldummy + credit/GDP + v \quad (3.12)$$

$$g_y = \phi_1 + \phi_2 g_k + \phi_3 g_{fdi_t} + \phi_4 g(HC) + \phi_5 (CPI) + \phi_6 (OPEN) + corrup + cistrifdummy + coldummy + credit/GDP + v \quad (3.13)$$

Equations (3.11), (3.12), and (3.13) represent primary, secondary and tertiary sectoral FDI models. In addition, various models would be estimated using contribution to growth. Following from equations (3.11), (3.12), and (3.13) the share of primary, secondary and tertiary sectors growth in GDP are given as follows:

$$g_P = \phi_1 + \phi_2 g_k + \phi_3 g_{fdi_t} + \phi_4 g(HC) + \phi_5 (CPI) + \phi_6 (OPEN) + corrup + cistrifdummy + coldummy + credit/GDP + v \quad (3.14)$$

$$g_s = \phi_1 + \phi_2 g_k + \phi_3 g_{fdi_s} + \phi_4 g(HC) + \phi_5 (CPI) + \phi_6 (OPEN) + corrup + cistrifdummy + coldummy + credit/GDP + v \quad (3.15)$$

$$g_t = \phi_1 + \phi_2 g_k + \phi_3 g_{fdi_t} + \phi_4 g(HC) + \phi_5 (CPI) + \phi_6 (OPEN) + corrup + cistrifdummy + coldummy + credit/GDP + v \quad (3.16)$$

where g_p, g_s and g_t are annual primary, secondary, and tertiary sectors contribution to growth as a percent of GDP growth.

3.4.2 Estimation Technique for Objective Three

Kao (1997) has demonstrated that integrated panel data regression though the estimator is consistent, the t-statistic diverges so that inferences about the regression coefficient are wrong with the probability that goes to one asymptotically. Thus, this study carried out panel unit root tests on the dependent and independent variables to avoid spurious regression. The study followed the approach of Im, Pesaran, and Shin (IPS) (1995) who developed a panel unit root test for the joint null hypothesis that every time series in the panel is non-stationary. The main extension by Im et al. (1997) was to allow for heterogeneity in the value of ρ_i under the alternative hypothesis. Panel cointegration test were followed by the unit root test. Panel cointegration techniques have become increasingly popular for a few reasons. As with time series cointegration, estimates from a

cointegrated panel are robust to a variety of problems that often plague empirical work, including endogeneity, correlation among regressors (domestic investment and foreign direct investment), omitted variables, and measurement error (Banerjee, 1999; Phillips and Moon, 2000; and Baltagi and Kao, 2000).

This study employed Pedroni (2001) test for cointegration which creates room for the individual linear trends and effects in the heterogeneous system. The method incorporates seven tests grouped into two broad categories, namely "within dimensions" and "between dimensions". This test clearly helped in establishing a long run relationship between sectoral foreign direct investment and economic growth. Estimation of the model were done with panel error correction which gives better understanding of the adjustments dynamics since most economic relationships are dynamic by nature. Different estimators can be used to estimate a vector cointegration panel data. The fully modified OLS (FMOLS) estimates were used. FMOLS modifies least squares to explicate serial correlation effects and for the endogeneity in the regressors that arise from the existence of a cointegrating relationship (Phillips and Hansen,1990).

3.4.3 Data Source

The study considers five (5) countries in Sub-Sahara African for the period 2003-2016. These countries were chosen based on the availability of sectoral FDI data since 2003 and their rankings on FDI performance in Sub-Sahara Africa over the last two decades. Data were sourced mostly from World Bank's world development indicators and UNCTAD investment data base, apart from sectoral FDI data which were sourced from FDI Markets. The countries included are South Africa, Nigeria, Ghana, Kenya, and Angola.

3.5 Objective Four and Estimation Technique

The fourth objective of the study is to identify and evaluate the factors that account for the existence or non-existence of spillover effects of FDI among Sub-Sahara African countries. To achieve this, first a model is built to identify and evaluate the factors that account for the existence or non-existence of spillover effects of FDI among Sub-Sahara African countries and the estimation technique required to estimate these relationships then follows.

3.5.1 Theoretical and Empirical Model for Objective Four

Spillover effects of FDI on domestic enterprises have been mixed in the literature, suggesting that theoretical spillover effects do not automatically reflect in actual effects on a country. This study identified three major components of achieving spillover effects. These three components are very significant to achieving FDI spillover and the interactions between them are also very critical. The first factor is what is considered as the potential for the foreign firm that has entered the host country to have the right characteristics such as right human capital and technology that could generate spillover. The second critical component of FDI spillover is the issue of the capacity of domestic firms to absorb the spillover that will be generated because of the presence of foreign firms. This is because domestic firms must have certain absorptive capacity that will ensure that they derive maximum benefit from the FDI spillover. Finally, there are a host of other factors that will help transmit the FDI spillover potential to the domestic firms who have the capacity to translate the potential spillover to actual spillover (Farole & Winkler, 2014). These other factors are called domestic institutional characteristics.

A framework by Haddad and Harrison (1993) based on a neoclassical growth theory will be used to examine how foreign firms present in African countries impact on productivity of domestic firms. The framework is based on a production function with output (Y) which has two inputs being capital (K) and labour (L) which are driven by productivity (A). This gives,

$$Y = \text{A F (K, L)} \tag{4.1}$$

If the number of firms (i) is take into consideration and productivity is assumed to vary across sectors (s) and regions (r) at a given time (t) then the production function based on Haddad and Harrison (1993) becomes

$$Y_{irst} = A_{rst}\ \text{F}(k_{irst}, L_{irst}) \tag{4.2}$$

If we assume that the marginal product of each sector is equal to its cost, then taking log of equation (4.2) and then total differentiating the equation gives

$$\Delta \ln Y_{irst} = \frac{\Delta A_{irst}}{A_{irst}} + \beta_1\, \Delta \ln K_{irst} + \beta_2\, \Delta \ln L_{irst} \tag{4.3}$$

where Y represents the value added, $\frac{\Delta A}{A}$ is the growth in productivity, K-capital, L-labour.

The coefficients of capital (K) and labour (L) are their share in value-added. The neoclassical endogenous growth theory creates avenues for policy variables such as FDI to affect growth (See for instance, De Mello, 1997; Boreisztein, 1998). According to Paus and Gallapher (2008) and Farole and Winkler (2014), productivity growth (A) is affected by the share of foreign firms, institutional factors and FDI mediating factors. The productivity growth (A) will be defined as,

$$\frac{\Delta A_{irst}}{\Delta A} = \propto_0 + \propto_2 FDI_{sct} + \gamma FDI_{sct} * \text{If} + k_r + k_s + k_t + \varepsilon_{irst} \tag{4.4}$$

FDI represents foreign direct investment spill over, IF stands for institutional/mediating factors which include FDI spill over potential, absorptive capacity and national characteristics and

institutions, k_s- fixed effects from the sector, k_r-regional fixed effects and $k_t$represents yearly fixed effects ε_{irst} - stochastic disturbance term which accounts for possible productivity growth changes due to potential stochastic shocks at firm, regional, or sectoral level.

Substituting equation (4.4) into equation (4.3)

$$\Delta \ln Y_{irst} = \beta_0 + \beta_1 \Delta \ln K_{irst} + \beta_2 \Delta \ln L_{irst} + \beta_3 FDI_{sct} + \gamma FDI_{sct} \text{ . IF} + K_r + K_s + K_t + \varepsilon_{irst} \quad (4.5)$$

3.5.2 Estimation Technique for Objective Three

In order to assess the FDI spillover effects and potentials in Africa, an approach similar to that used by Blalock and Gertler (2009) is applied to over 8000 manufacturing companies across 44 African countries from the World Bank Enterprise survey indicator database. The 44 African countries are chosen based on the availability of the enterprise survey data. The years in which the survey was conducted by the Word Bank for each of the countries are in the Appendix. This study focused mainly on the manufacturing sector because of the availability of data and the fact that firm level productivity which was proxied by labour productivity is basically defined as the value addition per worker hence expanding it beyond manufacturing can create measurement difficulties (Blalock and Gentler, 2009; Farole and Winkler 2014).

Following from the above equation, the study then measures intra-industry FDI spillover at the sectoral level by the use of foreign firms' share in output as a percentage of total sectoral output. In this case the only sector being considered is the manufacturing Sector.

$$FDI_{sct} = \frac{\sum_{i \epsilon sct} YF_{it}}{\sum_{i \epsilon sct} Y_{it}} \quad (4.6)$$

where YF represents foreign firms output and Y stand for total output in the manufacturing sector in Africa, iєrst represents a firm in a given sector in a country at a given time.

Equation (4.6) helps to measure horizontal spillover in the manufacturing sector. The firm level productivity is measured using labour productivity. In addition, capital intensity was added (Falore and Winkler, 2014. p. 62) which also measures the capital stock per each worker as an explanatory variable to help eliminate the situation where we have an omitted variable bias.

The above equation was estimated first using ordinary least squares (OLS). The equation was subsequently tested using instrumental variables two-stage least squares (IV SSLS) which helped deal with the defects of using OLS. This is because the cross-sectional nature of the data set makes it difficult to test for causal relationship between FDI spillover and domestic firm's productivity. Because there may be some unobserved characteristics which might attract a foreign firm to a domestic firm that could be correlated. There is therefore the need to control for country-sector effects which would be difficult using OLS because of the fact that the dataset are in cross-sectional form and hence will be perfectly correlated with the spillover variables (Aitken and Harrison, 1999; Falore and Winkler, 2014).

This calls for the use of instruments for FDI spillover. Harding and Javorcik (2011) in their study on FDI and export upgrading use inward FDI flow and stock to the United States as an instrument. Similarly, Jordan (2011) used US sectoral foreign employment share as instrument for the Sectoral FDI spillover in his study on the Mexican manufacturing firms. Haskel, Pereira and Slaughter (2007) used sectoral inward FDI as an instrument in their study on sectoral spillover variables in United Kingdom.

3.5.3 Data Source

Data were sourced from World Bank Enterprise Analysis Unit which publishes Enterprise Survey indicator database. The publication covers over 130 countries with a set of standardized questionnaires across all the surveyed countries. The enterprise survey has one of the most

comprehensive surveys at the micro level dealing with sectoral, firm size and regional issues. The survey is stratified at three different levels; these include sector, firm size and region. For the purposes of this study and the fact that the study intends to measure spillover effects, only the manufacturing sector would be considered since services data is unavailable.

The data in the survey covers a wide range of firm level characteristics, business environment, firm ownership, labour force and other governance issues. Where a country has more than one survey, the most recent one will be used. Various variables within the survey database would be used to measure the three core spillover characteristics of foreign firm spillover potential, absorptive capacity of the domestic firm and the national and institutional characteristics of the country.

CHAPTER FOUR

PRESENTATION AND DISCUSSION OF EMPIRICAL RESULTS ON FOREIGN DIRECT INVESTMENT THRESHOLD LEVELS AND ABSORPTIVE CAPACITY

4.0 Introduction

This chapter discusses the empirical results that relate to threshold effects of foreign direct investment and absorptive capacity on economic growth in Sub-Saharan Africa.

4.1 Discussion of the Baseline Model of the Standard Growth Equation

Before presenting results on the threshold model, the section presents and discusses the results on the standard growth equation. The results are presented in Table 4.1.

Table 4.1 GMM Estimates of the Standard Growth Equation

Variable	Coefficient	Standard error	z-statistic
GDP per capita(-1)	1.000284	.0031378	318.79
FDI per capita	-.1300368	.1173386	-1.11
Trade to GDP ratio	5.828676	4.109486	1.42
Inflation	-.0080098	.0095497	-0.84
Human capital index	484.7766	318.7646	1.52
Government expenditure to GDP ratio	-.1237325	.187425	-0.66
Capital to GDP ratio	-2.190235	9.652536	-0.23
Constant	-541.9857***	208.7205	-2.60

The results indicate that FDI per capita exerts insignificant effect on economic growth in Africa even at the 10 percent level of significance. The insignificant effect may be due to the fact that the countries selected do not share uniform characteristics in the content. Moreover, the results may suggest that relationship between FDI per capita and economic growth is non-linear rather than being linear.

The results also show that none of the control variables have significance influence on economic growth in Africa even at the 10 percent. That is trade to GDP ratio, inflation, human capital index, government expenditure to GDP ratio and capital play negligible role in stimulating economic growth in Ghana. Similar reasons cited above may explain the non-influential effects of the control variables on economic growth in Africa.

4.2 Threshold Effect of FDI on Economic Growth

This section presents and discusses the empirical results that relate to threshold effects of foreign direct investment as well as the absorptive capacity on economic growth in Sub-Saharan Africa.

4.2.1 The Threshold Level of Foreign Direct Investment

To determine the number of thresholds, the study sequentially estimates the model with one, two, and three thresholds. Also, to check the robustness of the estimates, the study estimated five different models, each with a different number of variables, as well as with different subsets of variables. Although, the existence of nuisance will result in the F-test statistic to follow non-standard distribution, Hansen (1999, 2000) suggested a "bootstrap" method to compute the asymptotic distribution of test statistics using the likelihood ratio test to test the significance of threshold effects. A bootstrap procedure attains the first-order asymptotic distribution, so p-values

constructed from the bootstrap are asymptotically valid. The study therefore uses 300 bootstrap replications to test for a single, double and triple threshold effects (see appendix A for the detailed results).

In model 1 where the study controls for inflation, human development, capital stock, institutional quality, infrastructure and political risk, this study documents the following findings. In the test for a single threshold (with H0: linear model; H1: single threshold model), the F1 statistic of 144.40 (bootstrap p-value = 0.0000) is larger than its critical value at 1% significance level of 38.96. Therefore, the null hypothesis of no threshold effects is strongly rejected. The F2 statistic in the test for a double threshold (with H0: single threshold model; H1: double threshold model) is also statistically significant at the 10 percent level of significance. The implication from the above results is that there are two thresholds in the first model. See threshold effect test table in Appendix A.1 for the threshold test results.

To determine the threshold values, the study estimates the double-threshold model. The threshold estimate is the FDI per capita by which the inflow of foreign direct investment may affect the economic growth in Sub-Saharan Africa. FDI per capita is superior to the use of FDI to GDP ratio in that the ratio may be distorted by huge GDP figure making the percentage small or extremely low GDP figure making the percentage relatively large which may be misleading as to what threshold of this ratio is needed to stimulate economic growth in Africa. The use of per capita FDI will assist governments to determine what amount of FDI will match up with its level of population. The results indicate that the threshold values are $44.67 and $125.56 for the FDI per capita. The FDI per capita value of $44.67 means that an inflow of FDI per person above this value in the selected countries in Sub-Saharan Africa will stimulate economic growth. Also, a value of $125.56 indicates that values above this threshold will stimulate economic growth but at slow rate

of growth relative to values between $44.67 and $125.56. Refer to Appendix A.1 for the threshold values.

The fixed effects panel threshold regression model is estimated for the double threshold value to determine its influence on economic growth in the selected Sub-Saharan Africa countries. The F statistic of 814.72, which is significant at the 1% level, for the null hypothesis of all ui=0, confirms that the fixed effect model is appropriate. The results are presented in Table 4.1.1.

The threshold results indicate that when FDI per person is less than $44.67 (< $44.67), the coefficient is significantly negative, suggesting that economic growth retards as FDI per person falls below this region. However, When FDI per capita is equal to or greater than $44.93 (≥ $44.93), the coefficient is significantly positive, suggesting that economic growth improves when FDI per person increases beyond $44.93. The difference between the threshold values is approximately 30 cents which appears marginal. This difference implies that the selected Sub-Saharan countries just need 30 cents of FDI per person to trigger economic growth once they reach the mark of $44.67 FDI per person. This brings into fore the relevant of marginal analysis in economic choice and decision-making.

Also, when FDI per person is above $125.56, the coefficient is significantly positive, but magnitude is smaller relative to the first threshold value. The empirical result is in line with Nguyen et al. (2017), who also found threshold effect of foreign direct investment. The implication of the results is that, given the absorptive capacity of the selected host countries, the minimum level of FDI per capita that can impact positively on economic growth is $44.93.

In model 2, where trade openness is included in the growth equation, the study found a single threshold value for FDI per capita with the same threshold magnitude of $44.67 for the first

threshold value in model. The implication of this result is that in the presence of trade openness, any value of FDI per person above $44.67 will generate a positive effect of FDI on economic growth in Sub-Saharan Africa. Thus, trade openness serves as a (positive) mediating factor in the FDI-economic growth nexus in Sub-Saharan Africa. Model 3 where the financial development indicator of domestic credit to GDP ratio is included in the growth equation, the study found double threshold values which are the same as model 1 results. Thus, when financial development (proxied by domestic credit to GDP ratio) is held constant, FDI per capita has little impact on economic growth. However, financial development complements FDI to exert non-diminishing effect on economic growth in Sub-Saharan Africa. However, when the study uses broad money to GDP ratio as a proxy for financial development in model 4, the study found a single threshold effect of FDI on economic growth in Sub-Saharan Africa with the same magnitude as in model 2.

Thus, the choice of financial development indicator determines whether FDI per capita will have diminishing effect on economic growth. This means that domestic credit to private sector as a percentage of GDP ratio is more appropriate in the SSA context compared with broad money to GDP ratio. Broad money includes currency, demand deposits, savings account and other near monies. Thus, an increase in this ratio indicates that more households are participating in the financial sector. However, this does not guarantee that funds will be channelled by the financial system to the private sector to exploit investment opportunities. On the other hand, an increase in domestic credit to private sector as a percentage GDP is directly channelled to private business for operation and therefore may strongly mediate the relationship between FDI and economic growth in SSA.

In model 5 where the study fully controls for all the variables with the inclusion of government expenditure, the study finds single threshold value of $44.93 which is in line with model 2 and

model 4. In all the models, there is unambiguous positive threshold effect of FDI per person on economic growth in Sub-Saharan Africa. All the threshold values for the five models can be found in Table 4.2.1.

Table 4.2.1 Threshold Estimate of the Five Models

	Model 1				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	44.6702	41.5678	45.8043	114.40	0.0000
Threshold 2	125.5624	123.3354	127.0404	20.60	0.0700
	Model 2				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	44.6702	43.5012	45.8043	113.08	113.08
Threshold 2	125.5624	107.4701	127.0404	19.09	0.1125
	Model 3				
Model	**Threshol**d	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	44.6702	43.4357	45.8043	105.08	0.0000
Threshold 2	125.5624	107.4701	127.0404	18.09	0.1125
	Model 4				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	44.6702	43.4357	45.8043	109.66	0.0000
Threshold 2	154.4216	137.5245	169.2551	17.91	0.1050
	Model 5				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	44.6702	43.4357	45.8043	103.45	0.0025
Threshold 2	125.5624	107.4701	127.0404	17.89	0.1250

Table 4.2.2 Fixed Effects Model Estimation Results (Dependent Variable: GDP Growth, 1993-2015)

	Model 1	Model 2	Model 3	Model 4	Model 5
Explanatory variables					
Trade to GDP ratio	-	-2.1449* [-1.8569]	-1.6732 [-1.55242]	-2.5571** [2.26713]	-3.645*** [-3.35]
Inflation	-0.0066 [0.98507]	-0.0058 [-0.84058]	-0.0055 [-0.84615]	-0.0067 [0.97101]	-.0082
Human Development Index	2605.586*** [8.2516]	2774.412*** [8.63943]	2213.444*** [7.04275]	2749.758*** [8.57864]	2196.881*** [-1.20]
Political risk	4.5497 [0.57171]	5.0047 [0.61994]	7.9241 [1.03106]	5.1833 [0.64425]	-2.2414 [-0.30]
Broad money to GDP ratio	-	-	-	3.6000** [2.13828]	2.6435 [1.61]
Domestic Credit to GDP ratio	-	-	13.2861*** [6.02708]	-	-
Government Expenditure to GDP ratio	-	-	-	-	-0.1155 [-1.44]
Capital to GDP ratio	-1.3720 [-0.66676]	1.3284 [0.59698]	0.3774 [0.17634]	1.1353 [0.51153]	.7397 [0.34]
Infrastructure (Mobile phone per thousand)	2.4176*** [4.86439]	2.4404*** [4.83439]	1.4549*** [2.91446]	2.1023*** [3.98691]	2.9308*** [4.63]
Corruption	5.5787 [0.27086]	0.3604 [0.01724]	14.4624 [0.72236]	10.6192 [0.49681]	-
FDI Threshold (0)	-4.3711*** [-11.29775]	-4.2711*** [-10.87071]	-3.9460*** [-10.85557]	-4.2218*** [-10.76441]	-4.1511*** [-10.43]
FDI Threshold (1)	2.8177*** [4.48393]	0.3132* [1.90976]	3.2061*** [4.7646]	0.2890* [1.76327]	.2730* [1.66]
FDI Threshold (2)	0.3232** [2.00]	-	0.2577* [1.68211]	-	-
Constant	501.7159*** [3.23021]	545.2945*** [3.34908]	503.5584*** [3.25133]	479.2823*** [2.90176]	890.3856*** [5.80]
No. of Observations	550	550	550	550	575
No. of Groups	25	25	25	25	25
F-test	0.0000	0.0000	0.0000	0.000	0.000
R^2	0.4050	0.3796	0.5316	0.3936	0.3578

denotes statistically significant at the10 percent, denotes statistically significant at the 5 percent and ***denotes statistically significant at the1 percent

Some studies have identified foreign direct investment to have a non-linear relationship with economic growth. Borensztein (1998) found a minimum threshold by which FDI impacts on growth through human capital development. Others such as Ford et al. (2008), Melnyk et al. (2014), Shu-Chen Chang (2015) established a non-linear nature of FDI impacting on growth even though different threshold levels were found using different variables. This implies that the impact of FDI on growth could have a reverse influence, confirming the results obtained in this study. These results underpin the neoclassical theory on FDI which stipulates that distortions in the perfectly competitive equilibrium are the reasons for FDI attraction (Mundell, 1957).

This level ensures that foreign direct investment exerts significant positive effect on economic growth in Sub-Saharan Africa. This finding is similar to the works of Jyun-Yi and Chih-Chiang (2008) where threshold regression was used to find the impact of FDI on growth using 62 countries. However, FDI inflows become a deterrent to economic growth when it falls below $44.93 per person in Sub-Saharan African economies. When FDI level is low, an exogenous increase in it would raise the capital quantity and per capita GDP only temporarily because diminishing returns would limit the growth in the long run**.** Further, according to De Mello (1997), the larger the technological gap between the host and the home country of FDI, the smaller is the impact of FDI on economic growth; thus, low levels of FDI may induce negative effect on economic growth in SSA. Again, the theoretical work on FDI points to advantages, conceivably, spillovers could nevertheless be small (Hausmann and Fernandez-Arias, 2000). Hence, substantial amount of FDI may be required to increase economic growth in the region.

Low levels of FDI have been attributed to a very large extent to weak institutional structures and absorptive capacity of the host country as found in the literature. For example, Xu (2000) and Balasubramanyam et al. (1996) explained that FDI has a negative impact on GDP growth. They assert that FDI has had a positive impact on growth in host countries with export promoting

strategy, but not in states with import substitution strategy. Choi (2004), Carkovic and Levine (2002) and Kherfi and Soliman (2005) found out that countries with faster economic growth attracts more FDI inflows. In an analysis made for Morocco, Turkey and Tunisia, Alaya (2006), observed a significant negative effect of FDI inflow on economic growth, although the growth was determined by exports and domestic investments. According to Simionescu (2016), there was a negative relationship between the FDI and economic growth in countries with a small domestic market, many restrictive labour practices and migration laws, no financing for risk capital and many restrictions imposed on domestic market.

According to the internationalization theory by Hymer (1976), FDI is not just about transfer of capital but it entails a package which includes capital, managerial know-how, new products and other potential advantages in an imperfect market. It is argued that market imperfection may occur for a number of reasons which includes product differentiation, marketing skills, better access to capital, technological advantage, economies of scale and sometimes government regulation.

4.2.2 The Threshold Levels of Absorptive Capacity

Human capital, financial development, trade openness, quality of institutions, and infrastructure are all examples of absorptive capacity factors examined previously by the literature. Thus, this study defines the absorptive capacity in terms of human capital, financial development, trade openness and infrastructure where infrastructure is defined in terms of government expenditure. Hence, this sub-section discusses the threshold levels needed for absorptive capacity of Sub-Saharan Africa countries, such as the degree of trade openness, government expenditure as a ratio of GDP, human development and financial development that interact with FDI to yield the desired results on economic growth.

The Role of Trade Openness

It is hypothesized that FDI and trade openness can be complementary for economic growth, and that an economy promoting more open trade policies, especially export promotion policies, are more likely to benefit from FDI spillovers (Balasubramanyam et al., 1996). Again, Bhagwati (I978) has hypothesised that the volume and efficacy of incoming FDI will vary according to whether a country is following the export promoting (EP) or the import substituting (IS) strategy.

In model 1 where the study controls for inflation, human development, capital stock, institutional quality, infrastructure and political risk, it was found that in the test for a single threshold (with H0: linear model; H1: single threshold model), F1 statistic of 39.51 (bootstrap p-value = 0.1133) is less than its critical value at 10% significance level of 43.46. Therefore, the study fails to reject null hypothesis of no threshold effects. The threshold test results can be found in Table 4.2.3.

In model 2, where trade openness is included in the growth equation, the study found no threshold effect of trade openness as absorptive capacity of FDI to effect economic growth in Sub-Saharan Africa. Model 3 where the financial development indicator of domestic credit to GDP ratio is included in the growth equation, the study found double threshold values which are 97.73 % and 99.93% of trade to GDP ratio. When trade to GDP ratio is below 97.73%, FDI has negative effect on economic growth. Also, when trade to GDP ratio is above 97.73 but below 99.3 %, the negative effect of FDI on economic growth becomes severe. However, values above 99.3% ensure that negative effect of FDI on economic growth ceases. Thus, when financial development (proxied by domestic credit to GDP ratio) is held constant, FDI per capita has severe effect persistently has negative effect on economic growth for all threshold values.

Table 4.2.3 Threshold Estimate of the Five Models

	Model 1				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	99.9267	98.9209	104.4381	39.51	0.1500
Threshold 2	72.8654	65.9228	72.9878	27.06	0.1200
	Model 2				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	99.9267	98.9209	104.4381	45.98	0.1067
Threshold 2	72.8654	65.1419	72.9878	26.44	0.1367
	Model 3				
Model	**Threshol**d	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	99.9267	98.9209	101.3605	57.65	0.0433
Threshold 2	97.7315	96.7902	105.3377	26.34	0.1267
	Model 4				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	99.9267	98.9209	101.3605	50.86	0.0833
Threshold 2	72.8654	65.9228	72.9878	24.16	0.1300
	Model 5				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	99.9267	98.9209	101.3605	50.41	0.1100
Threshold 2	72.8654	65.9228	72.9878	25.48	0.1400

Thus, financial development complements FDI to reduce the adverse effect of FDI on economic growth. However, when the study uses broad money to GDP ratio as a proxy for financial development in model 4, the study found a single threshold effect of FDI on economic growth with the magnitude of 99.3% of trade to GDP ratio. In model 5, where study fully controls for all the variables with the inclusion of government expenditure, the study finds single threshold value of 100.37% for trade openness. When trade as a percentage of GDP is less than 100%, the negative

coefficient of -0.25 implies a negative relationship between FDI and economic growth. However, this directional effect reverses and becomes statistically insignificant when trade as a percentage of GDP is greater or equal to 100%. All the threshold values can be found in Table 4.2.3. The results are presented in Table 4.2.4.

The implication of this threshold result is that in a regime where the economy is less open, FDI inflows is counter-productive to economic growth in Sub-Saharan Africa. This confirms Bhagwati's hypothesis that extensive and detailed analysis of the import substitution or trade-protective policies may induce inefficiencies.

The inefficiencies which such a trade regime imposes on the economy run to a list; its heavy reliance on tariffs and quotas on trade, as the principal instruments of the strategy, introduces widespread distortions in factor and product markets; it encourages the adoption of techniques of production widely at variance with the factor endowments of the economy.

In addition, it provides widespread incentives for rent seeking and directly unproductive profit seeking (DUPE) activities (Bhagwati, I994); it contributes to growth of income disparities; and it not only promotes misallocation of resources but also encourages inefficiency where there will be the existence of unused capacity creating divergence between output and capacity (Bhagwati, I978; Bhagwati &Srinivasan, I975, I979; Greenaway & Nam, I988; Kreuger I975)

The negative impact on growth that might occur because of protection induced inflows of FDI into an import competing industry has also been extensively analysed (Bhagwati, I973; Brecher and Diaz-Alejandro, I977).

Table 4.2.4 Fixed Effects Model Estimation Results (Dependent Variable: GDP Growth, 1993-2015)

	Model 1	Model 2	Model 3	Model 4	Model 5
Explanatory variables					
Trade to GDP ratio		-3.8034*** [-3.20]	-4.4716*** [-3.99]	-4.5251*** [-3.78]	-5.7063*** [-6.35]
Inflation	0.00100 [-1.37]	-0.0074 [-1.02]	-0.0071 [-1.05]	-0.0087 [-1.21]	-0.0115 [-1.60]
Human Capital Index	2968.16*** [8.75]	3097.599*** [9.14]	2550.017*** [7.74]	3056.308*** [9.11]	2194.41*** [5.51]
Political risk	4.5819 [0.53]	6.6088 [0.77]	6.8869 [0.85]	7.3266 [0.86]	-2.2414 [-0.30]
Broad money to GDP ratio	-			5.9689*** [3.38]	4.7707*** [2.81]
Domestic Credit to GDP ratio	-		16.6974*** [7.29]		
Government Expenditure to GDP ratio	-				-0.2235*** [-2.77]
Capital to GDP ratio	-1.7691 [-0.81]	1.0440 [0.44]	-1.0456 [-0.47]	0.7736 [0.33]	0.5550 [0.24]
Infrastructure (Mobile phone per thousand)	3.2567*** [6.06]	3.1296*** [5.86]	2.0776*** [3.99]	2.5740*** [4.65]	3.5857*** [5.40]
Corruption	12.7691 [0.57]	10.0486 [0.45]	31.1813 [1.47]	28.4112 [1.25]	
Bureaucracy					
FDI Threshold (0)	-1.5102*** [6.82]	-1.5426*** [-7.02]	-1.2816*** [-5.89]	-1.6078*** [-7.36]	-1.5852*** [-7.37]
FDI Threshold (1)	0.0496 [0.27]	0.1408 [0.78]	-5.5412*** [-5.49]	0.1525 [0.85]	0.1902 [1.06]
FDI Threshold (2)	-	-	0.2711 [1.58]		
Constant	362.4743***	499.9078*** [2.90]	496.8131*** [3.07]	386.0155*** [2.22]	959.3911*** [6.17]
No. of Observations	550	550	550	550	575
No. of Groups	25	25	25	25	25
F-test	0.0000	0.0000	0.0000	0.0000	0.0000
R^2	0.2152	0.1640	0.3171	0.1764	0.1005

*denotes statistically significant at the10 percent,** denotes statistically significant at the 5 percent and ***denotes statistically significant at the1 percent

However, the result shows that in the regime of greater openness, the counterproductive nature of FDI on economic growth reverses to productive one. The principal virtue of the EP strategy or greater trade openness, with its emphasis on neutrality of policy as between the import and export sectors of the economy, is that it allows for a free play of market forces and the allocation of resources based on comparative advantage. Furthermore, because of the neutrality of its policy orientation it offers none of the incentives for rent seeking and DUPE which the IS policy provides. The competition it allows for from both international trade and domestic sources encourages research and development and investment in human capital. Allocation of resources based on comparative advantage and market forces also promotes specialisation and economies of scale. However, the productive nature of FDI in high trade openness is insignificant to economic growth in Sub-Saharan. Perhaps, these exporting firms are in their infant stage, thus, unable to absorb the full benefit of FDI in the regime of high trade openness.

The Role of Government Expenditure

One of the earliest attempts to consider the interrelationship of FDI and public expenditures in determining the economic growth rate was the study of Le and Suruga (2005). They suggested that excessive spending in public capital expenditure can reduce the positive impact of FDI on economic growth. Le and Suruga (2005) suggested that the effect of FDI on economic growth becomes weaker as the public capital expenditure exceeds 8-9%. This study continues their work by investigating some other potential interactions between these two factors and how it affects economic growth of sub-Saharan African countries.

In model 1 where the study controls for inflation, human development, capital stock, institutional quality, infrastructure and political risk, it was found that in the test for a single threshold (with

H0: linear model; H1: single threshold model), F1 statistic of 44.46 (bootstrap p-value = 0.0233) is greater than its critical value at 5% significance level of 26.2233.

Therefore, the study rejects the null hypothesis of no threshold effects. The estimated single threshold value of government expenditure to GDP ratio is 13.49%. That is, for values below 13.49% of government to GDP ratio, FDI tend to have negative effect on economic growth in Sub-Saharan Africa. This negative effect of FDI on economic growth ceases to exist when government expenditure to GDP ratio exceeds 13.49%. See appendix A.3 for the threshold tests as well as the threshold values.

In model 2, where trade openness is included in the growth equation, the study also found a single threshold effect of government expenditure as a percentage of GDP with the same threshold value established in model 1. Model 3 where the financial development indicator of domestic credit to GDP ratio is included in the growth equation, the study found double threshold values which are 10.68 % and 13.49% of trade to GDP ratio. When trade to GDP ratio is below 10.68%, FDI has negligible effect on economic growth in Sub-Saharan Africa. Also, when trade to GDP ratio is above 10.68% but below 13.49 %, there is negative effect of FDI on economic growth. However, values above 13.49% ensure that negative effect of FDI on economic growth ceases. However, when the study uses broad money to GDP ratio as a proxy for financial development in model 4, the study found double threshold effect of FDI on economic growth in Sub-Saharan Africa with the magnitude of 13.49% and 16.33% of trade to GDP ratio. When government expenditure as a percentage of GDP is less than 13.49%, there is a negative relationship between FDI and economic growth. When 13.49% ≤ government expenditure < 16.33%, economic growth is positively related to FDI. Finally, when government expenditure as a percentage of GDP ≥16.33%, economic growth is negatively related to FDI. These threshold values can be found in Table 4.2.5.

Table 4.2.5 Threshold Estimate of the Five Models

	Model 1				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	13.4869	13.4634	13.6287	44.46	0.0250
Threshold 2	28.0381	17.1172	28.1823	19.61	0.1100
	Model 2				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	13.4869	13.4634	13.6287	47.01	0.0200
Threshold 2	16.3256	16.2114	16.6937	20.53	0.1300
	Model 3				
Model	**Threshol**d	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	13.4869	13.4634	13.6287	47.10	0.0100
Threshold 2	10.6782	10.7320	10.7320	26.17	0.0550
	Model 4				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	13.4869	13.4634	13.6287	47.07	0.0075
Threshold 2	16.3256	16.2114	16.6937	21.60	0.1000
	Model 5				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	13.4869	13.4634	13.6287	47.36	0.0175
Threshold 2	16.3256	16.2114	16.6937	25.48	0.1000

In model 5, where the study fully controls for all the variables with the inclusion of government expenditure, the study finds double threshold effect of government expenditure to GDP ratio as an absorptive capacity. When government expenditure as a percentage of GDP < 13.49% the negative coefficient of -2.01 implies a negative relationship between FDI and economic growth.

Table 4.2.6 ***Fixed Effects Model Estimation Results (GDP Growth, 1993-2015)***

	Model 1	Model 2	Model 3	Model 4	Model 5
Explanatory variables					
Trade to GDP ratio		-3.1182*** [-2.66]	-4.3232*** [-3.88]	-4.0039*** [-3.41]	-4.9656*** [-4.46]
Inflation	-0.0109 [-1.52]	-0.0089 [-1.24]	-0.0084 [-1.24]	-0.0110 [-1.56]	-0.0112 [-1.60]
Human Development Index	2925.732*** [8.68]	3027.915*** [8.98]	2388.945*** [7.22]	2748.734*** [5.30]	2140.329*** [5.79]
Political risk	4.2045 [0.49]	5.6260 [0.66]	5.6507 [0.71]	4.2723 [0.53]	1.5332 [0.20]
Broad money to GDP ratio	-	-		5.0575*** [2.92]	3.3759** [2.03
Domestic Credit to GDP ratio	-	-	16.6722*** [7.29]	-	-0.2250*** [-2.79]
Government Expenditure to GDP ratio	-	-		-	-0.2250*** [-2.79
Capital to GDP ratio	-3.3319 [-1.51]	-1.0511 [-0.45]	-1.9987 [-0.90]	1.5293 [0.66]	-1.7709 [-0.79]
Infrastructure (Mobile phone per thousand)	3.0688*** [5.78]	2.9461*** [5.56]	1.8280*** [3.51]	2.1772*** [3.99]	3.5712*** [5.52]
Corruption	-2.9003 [-0.13]	-6.5376 [-0.30]	15.9052 [0.76]	-4.9990 [-0.20]	
Bureaucracy					
FDI Threshold (0)	-1.8387*** [-7.43]	-1.8323*** [-7.44]	0.5695 [1.20]	-0.9920*** [-5.96]	-2.0090*** [-8.22]
FDI Threshold (1)	-0.1189 [-0.73]	-0.0729 [-0.45]	-4.5158*** [-8.92]	1.1788*** [4.60]	-0.5999*** [-3.14]
FDI Threshold (2)	-		0.0220 [0.14]	-1.3023*** [-2.75]	0.6845*** [3.04]
Constant	443.8299*** [2.67]	563.1273*** [3.29]	586.5881*** [3.64]	576.2625*** [3.38]	998.1918*** [6.36]
No. of Observations	550	550	550	550	575
No. of Groups	25	25	25	25	25
F-test	0.0000	0.0000	0.0000	0.000	0.0000
R^2	0.2729	0.2251	0.4009	0.2122	0.1537

*denotes statistically significant at the10 percent,** denotes statistically significant at the 5 percent and ***denotes statistically significant at the1 percent

Therefore, the study suggests that with the current absorptive capacity of selected host countries the best level of government expenditure is 16.21% of GDP and beyond, and below 16.21% of GDP, the benefit of FDI to economic growth will decline or disappear. FDI is expected to have positive impact on economic growth but such impact should be stronger at the early stages of development process and become less important when the country becomes more advanced. As suggested by Galor and Moav (2004), the effect of foreign direct investment through public capital on economic growth must also follow the same model. According to Galor and Moav (2004), the main engine of its economic growth varies at different stages of a country's development.

While physical capital accumulation is the main engine of economic growth at the early stages of development, human capital accumulation plays the similar role in more advanced societies.

Most countries in Sub-Saharan Africa are classified under developing countries, hence at their early stages of development. Thus, this requires active role of the government to aid the process of growth through public expenditure.

Public expenditure on infrastructure, creating friendly environment for business and to mention a few will ensure that foreign firms remain competitive and therefore contribute to host country growth. Thus, expenditure levels below 16.21% of GDP may not create the avenues for massive infrastructural development and hence hindering the potentials of foreign direct investment to stimulate economic growth of the host countries in Sub-Saharan Africa. Studies by Thanh and Hoai (2015), Hajamini and Falahi (2012) and Siefu and Njocke (2018) all point to a certain minimum levels of government expenditure that impact on growth below which its impact can be reversed.

The Role of Financial Development

Kalemli-Ozcan, and Sayek (2004) point out those economies with well-developed financial markets gain significantly from FDI. The level of development of the financial market is a deciding factor whether MNC's operate isolated in enclaves or they become catalysts for technology transfers.

Domestic Credit to GDP ratio as an Indicator of Financial Development

In model 1 where the study controls for inflation, human development, capital stock, institutional quality, infrastructure and political risk, the test for a single threshold (with H0: linear model; H1: single threshold model), yields the F1 statistic of 87.37 (bootstrap p-value = 0.0000), which is larger than its critical value at 1% significance level of 67.39. Therefore, the null hypothesis of no threshold effects is strongly rejected. F2 statistic in the test for a double threshold (with H0: single threshold model; H1: double threshold model) is also statistically significant at the 1 percent level of significance. The implication from the above results is that there are double thresholds in the first model. When domestic credit as a percentage of GDP is less than 10.69%, there is a negative relationship between FDI and economic growth. When 10.69% $\leq$ domestic credit as a percentage of GDP < 25.25% the negative coefficient suggests that economic growth is negatively related to FDI and the negative effect is less relative to the immediate previous regime. Finally, when domestic credit as a percentage of GDP $\geq$ 25.25%, the positive coefficient suggests that economic growth is positively related to FDI. In model 2, where trade openness is included in the growth equation, the study also found double threshold effects of domestic credit to GDP ratio with same magnitudes as in model 1 as absorptive capacity of FDI to effect economic growth in Sub-Saharan Africa. See the threshold tests and threshold values in Table 4.2.7.

Table 4.2.7 ***Threshold Estimate of the Five Models***

	Model 1				
Model	**Threshold**	**Lower**	**Upper**		**P-value**
Threshold 1	25.2461	24.2566	25.2488	87.37	0.0025
Threshold 2	10.6880	10.3539	10.7348	62.66	0.0125
	Model 2				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	25.2461	24.2566	25.2488	98.02	0.0025
Threshold 2	10.6880	10.3539	10.7348	63.77	0.0050
	Model 3				
Model	**Threshol**d	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	25.2461	24.2566	25.2488	81.82	0.0025
Threshold 2	10.7348	10.3870	10.7586	60.89	0.0025
	Model 4				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	25.2461	24.2566	25.2488	98.38	0.0050
Threshold 2	10.6880	10.3539	10.7348	61.31	0.0025
	Model 5				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	25.2461	24.2566	25.2488	98.92	0.0000
Threshold 2	10.6880	10.3539	10.7348	63.26	0.0000

In Model 3 where the financial development indicator of domestic credit to GDP ratio is included in the growth equation, the study again found double thresholds with the same magnitudes as obtained in model 1 and 2. In model 4, where study fully controls for all the variables with the inclusion of government expenditure, the study again finds the same double threshold values as obtained in model 1, 2, and 3. Thus, the study concludes that domestic credit to GPD ratio as a measure of financial development is robust to the choice and number regressors included in the growth equation. The results are presented in Table 4.2.8.

Table 4.2.8 ***Fixed Effects Model Estimation Results (Dependent Variable: GDP Growth, 1993-2015)***

	Model 1	Model 2	Model 3	Model4
Explanatory variables				
Trade to GDP ratio	-	-4.1189***	-4.3671***	-3.931487***
		[-2.84]	[-4.16]	[-3.73]
Inflation	-0.0136**	-0.0110*	-0.0106**	-.0115691*
	[-2.07]	[-1.68]	[-1.66]	[-1.82]
Human	2531.234***	2649.549***	2315.959***	2244.175***
Development Index	[8.19]	[8.64]	[7.54]	[7.33]
Political risk	6.6719	8.6029	8.9159	7.090043
	[0.86]	[1.12]	[1.18]	[0.94]
Domestic Credit to GDP ratio	-	-	10.9870***	10.93442***
			[5.03]	[5.03]
Government Expenditure to GDP ratio	-	-	-	-.2008645***
				[-2.75]
Capital to GDP ratio	-5.2593***	-2.2577	-3.1696	-3.481968*
	[-2.60]	[-1.05]	[-1.51]	[-1.67]
Infrastructure	2.1701***	1.9699***	1.3418***	1.321075***
(Mobile phone per thousand)	[4.44]	[4.06]	[2.74]	[2.71]
Corruption	-17.0744	-22.5701	-8.3034	-6.81921
	[-0.85]	[-1.13]	[-0.42]	[-0.35]
Bureaucracy				
FDI Threshold (0)	-1.8653***	-1.8301***	-1.7223***	-1.714573***
	[-9.80]	[-9.73]	[-9.31]	[-9.33]
FDI Threshold (1)	-0.0981	-0.0721	-0.0408	-.0171147
	[-0.57]	[-0.42]	[-0.24]	[-0.10]
FDI Threshold (2)	2.6095***	2.8145***	2.5741***	2.582761***
	[7.92]	[8.54]	[7.91]	[7.98]
Constant	662.962***	828.679***	791.8678***	817.072***
	[4.35]	[5.29]	[5.17]	[5.36]
No. of Observations	550	550	550	550
No. of Groups	25	25	25	25
p-value of F-test	0.0000	0.0000	0..0000	0.0000
R^2	0.2373	0.1680	0.2634	0.2607

*denotes statistically significant at the10 percent,** denotes statistically significant at the 5 percent and ***denotes statistically significant at the1 percent

Broad Money to GDP Ratio

In model 1 where the study controls for inflation, human development, capital stock, institutional quality, infrastructure and political risk, the test for a single threshold (with H0: linear model; H1: single threshold model), yields the F1 statistic of 125.54 (bootstrap p-value = 0.0000), which is larger than its critical value at 1% significance level of 67.80. The threshold tests can be found in Table 4.2.9.

Table 4.2.9 ***Threshold Estimate of the Five Models***

	Model 1				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	37.6749	37.4754	37.7661	125.54	0.0000
Threshold 2	20.9925	20.6057	21.0259	50.34	0.0375
	Model 2				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	37.6749	37.4754	37.7661	135.46	0.0000
Threshold 2	20.9925	20.6057	21.0259	55.38	0.0250
	Model 3				
Model	**Threshol**d	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	37.7661	37.5343	38.1589	110.20	0.0000
Threshold 2	20.9925	20.6057	21.0259	57.95	0.0125
	Model 4				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	37.6749	37.4754	37.7661	127.56	0.0000
Threshold 2	20.9925	20.6057	21.0259	54.86	0.0267
	Model 5				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	37.6749	37.4754	37.7661	129.54	0.0000
Threshold 2	20.9925	20.6057	21.0259	57.43	0.0200

Therefore, the null hypothesis of no threshold effects is strongly rejected. F2 statistic in the test for a double threshold (with H0: single threshold model; H1: double threshold model) is also statistically significant at the five percent level of significance. The implication from the above results is that there are double thresholds in the first model. When broad money as a percentage of GDP < 20.99%, the negative coefficient implies a negative relationship between FDI and economic growth. When 20.99% ≤ domestic credit as a percentage of GDP < 37.67% the negative coefficient suggests that economic growth is negatively related to FDI and the negative effect is less relative to the immediate previous regime

Finally, when broad money as a percentage of GDP ≥37.67%, the positive coefficient (see the fixed effect estimation Table in Appendix A.4) suggests that economic growth is positively related to FDI. See the detailed threshold results in Table 4.2.9.

Model 3 where the financial development indicator of money to GDP ratio is included in the growth equation, the study again found double thresholds with the same magnitudes as obtained in model 1 and 2.

In model 4, where study fully controls for all the variables with the inclusion of government expenditure, the study again finds the same double threshold values as obtained in model 1, 2, and 3.

Thus, the study concludes that broad money to GDP ratio as a measure of financial development is robust to the choice and number of regressors included in the growth equation. The result is consistent with findings of Raheem and Oyinlola (2013). The results are presented in Table 4.2.10.

Table 4.2.10 ***Fixed Effects Model Estimation Results (Dependent Variable: GDP Growth, 1993-2015)***

	Model 1	Model 2	Model 3	Model 4
Explanatory variables				
Trade to GDP ratio		-4.3373***	-4.4462***	-4.3671***
		[-4.15]	[-4.20]	[-4.29
Inflation	-0.0136**	-0.0108*	-0.0111*	-0.01192*
	[-2.10]	[-1.70]	[-1.73]	[-1.85]
Human	2577.975***	2708.08***	2702.535***	2056.658***
Development Index	[8.51]	[9.03]	[9.00]	[6.04]
Political risk	3.2280	5.1830	5.2225	0.9111
	[0.42]	[0.69]	[0.69]	[0.13]
Broad money to GDP ratio	-	-	1.0997	0.0995
			[0.69]	[1.57]
Domestic Credit to GDP ratio	-	-	-	
Government Expenditure to GDP ratio	-	-	-	-0.2381***
				[-3.20]
Capital to GDP ratio	-4.5940**	-1.4687	-1.5010	-2.2493
	[-2.33]	[-0.71]	[-0.73]	[-1.10]
Infrastructure (Mobile phone per thousand)	2.0180***	1.8115***	1.7148***	2.8110***
	[4.21]	[2.82]	[3.46]	[4.74]
Corruption	-7.8610	-13.0871	-9.8329	
	[-0.40]	[-0.67]	[-0.49]	
FDI Threshold (0)	-1.9783***	-1.9765***	-1.9707***	-2.0366***
	[-10.14]	[-10.29]	[-10.25]	[-10.35]
FDI Threshold (1)	-0.3954**	-0.3407**	-0.3417**	-0.3659**
	[-2.35]	[-2.05]	[-2.05]	[-2.18]
FDI Threshold (2)	2.8626***	3.0312***	2.9923***	2.5104***
	[9.05]	[9.65]	[9.37]	[8.70]
Constant	630.1105***	802.4445***	779.8754***	1089.689***
	[4.22]	[5.25]	[4.99]	[7.53]
No. of Observations	550	550	550	575
No. of Groups	25	25	25	25
p-value of F-test	0.0000	0.0000	0.0000	0.000
R^2	0.3672	0.1798	0.1809	0.1429

*denotes statistically significant at the10 percent,** denotes statistically significant at the 5 percent and ***denotes statistically significant at the1 percent

Absorptive Capacity Based on Technology

The sub-section tests threshold effect of technology on economic growth in Sub-Saharan Africa. The threshold variable is defined as initial level of technology relative to the best level of technology (ABC) in Sub-Saharan Africa.

In model 1 where the study controls for inflation, human development, capital stock, institutional quality, infrastructure and political risk, the test for a single threshold (with H0: linear model; H1: single threshold model), yields the F1 statistic of 110.00 (bootstrap p-value = 0.0033), which is larger than its critical value at 1% significance level of 88.9268. Therefore, the null hypothesis of no threshold effects is strongly rejected. F2 statistic in the test for a double threshold (with H0: single threshold model; H1: double threshold model) is also statistically significant at the 10 percent level of significance. The implication from the above results is that there are double thresholds in the first model. The regression slope estimates in TAR model indicate the effect of FDI in the three regimes. When ABC < 0.4724, the test suggests that economic growth is not related to FDI. When $0.4724 \leq ABC < 0.6904$: coefficient of -1.8643 indicates there an inverse relationship between FDI and economic growth. When $ABC \geq 0.6904$, the coefficient of 2.8071 indicates a positive relationship between economic growth and FDI. See Table 4.11 for the detailed results on the threshold tests and values.

In model 2, where trade openness is included in the growth equation, the study also found double threshold effects of level of technology with same magnitudes as in model 1 as absorptive capacity of FDI to effect economic growth in Sub-Saharan Africa. In Model 3 where the financial development indicator of domestic credit to GDP ratio is included in the growth equation, the study again found double thresholds with the same magnitudes as obtained in model 1 and 2.

that the level of technology is robust to the choice and number of regressors included in the growth equation. The results are presented in Table 4.2.12.

Table 4.2.11 ***Threshold Estimate of the Five Models***

	Model 1				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	0.6904	0.6818	0.6934	110.00	0.0075
Threshold 2	0.4721	0.4521	0.4521	53.55	0.0650
	Model 2				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	0.6904	0.6818	0.6934	116.73	0.0050
Threshold 2	0.4721	0.4521	0.4790	58.98	0.0375
	Model 3				
Model	**Threshol**d	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	0.6904	0.6818	0.6934	106.55	0.0000
Threshold 2	0.4721	0.4521	0.4790	64.24	0.0175
	Model 4				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	0.6904	0.6818	0.6934	119.63	0.0050
Threshold 2	0.4721	0.4521	0.4790	60.64	0.0325
	Model 5				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	0.6904	0.6818	0.6934	120.88	0.0000
Threshold 2	0.4721	0.4521	0.4790	59.82	0.0275

The implication of the results is that, given the absorptive capacity of the selected host countries a technology level of 0.6904 ensures that foreign direct investment exerts significant positive effect on economic growth in Sub-Saharan Africa. Thus, productive effect of FDI increases as absorptive capacity increases from 0.6940 and beyond.

Table 4.2.12 ***Fixed Effects Model Estimation Results (Dependent Variable: GDP Growth, 1993-2015)***

	Model 1	Model 2	Model 3	Model 4	Model 5
Explanatory variables					
Trade to GDP ratio	-		-4.4708*** [-4.36]	-4.6574*** [-4.37]	-4.2719*** [-3.99]
Inflation	-.0105076 [-1.61]	-.0078227 [-1.20]	-.0073941 [-1.18]	-.0090237 [-1.40]	-.0100802 [-.57]
Human Development Index	2459.26*** [7.99]	2578.404*** [8.45]	2162.726*** [7.15]	2537.146*** [8.38]	2464.391*** [8.16]
Political risk	6.853092 [0.88]	8.816363 [1.15]	9.65592 [1.30]	9.203998 [1.21]	7.361266 [0.97]
Broad money to GDP ratio	-	-	-	5.16130*** [3.27]	5.539185*** [3.51]
Domestic Credit to GDP ratio	-	-	13.10496*** [6.17]	-	-
Government Expenditure to GDP ratio	-	-	-	-	-.1969795 [-2.67]
Capital to GDP ratio	-1.50624 [-0.76]	1.520379 [0.72]	.2033587 [0.10]	1.267453 [0.61]	.9596996 [0.46]
Infrastructure (Mobile phone per thousand)	2.498268*** [5.12]	2.325728*** [4.81]	1.554694*** [3.21]	1.830585*** [3.64]	1.767824*** [3.53]
Corruption	6.900216 [0.34]	2.730172 [0.13]	19.8835 [1.00]	17.73465 [0.86]	19.97472 [0.97]
FDI Threshold (0)	-.0315896 [-0.17]	.0390919 [0.21]	.1131479 [0.62]	.023997 [0.13]	.0286653 [0.16]
FDI Threshold (1)	-1.904594*** [-9.43]	-1.90431*** [-9.55]	-1.84483*** [-9.57]	-1.92306*** [-9.73]	-1.89599*** [-9.64]
FDI Threshold (2)	2.642616*** [7.75]	2.771926*** [8.20]	2.579664*** [7.86]	2.767088*** [8.26]	2.776697*** [8.34]
Constant	546.9388*** [3.62]	705.2029*** [8.20]	675.0946*** [4.51]	610.2437*** [3.91]	628.0697*** [4.04]
No. of Observations	550	550	550	550	575
No. of Groups	25	25	25	25	25
F-test	0.0000	0.0000	0.0000	0.000	0.0000
R^2	0.2205	0.1628	0.2512	0.1657	0.1643

*denotes statistically significant at the10 percent, ** denotes statistically significant at the 5 percent and ***denotes statistically significant at the1 percent. The figures in the square brackets are t-statistics

The results also imply that domestic firms that are near the technology frontier (ABC > 0.4724) do not have much to learn from foreign firms. The result is consistent with Girma (2005) who also found non-linear relationship between productivity and foreign direct investment

Below 0.6904, Sub-Saharan Africa countries do not benefit from FDI. The implication of this

result is that countries that are far from their technology frontier will not extract economic benefit of the inflow of FDI through productivity gains and economic growth. The results are presented in Table 4.1.6.

In model 4, where the study uses broad money to GDP ratio as an indicator of financial development, double threshold results was also registered. Finally, in model 5, where study fully controls for all the variables with the inclusion of government expenditure, the study again finds the same double threshold values as obtained in model 1, 2, 3and 4. Thus, the study concludes

4.3 Effect of Foreign Direct Investment on Efficiency Improvement in Sub-Saharan Africa

This section discusses the effect of foreign direct investment on improvement of technical efficiency in sub-Saharan African countries. As outlined in the methodology (Section 3.2.4), a panel stochastic frontier model is fitted where the technical inefficiency equation is modelled as a function of a set of regressors which, in this study, constitute foreign direct investment, trade openness and human capital. The inefficiency variables were chosen by following the methodology of Wijeweera et al. (2010). The results are presented in Table 4.3.

General government expenditure was found to exert significant effect on economic growth in Sub-Saharan Africa at the 1 percent level of significance. Barro (1990) indicated that government

expenditure has a role to play in the growth processes when it is productive one. Thus, expenditure on infrastructural building, improving investment and business climate, to mention a few, is expected to shore up the performance of economies in the region through economic growth. Also, expenditure on building strong institutions such as property rights enforcement generates enhancing effects on economic growth.

The results further indicate that consumer price index exerts significant negative effect on real GDP per capita in sub-Saharan Africa at the 1 percent level of significance. Increases in the rate of inflation create uncertainty about future investment thereby affecting investors' confidence which reduces volume of investment and therefore reducing growth in the economy.

Further to this, increase in inflation increases the interest rate which increases cost of investment thus serves as deterrent for firms to invest in the economy. When inflation rises, interest rates also rise mainly due to market expectations, it is further argued that since the aim of investors is to increase their long-run purchasing power, inflation puts this goal at risk because investment returns should first keep up with the rate of inflation. Increase in inflationary rate may also lead to capital flight in the economy thereby affecting the growth prospects of Sub-Saharan Africa countries. Davies (2007) suggested a percentage increase in inflation reduces GDP by 0.005 to 0.01 percentage point due to capital flight. Davies (2007) suggests that a percentage point increase in inflation is associated with a 0.005 to 0.01 percentage point increase in GDP leads to an increase in capital flight flows. He also revealed that high and sustained rates of inflation rendered some post-conflict economies to experience a substantial level of capital flight. The high and sustained inflation rates that some post-conflict economies experienced led to a substantial level of capital flight flows.

Again, gross capital exerts significant positive effect on the growth of Sub-Saharan Africa countries at the 1 percent level of significance. Both exogenous and endogenous neoclassical growth literature recognizes the role of capital in stimulating growth of economies. High level of capital stock improves labour productivity and therefore increases economic growth. The result is in line with the one obtained by Wijeweera et al. (2010) and Nouzard (2008).

Related to this variable is human capital measured by human development index which the study finds to play negligible role in determining economic growth in Sub-Saharan Africa at the 1 percent level of significance.

The panel stochastic frontier model was also fitted where the technical inefficiency equation is modelled as a function of a set of regressors which, in this study, constitute foreign direct investment, trade openness and human capital. The results show that foreign direct investment has significant negative effect on technical inefficiency in Sub-Saharan Africa countries at the 1 percent level of significance.

The result implies that inflow of foreign direct investment reduces inefficiency in the production structure of Sub-Saharan Africa countries. Thus, Sub-Saharan Africa countries benefits from efficiency gains from the inflow of foreign direct investment.

As Hymer (1976) noted, FDI is not just about transfer of capital but it entails a package which includes managerial know-how, and new products. It argued that market imperfections may occur for several reasons which includes product differentiation, marketing skills, access to capital, technological advantage, and economies of scale. All these accompanying characteristics of FDI reduce levels of inefficiency in the production structure.

Table 4.3 ***Maximum Likelihood Estimates of Stochastic Production Frontier with Mean Inefficiency with Annual Panel of 43 Countries: 1980–2015***

Explanatory Variables	Coefficient
Frontier Model	
Expenditure to GDP ratio	0.1089793***
	[8.85]
Human Development Index	0.0148017
	[0.0213662]
Inflation	-0.0206531***
	[-4.82]
Capital to GDP ratio	.0760959***
	[11.04]
Broad money to GDP ratio	-.003511
Regime	[-0.18]
	-.0491956***
	[-2.65]
Inefficiency Effects Model	
FDI	-0.0019451**
	[-2.23]
Human Development Index	-1.005635
	[-0.72]
Trade to GDP ratio	0.0262523***
	[7.84]

** denotes statistically significant at the 5 percent and ***denotes statistically significant at the1 percent

The other control variable, namely, human development index, exerts negligible effect on inefficiency. Even though the sign is negative human development in Sub-Saharan does not proffer significant improvement in the production structure of Sub-Saharan Africa countries.

The results further show that trade openness exerts significant positive effects on inefficiency at the one percent level of significance. This implies that the more open sub-Saharan Africa countries are, the less they are efficient. The finding is a sharp contrast with Wijeera et al. (2010) who found that trade openness rather worsens the level of inefficiency in production. Perhaps these industries in the Sub-Saharan Africa countries are in their infant stage of development therefore excessive openness of the economy would rather have a dampening effect on their growth and productivity.

CHAPTER FIVE

PRESENTATION AND DISCUSSION OF EMPIRICAL RESULTS ON SECTORAL FOREIGN DIRECT INVESTMENT

5.0 Introduction

The chapter discusses sectoral FDI effect on economic growth in Sub-Saharan Africa and the spillover effects of foreign direct investment on domestic firms' productivity.

5.1 Panel Unit Root Test Results

The study carried out a unit root test on both the independent and dependent variables using the approach of Im, Pesaran and Shin Panel (1995) to check the stationarity or otherwise of the time series variables. While a number of literatures have recognized the theoretical possibility of two-way feedbacks between FDI and economic growth along with their long-run and short-run dynamics, empirical investigations have failed to provide conclusive evidence in support of such two-way feedback effects at the sector level. Moreover, earlier studies are typically devoid of a test of the co-integrated relationship between the two variables of interest. Given the unit root characteristics of time series variables in general, results based on panel regression analysis are subject to spurious correlation.

Therefore, a better understanding of the FDI–growth relationship in the context of policy reform and changes in the structure of FDI requires complementary analyses that rigorously explore the issue of cointegration as well as the long-run and short-run dimensions of the causal relationship between FDI and growth. To assess the causal links between the referred variables, we estimate a vector error correction model that emanates from the cointegrd relationship between the variables.

A panel cointegration framework that allows for heterogeneity across the industries in the primary, secondary, and tertiary sectors is used. The following two questions are of importance:

- Is there a long-run steady state relationship between FDI and output for all industries included in the panel?
- Given the existence of a cointegrated relationship, can we accurately identify the chronology of causal effects between FDI and output by unraveling the short-run dynamics of the long-run relationship?

Our empirical investigation regarding the association between FDI stocks and economic growth follows the three-step procedure suggested by Basu et al. (2003). We begin by testing for non-stationarity in the two variables of FDI stocks and output in our panel of industries. Prompted by the existence of unit roots in the time series, we use the panel cointegration technique developed by Pedroni (2004, 1999) to test for a long-run cointegrating relationship between the two variables in the second step of our estimation. Given the evidence of cointegration in the long-run FDI–growth relationship across the panels, an error correction model to uncover Granger causality in the relationship in the final step of our estimation. While our approach of examining causality within a panel cointegration framework has major advantages compared to the existing literature on the FDI–growth link there are some limitations. In other words, data restrictions leave us with no choice but to opt for attribution, rather than comprehensiveness in dealing with the ‘‘inescapable trade-off’’ (Clemens et al., 2004, p. 10) between the two.

Im, Pesaran, and Shin panel unit root results indicate that GDP per capita, capital per capita, human development index, trade openness, consumer price index, inflation, domestic credit to private sector as a percentage of GDP, primary FDI per capita, secondary FDI per capita and tertiary FDI per capita, FDI to GDP ratio, agriculture value added, industry value added as a percentage of

GDP and service value added as a percentage of GDP are non-stationary at the level at the 10 percent level of significance. All the variables are stationary at the first difference at the one percent, five percent, and 10 percent levels of significance. Thus, the variables are integrated of order one. The study therefore proceeded to conduct Pedroni Panel Cointegration test for the Sectoral FDI models. The results of the unit root test are presented in the Table 5.1.

The bivariate approach has been used in several recent studies on the causal links between FDI and growth, including Chowdhury and Mavrotas (2006), Frimpong and Oteng-Abayie (2006), and Hansen and Rand (2006). The same applies to related fields such as the causal links between exports and growth as well as those between local financial development and growth. The preference for bivariate approaches in the relevant literature is to avoid the complications resulting from indirect causality once the so-called auxiliary variables are accounted for in a multivariate framework (Dufour &Renault, 1998). For example, Konya (2004, p. 79) considers it ‘‘a clear advantage’’ that ‘‘in a bivariate system, no-causality for one period ahead implies no-causality at, or up to, any horizon.’’

Moreover, the usable sample size tends to shrink considerably when testing for causality in a multivariate system (Ko´nya, 2004, p. 88).

We follow the standard bivariate approach. The important contribution to the existing literature is rather that we account for the heterogeneity of the FDI–growth link across sectors by applying a panel cointegration framework. In this way, we aim at identifying the precise direction of causality between these two variables, rather than identifying the relative importance of various possible determinants of growth.

Table 5.1 ***Im, Pesaran and Shin Panel Unit Root Test Results***

Variables	Level	First Difference
GDP per capita	-0.70	-3.54***
Capital per capita	-0.84	-3.00***
Human development index	-0.12	-2.50***
Trade openness	-0.37	-5.71
Consumer price index	0.86	-1.62*
Domestic credit % GDP	-0.20	-2.23**
Primary FDI per capita	-0.71	-4.24***
Secondary FDI per capita	0.19	-4.67***
Tertiary FDI per capita	-0.59	-3.68***
Industry value added % GDP	-0.36	-3.14***
Service value added % GDP	-0.24	-2.94***
Agriculture value added % GDP	-1.06459	-2.10169**
FDI to GDP ratio	2.37095	-2.21860**
Inflation	1.89169	-4.18325

** denotes statistically significant at the 5 percent and ***denotes statistically significant at the1 percent

5.2 Pedroni Panel Cointegration Results

This section discusses panel cointegration based on Pedroni panel cointegration approach. Pedroni (1999, 2004) proposes a residual-based test for the null of cointegration for dynamic panels with multiple regressors in which the short-run dynamics and the long-run slope coefficients are permitted to be heterogeneous across individuals. The test allows for individual heterogeneous fixed effects and trend terms and no exogeneity requirements are imposed on the regressors of the cointegrating regressions. The cointegration tests examine the null hypothesis of no cointegration among the variables of interest.

It must however take into consideration the spurious regression problem. Thus, tests based on the null of cointegration must take into consideration an efficient estimation of a cointegrated relationship. Basically, it employs four panel statistics and three group panel statistics to test the null hypothesis of no cointegration against the alternative hypothesis of cointegration (Pedroni, 1999).

In the case of panel statistics, the first-order autoregressive term is assumed to be the same across all the cross sections, while in the case of group panel statistics the parameter is allowed to vary over the cross sections. Further, the concept of pooled estimation is different from pooling the cross-section testing results (Barbieri, 2014). In the case of cointegration, treating each cross-section independently may translate to allowing for varying slopes and varying intercepts. This has strong implications for the model. If the null is rejected in the panel case, then the variables of the production (labour productivity) function are cointegrated for all the sectors. On the other hand, if the null is rejected in the group panel case, then cointegration among the relevant variables exists for at least one of the sectors.

The Pedroni panel cointegration test shows that v-statistic, PP-statistic ADF-statistic weighted v-statistic, weighted-PP-statistic, weighted ADF-statistic, Group PP-statistic and Group ADF statics are statistically significant at the one (1) percent level of significance. Thus, most of the test statistics reject the null hypothesis that there is no cointegration among the variables in the Economic growth measure and primary FDI per capita model. The study therefore concludes that there is a long-run relationship between economic growth, primary FDI per capita and other growth-determinant variables. The panel cointegration results also show that PP-statistic weighted PP-statistic, weighted ADF-statistic, Group PP-statistic and Group ADF statistic are statistically significant at the 10 percent and 1 percent level significance for the GDP per capita and secondary FDI per capita model. Since these statistics are statistically significant, it implies that GDP per capita, secondary FDI per capita and other growth-determinant variables are cointegrated. In other words, there is long run relationship between GDP per capita, secondary FDI per capita and other growth-determinant variables. The results are presented in Table 4.4.1

The v-statistic, PP-statistic, ADF-statistic, weighted PP-statistic, weighted ADF-statistic, Group PP-statistic and Group ADF-statistic are statistically significant at the 1 percent level of significance for the GDP per capita and tertiary FDI per capita model. This implies that GDP per capita, tertiary FDI and other growth-determinant variables are cointegrated. That is, there is a long-run relationship between GDP per capita, tertiary FDI and other growth-determinant variables.

Table 5.2 ***Pedroni Panel Cointegration Test Results for Economic Growth Models***

Pedroni cointegration statistic	GDP per capita and Primary FDI per capita model	GDP per capita and Secondary FDI per capita model	GDP per capita and Tertiary FDI per capita model
v-statistic	14.66744***	0.417713	5.376701***
rho-statistic	2.526718	3.158910	2.294858
PP-statistic	-3.287845***	-1.581137*	-7.187666***
ADF-statistic	-4.001736***	-1.155246	-5.752378***
Weighted v-statistic	2.204090**	-0.443842	0.785034
Weighted rho-statistic	2.754122	2.927978	2.821029
Weighted PP-statistic	-5.682045***	-4.943969***	-5.577052***
Weighted ADF-statistic	-4.165604***	-3.007067***	-3.303045***
Group rho-statistic	3.491797	4.057139	3.699173
Group PP-statistic	-17.07967***	-3.614594***	-11.50767***
Group ADF-statistic	-5.396374***	-2.400536***	-4.403389***

** denotes statistically significant at the 5 percent and ***denotes statistically significant at the1 percent

Most of the panel cointegration statistics in the industry contribution to growth and secondary FDI per capita model are statistically significant implying that there is long-run relationship between industry contribution to economic growth, secondary FDI per capita and other growth-determinant variables.

Finally, most of the panel co-integration test statistics are statistically significant at the 1 percent and 5 percent level of significance for the service sector contribution to growth and tertiary FDI per capita model. The study therefore concludes that there is long-run relationship between service contribution to growth, tertiary FDI per capita and other growth-determinant variables.

With the establishment of long-run relationship for the sectoral FDI models, the study employed the FMOLS to estimate the long-run equation. For many hypotheses to which cointegration methods have been applied, data is in fact commonly available on a time series basis for multiple countries, for example, and practitioners could stand to benefit significantly if there existed a straightforward approach to perform cointegration tests for pooled time series panels. Many areas of research come to mind, such as the growth and convergence literature, or the purchasing power parity literature, for which it is natural to think about long run time series properties of data that are expected to hold for groups of countries. Alternatively, examples are also readily available for issues that involve time series panels for yields across asset term structures or price movements across industries, to name only a few. For applications where the cross-sectional dimension grows reasonably large, existing systems methods such as the Johansen (1989; 1991) procedure are likely to become infeasible, and panel methods may be more appropriate. On the other hand, pooling time series has traditionally involved a substantial degree of sacrifice in terms of the permissible heterogeneity of the individual time series.

To ensure broad applicability of any panel cointegration test, it will be important to allow for as much heterogeneity as possible among the individual members of the panel. Therefore, one objective of this paper was to construct panel cointegration test statistics that allow one to vary the degree of permissible heterogeneity among the members of the panel, and in the extreme case pool only the multivariate unit root information, leaving the form of the time series dynamics and the

potential cointegrating vectors entirely heterogeneous across individual members. Unfortunately, relatively little is known about the properties of cointegration tests for these types of applications in which both the time series and cross-sectional dimensions grow large. Recent work by Levin and Lin (1994) and Quah (1994) has gone a long way toward furthering the understanding of asymptotic for non-stationary panels. Quah (1994) derives asymptotically normal distributions for standard unit root tests in panels for which the time series and cross-sectional dimensions grow large at the same rate. Levin and Lin (1994) extend this work for the case in which both dimensions grow large independently and derive asymptotic distributions for panel unit root tests that allow for heterogeneous intercepts and trends across individual members.

In recent times, Im, Pesaran and Shin (1995) suggest a panel unit root estimator based on an alternative group mean approach. Based on the relationship between cointegration tests and unit root tests in the conventional single series case, it is likely to think that the panel unit root statistics introduced in these studies might be directly applicable to tests of the null of no cointegration, with perhaps changes in some of the critical values to reflect the use of estimated residuals. Quite to the contrary, however, the relationship for nonstationary panels often turns out to be considerably more involved. The asymptotic methods used for nonstationary panels dictate that in general the properties of unit root tests applied to estimated residuals can be considerably different than the case in which these tests are applied to raw data. The multivariate nature of cointegration introduces two key complicating features. The first involves the fact that regressors are typically not required to be exogenous for cointegrated systems, which introduce off diagonal terms in the residual asymptotic covariance matrix. As Phillips and Ouliaris (1990) demonstrate, for the single series case these terms drop out of the asymptotic distributions for unit root tests based on residuals. By contrast, for nonstationary panels, these effects are likely to be idiosyncratic across

individual members and will not generally vanish from the asymptotic distribution for unit root tests. If these features of the data are ignored, the asymptotic method used to average over the cross-sectional dimension of the data for raw unit root tests can introduce undesirable data dependencies into the asymptotic distributions when estimated residuals are used.

The second, more general complicating feature that estimated residuals bring to unit root tests for panels involves the dependency of the residuals on the distributional properties of the estimated coefficients of the spurious regression. For the conventional single series case, the spurious regression estimator converges to a nonstandard random variable, which has the effect of altering the asymptotic distributions and the corresponding critical values required to reject the null of no co-integration as compared to the null of a raw unit root. For panels, because of the averaging that occurs in the cross-sectional dimension, this can induce much more dramatic effects on the properties of the asymptotic distributions.

For panels, we show that the nature of the cross sectional asymptotic is such that the effect of this dependency on the distribution of the estimated coefficients will hinge critically on whether this coefficient is constrained to be homogeneous for all members of the panel. Specifically, we show that if the alternate hypothesis is such that any co-integrating relationship is necessarily similar among members of the panel, so that the coefficients of the spurious regression can be constrained to be homogenous, then under some circumstances, the slope estimator can become consistent at rate even under the null of no co-integration as the cross-sectional dimension grows large.

This has the interesting consequence of producing for this special case a type of asymptotic equivalency result for non-stationary panels such that the asymptotic distribution of the unit roots tests will be invariant to whether the residuals are known or are estimated.

Table 5.3 *Pedroni Panel Cointegration Test Results for Sectoral Contribution to Growth Models*

Pedroni cointegration statistic	Agriculture value added %of GDP and FDI to GDP ratio	Industry value added % of GDP and FDI to GDP ratio	Service value added % of GDP and FDI to GDP ratio
v-statistic	-2.738414	-2.971310	-1.745820
rho-statistic	4.077605	3.884912	3.743203
PP-statistic	-1.373408*	-1.847608**	-1.571808*
ADF-statistic	-3.407823***	-1.876243**	-2.012145**
Weighted v-statistic	-3.099926	-4.471028	-1.532656
Weighted rho-statistic	3.015840	4.214260	3.506240
Weighted PP-statistic	-3.885178***	-3.833148***	-2.105412**
Weighted ADF-statistic	-3.676874***	-4.892126***	-2.282567**
Group rho-statistic	4.732780	5.405477	5.105385
Group PP-statistic	-4.682253***	-4.793605***	-2.510577***
Group ADF-statistic	-4.315091***	-3.531503***	-3.733508***

** denotes statistically significant at the 5 percent and ***denotes statistically significant at the1 percent

Most of the panel cointegration statistics in the agriculture contribution to growth model are statistically significant implying that there is long-run relationship between agriculture

contribution to growth and FDI as a percentage of GDP and other growth-determinant variables. Also, industry contribution to growth and FDI as a percentage of GDP are statistically significant implying that there is long-run relationship between industry contribution to economic growth, FDI as a percentage of GDP and other growth-determinant variables. Finally, most of the panel-cointegration test statistics are statistically significant at the 1 percent and 5 percent level of significance for the service sector contribution to growth and FDI as a percentage of GDP model. The study therefore concludes that there is long-run relationship between service contribution to growth, FDI as a percentage of GDP and other growth-determinant variables.

Except for service sector contribution to growth and secondary FDI per capita, most of the panel co-integration statistics for the remaining models are statistically significant implying that there is long-run relationship.

5.3 FMOLS Estimate of the Long run Models for the Sectoral FDI

Fully Modified Ordinary Least Squares is applied to estimate the effects of sectoral FDI on economic growth and a sector contribution to economic growth in the selected countries in Sub-Saharan Africa. The results are presented in Table 5.4.

Economic Growth and Primary FDI per capita

The result shows that primary FDI per capita exerts significant effect on economic growth at the one (1) percent level of significance. FDI inflow emanating from primary source proffer significant effect on the economic growth of the selected countries in Sub-Saharan Africa bearing in mind that the primary sector is the backbone of most of the economies of the selected countries in the study. Investment in the primary sectors generates quick return especially in minerals such as gold

and diamond which contributes significantly to the national exports of these countries thereby expanding the productive capacities of the selected economies and raising their growth prospects.

Madem et al. (2012) indicated that investment in the primary sector such as agriculture, fisheries, mining and quarrying generates substantial employment for developing countries where unemployment rate is very high thereby increasing the countries' growth prospects.

Most of the other growth-determinant variables are statistically significant. Capital per capita exerts significant effect on economic growth of the selected countries in Sub-Saharan Africa.

The contribution of capital to the growth processes of an economy cannot be overemphasized as it represents basic input in the production process and enhances the productivity of labour, making labour more effective in the production processes hence bringing forth more output and growth in the selected economies. Financial development proxied by domestic credit to private sector as a percentage of GDP also contributes it shares to growth processes of the selected countries in Sub-Saharan Africa.

Human development index is also established in this study to have strong link with economic growth in the selected countries in Sub-Saharan Africa. However, trade openness did not contribute to the success of growth prospects of the selected countries when one controls for primary FDI per capita. The potential for linkages is typically considered limited in the primary sector (UNCTAD, 2001). Resource-seeking FDI in this sector often takes place in economic enclaves that are largely isolated from the local economy.

Table 5.4 ***Pedroni Panel Cointegration Test Results for Sectoral Contribution to Growth Models***

** denotes statistically significant at the 5 percent and ***denotes statistically significant at the1 percent

Variables	Agric. value added (%of GDP) and Primary FDI per capita model	Agric. value added (%of GDP) and Secondary FDI per capita model	Agric. value added (%of GDP) and Tertiary FDI per capita model	Industry value added (% of GDP) and Primary FDI per capita	Industry value added (% of GDP) and Secondary FDI per capita	Industry value added (% of GDP) and Tertiary FDI per capita	Service value added (% of GDP) and Primary FDI per capita	Service value added (% of GDP) and Secondary FDI per capita	Service value added (% of GDP) and Tertiary FDI per capita
v-statistic	-1.889	-1.505	-1.729	1.053	0.874	0.218	-0.164	-1.507	-0.287
rho-statistic	2.172	1.680	2.205	1.769	2.291	2.499	3.222	2.662	2.572
PP-statistic	-2.409***	-4.603***	-1.957**	4.512***	-2.199**	-1.413*	-0.179	1.930	-0.659
ADF-statistic	-3.191***	-4.568***	-2.787***	-4.423***	-1.989**	-1.192	-1.161	0.032	-3.465***
Weighted v-statistic	-2.149	-2.033	-2.248	-2.201	-2.748	-2.789	-0.881	-2.685	-2.030
Weighted rho-statistic	2.384	2.163	2.585	2.813	2.357	2.831	2.877	3.018	2.751
Weighted PP-statistic	-4.549***	-4.784***	-3.027***	-6.285***	-14.86***	-6.975***	-2.741***	3.898	-1.755**
Weighted ADF Statistic	-4.481***	-3.689***	-3.222***	-2.381***	-5.289***	-2.443***	-1.543*	1.389	-4.449***
Group rho-statistic	2.924	2.871	3.187	3.084	3.067	3.330	3.943	3.693	3.746
Group PP-statistic	-7.578***	-5.100***	-4.729***	-6.538***	-12.26***	-5.808***	-1.704**	1.509	-1.735**
Group ADF-statistic	-4.810***	-3.718***	-2.815***	-4.064***	-5.142***	-2.958***	-1.792**	0.189	-4.228***

Table 5.5 ***Fully Modified Ordinary Least Squares Long run Results***

Variables	GDP per capita and Primary FDI per capita model	GDP per capita and Secondary FDI per capita model	GDP per capita and Tertiary FDI per capita model
Primary FDI per capita	0.567912*** [3.144004]	-	-
Secondary FDI per capita	-	1.004144 [1.606111]	-
Tertiary FDI per capita	-	-	4.094615** [2.043580]
Capital per capita	9.257784*** [6.418851]	8.986970*** [6.000650]	2.876876 [0.920520]
Human development	6003.709*** [10.01206]	6523.243*** [13.07095]	11140*** [7.897637]
Trade openness	-0.619791 [-0.388326]	0.056318 [0.043836]	0.080946 [0.045145]
Consumer	-6.749054*** [-3.877947]	-7.088513*** [-4.209204]	-4.401136* [-1.805326]
Domestic credit (% of GDP)	17.51353*** [5.138302]	13.52750*** [4.933937]	-0.436007*** [-4.630286]

** denotes statistically significant at the 5 percent and ***denotes statistically significant at the1 percent

Positive growth effects of FDI in the primary sector may be compromised in other ways, too. FDI in this sector tends to be volatile; it is sensitive to international commodity prices and often financed through inter-company loans rather than equity (Aykut & Sayek, 2007; World Bank, 2005). According to Lensink and Morrissey (2006), the volatility of FDI has a negative impact on growth. Furthermore, large-scale FDI for resource-seeking reasons may give rise to Dutch disease effects and encourage unproductive activities such as rent seeking (Aykut & Sayek, 2007). While

all this renders positive growth effects rather unlikely, the typically high export orientation of FDI in the primary sector may counterbalance negative factors.

Economic Growth and Secondary FDI per capita Models

The result shows that secondary FDI per capita exerts no effect on economic growth even at the 10 percent level of significance for the selected countries in Sub-Saharan Africa. Again, secondary FDI per capita exerts no effect on the industry contribution to economic growth in Sub-Saharan Africa. Obviously, once secondary FDI does not contribute to the overall growth of the selected countries in Sub-Saharan Africa, enhancing the sector contribution to growth of the economy will be failure.

The result is not very surprising as Chen et al. (2015) in their study indicated that manufacturing FDI in Africa remains relatively undiversified, focusing on raw material (food) processing or end-product assembly, which are characterized by low value addition, even in those countries that manage to attract significant inflows. In addition, FDI is traditionally concentrated in the food and beverage subsector in most of the countries. This concentration in low value addition activities may be appropriate in the short run, however, as it is likely to be a first step for economies to integrate into Global Value Chains (GVCs) by exploiting their comparative advantages. Also, the dependence on imported production inputs, erratic electricity supply, and poor trade logistics drive the cost up and pose the threat to the sustainability of manufacturing FDI. These bottlenecks also lead to production inefficiencies that constrain Africa's integration into the global value chain and thereby constraining secondary FDI to generate growth in the recipient countries in the long run.

However, according to Alfaro (2003), FDI-related transfers of technology and knowledge primarily occur in the manufacturing sector. It is mostly in manufacturing sector that foreign

investors use intermediate inputs intensively which creates positive externalities and allows local producers to draw on a larger variety of inputs and hence, increasing their productivity (Rodriguez-Clare, 1996). Also, UNCTAD (2001, p. 138) argues that the manufacturing sector comprises a broad range of linkage-intensive activities which are likely to have a positive effect on the economies of developing nations. Nonetheless, Aykut and Sayek (2007) suspect that unless FDI is motivated by efficiency-seeking reasons, except FDI is located in enclaves such as export-processing zones, then technology and knowledge spillovers in manufacturing are most likely thereby enhancing the FDI per capita.

Most of the other growth-determinant variables are statistically significant. Capital per capita, financial development, human development, and consumer price index all have significant effect on economic growth of the selected countries in Sub-Saharan Africa.

Economic Growth and Tertiary FDI per capita Models

The result shows that tertiary FDI per capita exerts significant effect on economic growth at the 1 percent level of significance. The result is consistent with Imoudu (2012) results who established that tertiary FDI has significant positive effect on economic growth in Nigeria. Also, Noland et al. (2012) had similar result and explain that the tertiary sector supports other sectors such as secondary and primary sectors. They further explained that growth in service or tertiary sector results in more inclusive growth and political stability. FDI inflow emanating from tertiary source proffer significant effect on the economic growth of the selected countries in Sub-Saharan Africa since the tertiary sector has turned out to be one of the leading sectors of the selected countries in Sub-Saharan Africa in recent years. The finance and telecommunication sectors have played

significant role in shaping the economies of the selected countries in Sub-Saharan Africa. However, foreign direct investment in this sector does not enhance the service sector to contribute to overall growth of the selected countries in Sub-Saharan Africa.

Compared to the primary sector and the manufacturing sector, the growth effects of FDI in the services sector appear to be more ambiguous a priori. Alfaro (2003) and UNCTAD (2001) suspect that the services sector resembles the primary sector with regard to the limited potential of linkages and spillovers (see also World Bank, 2005, p. 96). The increasing tradability of services notwithstanding, the bulk of FDI in this sector still appears to be market-seeking. The superior market power of foreign service providers, whose entry into the host country is often through mergers and acquisitions rather than greenfield FDI, has ‘‘significant crowding-out potential’’ (Aykut & Sayek, 2007; UNCTAD,2004, pp. 111, 124). Moreover, linkages with the local economy may remain weak even for FDI in tradable services.

Most of the other growth-determinant variables are statistically significant. Financial development, human development, and consumer price index all have significant effect on economic growth of the selected countries in Sub-Saharan Africa. The result shows that FDI to GDP exerts negative effect on agriculture contribution to economic growth at the 1 percent level of significance. However, FDI to GDP ratio play a negligible role in determining industry and service contribution to economic growth in Sub-Saharan Africa. Perhaps, there is a threshold level required for FDI to GDP ratio to enhance industry and service sectors contribution to economic growth in Sub-Saharan Africa.

Table 5.6 ***Fully Modified Ordinary Least Squares Long run Results***

Variables	Agriculture value added (%of GDP) and FDI to GDP ratio	Industry value added (% of GDP) and FDI to GDP ratio	Service value added (% of GDP) and FDI to GDP ratio
FDI to GDP ratio	-0.520698	-0.055592	-0.062820
	[-4.107717]	[-0.841774]	[-0.392509]
	-0.174065	-0.067052	-0.047752
Capital per capita	[-3.032989]	[-2.203879]	[-0.640732]
Human development	54.88402	51.42248	92.22307
	[12.61206]	[5.163406]	[17.49447]
Trade openness	0.182843	0.097844	0.059408
	[5.848044]	[6.223563]	[1.851958]
Consumer	0.110902	-0.001426	0.029942
	[4.348037]	[-0.094748]	[0.563006]
Domestic credit (% of GDP)	-0.475814	-0.398702	-0.134603
	[-5.988341]	[-6.635035]	[-1.882292]

** denotes statistically significant at the 5 percent and ***denotes statistically significant at the1 percent

Among the sectoral FDI, primary FDI per capita is the only sectoral FDI that enhances agriculture contribution to economic growth. Since agriculture is classified under the primary sector, foreign investment in such a sector will directly influence agriculture contribution to economic growth. Also, for the industrial sector, primary FDI per capita is the significant sectoral FDI that enhances the industrial sector contribution to economic growth in Sub-Saharan.

Most of the primary FDI are channelled to extractive industry such quarrying and mining industry which their productivity and sector contribution to economic growth.

Secondary FDI per capita exerts no effect on the industry contribution to economic growth in Sub-Saharan Africa. The result is not very surprising as Chen et al. (2015) in their study indicated that

manufacturing FDI in Africa remains relatively undiversified, focusing on raw material (food) processing or end-product assembly, which are characterized by low value addition, even in those countries that manage to attract significant inflows. In addition, FDI is traditionally concentrated in the food and beverage subsector in most of the countries. This concentration in low value addition activities may be appropriate in the short run, however, as it is likely to be a first step for economies to integrate into Global Value Chains (GVCs) through exploiting their comparative advantages. Also, the dependence on imported production inputs, erratic electricity supply, and poor trade logistics drive the cost up and pose the threat to the sustainability of manufacturing FDI. These bottlenecks also lead to production inefficiencies that constrain Africa's integration into the global value chain and thereby constraining secondary FDI to generate growth in the recipient countries in the long run.

However, according to Alfaro (2003), FDI-related transfers of technology and knowledge primarily occur in the manufacturing sector. It is mostly in manufacturing sector that foreign investors use intermediate inputs intensively which creates positive externalities and allows local producers to draw on a larger variety of inputs and hence, increasing their productivity (Rodriguez-Clare, 1996). Also, UNCTAD (2001, p. 138) argues that the manufacturing sector comprises a broad range of linkage-intensive activities which are likely to have a positive effect on the economies of developing nations. Nonetheless, Aykut and Sayek (2007) suspect that unless FDI is motivated by efficiency-seeking reasons, except FDI is located in enclaves such as export-processing zones, then technology and knowledge spillover in manufacturing are most likely thereby enhancing the FDI per capita.

Table 5.7 ***Fully Modified Ordinary Least Squares Long run Results***

Variables	Agric. value added (%of GDP) and Primary FDI per capita model	Agric. value added (%of GDP) and Secondary FDI per capita model	Agric. value added (%of GDP) and Tertiary FDI per capita model	Industry value added (% of GDP) and Primary FDI per capita	Industry value added (% of GDP) and Secondary FDI per capita	Industry value added (% of GDP) and Tertiary FDI per capita	Service value added (% of GDP) and Primary FDI per capita	Service value added (% of GDP) and Tertiary FDI per capita
Primary FDI per capita	0.014 [2.258]	-	-	0.030 [4.292]	-		0.010 [0.581]	
Secondary FDI per capita	-	-0.020 [-0.870]			0.069 [1.221]			
Tertiary FDI per capita	-		0.014 [0.813]			-0.034 [-0.984]		0.037 [1.125]
Capital per capita	-0.258 [-9.675]	0.015 [-10.238]	-0.265 [-11.152]	-0.363 [-6.465]	-0.403*** [-2.804]	-0.344 [-6.167]	0.427 [9.344]	0.597*** [4.001]
Human development	27.663 [10.712]	26.521 [9.753]	26.723 [9.082]	52.330 [13.653]	70.162*** [3.114]	47.318 [7.360]	116.747 [19.40086]	118.98*** [2.944]
Trade openness	0.0426 [2.835]	0.057 [2.718]	0.066 [3.628]	0.068 [2.764]	0.105*** [5.134]	0.128 [2.897]	-0.193 [-4.675]	-0.083*** [-2.759]
Inflation	0.117 [2.326]	0.123 [3.348]	0.065 [1.346]	0.061 [0.900]	-0.077 [-0.566]	0.078 [0.764]	-0.035 [-0.399]	-0.214** [-2.001]
Domestic credit (% of GDP)	0.367 [3.857]	0.318 [4.684]	0.318 [3.450]	-0.145 [-1.785]	-0.018 [-0.405]	-0.169 [-2.692]	-0.117 [-0.838]	-0.436*** [-4.630]

*denotes statistically significant at the10 percent, ** denotes statistically significant at the 5 percent and ***denotes statistically significant at the1 percent. The figures in the square brackets are t-statistics

Table 5.8 ***Fixed Effects Model Estimation Results (Dependent Variable: GDP Growth, 1993-2015)***

	Dependent variables		
Explanatory variables	Agriculture value added (% of GDP)	Industry value added (% of GDP)	Service value added (% of GDP)
Trade to GDP ratio	-.0361689*	.1339473***	-.0229156
	[-1.93]	[7.38]	[-1.04]
Inflation	.0006796***	-.0001546	-.0004308***
	[4.96]	[-1.16]	[-2.67]
Human Development	-34.18647***	-8.857432*	2.368329
Index	[-7.12]	[-1.91]	[0.42]
Domestic credit to	.0507924	-.0977226***	.258092***
GDP ratio	[1.46]	[-2.90]	[6.28]
Government Expenditure to GDP ratio			
Capital to GDP ratio	-.0298276	-.0835873**	-.1290354***
	[-0.81]	[-2.36]	[-2.99]
FDI threshold dummy (0)	-	-	.0076935
			[1.00]
FDI threshold dummy (1)	-	-	.0974646***
			[5.90]
FDI threshold dummy (2)	-	-	-.0128449***
			[-4.73]
Constant	41.9102***	23.17219***	44.02399***
	[22.09]	[12.62]	[19.67]
No. of Observations	528	528	528
No. of Groups	24	24	24
F-test (P-value)	0.0000	0.0000	0.000
R^2	0.1413	0.2662	0.2225

*denotes statistically significant at the10 percent, ** denotes statistically significant at the 5 percent and ***denotes statistically significant at the1 percent. The figures in the square brackets are t-statistics

The result shows that none of the sectoral FDI exert significant effect on the service contribution to economic growth even at the 10 percent level of significance.

The results indicate that there is no threshold effect of FDI to GDP on agriculture to contribution to economic growth in Sub-Saharan Africa even at the 10 percent level of significance. This confirms the linear relationship established in the previous model. The results also indicate that there is no threshold effect of FDI to GDP on industry contribution to economic growth in Sub-Saharan Africa. The results imply that there is no level of foreign direct investment that enhances the industrial contribution to economic growth in Sub-Saharan Africa. However, the results indicate that there is double threshold effect of FDI to GDP in the service sector. The results indicate the estimates of two threshold values of $106.96 and $130.28 for the FDI per capita. The value of $106.96 indicates the minimum value for which FDI inflow will enhance service sector contribution to economic growth in Sub-Sahara Africa.

The FDI per capita value of $106.96 means that an inflow of FDI per person above this value in the selected countries in Sub-Saharan Africa will enhance economic growth. Also, a value of $130.28 indicates that values above this threshold will make the service sector adversely contribute to economic growth in Sub-Saharan.

CHAPTER SIX

PRESENTATION AND DISCUSSION OF EMPIRICAL RESULTS ON SPILLOVER EFFECTS OF FOREIGN DIRECT INVESTMENT

6. 0 Introduction

This chapter discusses the spillover effects of FDI on domestic firms' productivity and in addition examines the mediating factors for the relationship between FDI spillover and domestic firm's productivity.

6.1 FDI Spillover and Mediating Factors Effects on Domestic Firms' Productivity

This section of the study examines the spillover effects of foreign direct investment on domestic firms' productivity in the selected countries of Sub-Saharan Africa. The discussion of the results is categorized into three sections. The first section deals with FDI spillover potential on domestic firms' productivity while the second and third sections respectively discuss the role of absorptive capacity and national characteristics in mediating the effect of FDI spillover on domestic firms' productivity.

FDI Spillover Potential

FDI spillover refers to the benefits that domestic firms derive from the location and presence of foreign enterprises. In this study, FDI spillover is measured by the foreign firms' share in output as a percentage of total sectoral output. In this case the only sector being considered is the manufacturing sector. Also, domestic productivity was proxied by manufacturing firms' labour productivity which is measured as the value addition per worker. Column A of the Table 4.6.1 shows the results on FDI spillover potential on domestic firms' productivity. The empirical

implementation of this section makes use of Ordinary Least Squares (OLS) technique. The choice of this technique is premised on the Gauss-Markov theorem which portends that the least squares technique is the best linear unbiased estimator (BLUE) with which a straight-line trend equation could be estimated (Gujarati & Porter, 2009).

The result indicates that FDI spillover exerts significant effect on domestic firms' productivity at the five percent level of significance. This implies that FDI promotes productivity of labour in domestic firms in the host country. FDI is normally conceived to possess technological, skills and training packages transfer potentials and to mention a few which promote productivity of domestic labour. As suggested by Görg and Greenaway (2004), cross-sectional studies tend to find statistically significant evidence of positive spillovers. The results further show that a sector's average share of foreign ownership in a country, average percentage of domestic input purchases of FDI firms in a country (*inp*) and sectoral FDI technology intensity in a country (*tech*) were not statistically significant even at the 10 percent level of significance

This implies that ownership structure, domestic input purchases of FDI firms and FDI technology intensity do not matter for domestic firms' labour productivity. The findings are consistent with studies in the electronics sector in Mexico, Costa Rica, and Malaysia which identify a missing link between high-tech FDI and the development of domestic suppliers (Gallagher & Zarsky, 2007; Paus &Gallagher, 2008; Phillips & Henderson, 2009), due largely to scale requirements as well as the sourcing strategies of multinationals. High-tech FDI may also lead to limited spillover, if the technology gap between foreign and local firms is so large that domestic firms are unable to absorb potential spillover. The results are also consistent with the findings of Farole and Winkler (2012) who also found an insignificant effect of the FDI spillover potentials (input, own, and tech) on domestic firms' productivity.

This could possibly be due to heterogeneous productivity levels of domestic firms in the selected countries of Sub-Saharan Africa (Farole & Winkler, 2012; Girma & Görg, 2007). The study proceeded to control for firm heterogeneity to check for the robustness of the results. To do this, the firms in the various countries were classified into low productivity firms and high productivity firms based on Farole and Winkler (2012) classification. Firms that were below 66.7 percentile rank were classified as low productivity firms whiles firms above 66.7 percentile rank were classified as high productivity firms.

High productivity firms were the control group. The Dlow in the model represents dummy variable for the low productivity domestic firms and this was also interacted with the FDI spill-over potentials. Again, the results revealed that domestic input purchases of FDI firms were not statistically significant even at the 10 percent level of significance. This implies that firms' heterogeneity does not interact with domestic input purchases of FDI firms to stimulate domestic firms' productivity.

However, firms' heterogeneity accounted for how ownership structure affects the domestic firms' productivity. The study found that ownership structure impacts significantly on low productivity domestic firms more than the high productivity domestic firms at 1 percent level of significance. The results imply that low productivity firms benefit from the presence of FDI in terms of ownership structure. The results further indicated that FDI technology intensity impacted on high productivity domestic firms more than the low productivity domestic firms. The results imply that a smaller technology gap between high-productivity domestic firms and foreign firms renders it easier for the former to absorb foreign technology

Table 6.1 ***Fixed Effects Model Estimation Results (Dependent Variable: GDP Growth, 1993-2015)***

Explanatory variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Trade to GDP ratio	-		-4.4708*** [-4.36]	-4.6574*** [-4.37]	-4.2719*** [-3.99]
Inflation	-.0105076 [-1.61]	-.0078227 [-1.20]	-.0073941 [-1.18]	-.0090237 [-1.40]	-.0100802 [-.57]
Human Development Index	2459.26*** [7.99]	2578.404*** [8.45]	2162.726*** [7.15]	2537.146*** [8.38]	2464.391*** [8.16]
Political risk	6.853092 [0.88]	8.816363 [1.15]	9.65592 [1.30]	9.203998 [1.21]	7.361266 [0.97]
Broad money to GDP ratio	-	-	-	5.16130*** [3.27]	5.539185*** [3.51]
Domestic Credit to GDP ratio	-	-	13.10496*** [6.17]	-	-
Government Expenditure to GDP ratio	-	-	-	-	-.1969795 [-2.67]
Capital to GDP ratio	-1.50624 [-0.76]	1.520379 [0.72]	.2033587 [0.10]	1.267453 [0.61]	.9596996 [0.46]
Infrastructure (Mobile phone per thousand)	2.498268*** [5.12]	2.325728*** [4.81]	1.554694*** [3.21]	1.830585*** [3.64]	1.767824*** [3.53]
Corruption	6.900216 [0.34]	2.730172 [0.13]	19.8835 [1.00]	17.73465 [0.86]	19.97472 [0.97]
FDI Threshold (0)	-.0315896 [-0.17]	.0390919 [0.21]	.1131479 [0.62]	.023997 [0.13]	.0286653 [0.16]
FDI Threshold (1)	-1.904594*** [-9.43]	-1.90431*** [-9.55]	-1.84483*** [-9.57]	-1.92306*** [-9.73]	-1.89599*** [-9.64]
FDI Threshold (2)	2.642616*** [7.75]	2.771926*** [8.20]	2.579664*** [7.86]	2.767088*** [8.26]	2.776697*** [8.34]
Constant	546.9388*** [3.62]	705.2029*** [8.20]	675.0946*** [4.51]	610.2437*** [3.91]	628.0697*** [4.04]
No. of Observations	550	550	550	550	575
No. of Groups	25	25	25	25	25
F-test	0.0000	0.0000	0.0000	0.000	0.0000
R^2	0.2205	0.1628	0.2512	0.1657	0.1643

*denotes statistically significant at the10 percent, ** denotes statistically significant at the 5 percent and ***denotes statistically significant at the1 percent. The figures in the square brackets are t-statistics

The results further indicate that capital intensity exerts significant effect on domestic firms' productivity at the 1 percent level of significance. This implies that high capital labour ratio promotes domestic firms' productivity in the selected countries in Sub-Saharan Africa. This

confirms both endogenous and exogenous growth theories that capital labour ratio enhances labour productivity. This also implies that capital and labour in the manufacturing sector of the selected countries in Sub-Saharan Africa are complements. Thus, to promote the effort of labour in the production process, more machines and equipment must be provided. This result is consistent with the findings of Farole and Winkler (2012) who also established positive influence of capital intensity on labour productivity.

Absorptive Capacity of Domestic Firms

Column B of the above table shows the results on absorptive capacity of domestic firms as mediating factor of FDI spillover potential on domestic firms' productivity. The study found that FDI spillover potential is robust to the choice of mediating factors. Consistently, the result indicates that FDI spillover exerts significant effect on domestic firms' productivity at the 5 percent level of significance as established under FDI spillover potential model in column A of the table 4.6.1.

It is interesting to note that some of the absorptive capacity measures of domestic firms were statistically significant and had the correct signs. It can also be observed from column B that the size of the labour force as absorptive capacity interacts with FDI spillover measure to exert significant effect on domestic firms' productivity in the manufacturing sector in the selected countries of Sub-Saharan Africa at the 10 percent level of significance. This implies that for FDI to stimulate productivity in domestic firms, the size of labour force in domestic firms matters.

The positive sign implies that firms that employ more workers enhance FDI presence to promote domestic productivity in the region. This is because, it is believed that firms that employ more workforce has strong financial capacity and other related characteristics to absorb and extract

benefits from the presence of FDI in Sub-Saharan Africa. Larger firms may be better positioned to compete with multinationals and to imitate their tools (Crespo & Fontoura, 2007), as well as to fulfil supply requirements and standards and provide the volumes demanded by multinationals. Analogously, larger firms may pay better wages and therefore find it easier to attract workers employed by multinational firms. Larger firms might also be more visible (for example, through membership in associations), and thus more likely selected as local suppliers by foreign firms. While Aitken and Harrison (1999) find negative spillover from FDI for domestic plants in República Bolivariana de Venezuela, these effects are only significant for firms with fewer than 50 employees. This suggests that smaller firms may be less productive and less capable of absorbing positive spillover effects.

The results further indicate that domestic firms' technology intensity interacts with FDI spill over measure to significantly affect domestic firms' productivity at the 10 percent level of significance. The results imply that the level of research and development in domestic firms play a key role in enhancing FDI to stimulate domestic firms' productivity levels. High level of technology diffusion in the production process of the domestic firms help these firms to adopt and absorb these technological transfers from the foreign firms easily thereby enhancing factor inputs productivity and for that matter the domestic firms' productivity levels.

The literature suggests that there is solid evidence for the supportive role of R & D in local firms for developed countries. Examples include Spain (Barrios & Strobl 2002; Barrios et al. 2004), the United States (Keller & Yeaple, 2009), Ireland (Barrios et al., 2004), and Sweden (Karpaty & Lundberg, 2004), among others. There are also studies confirming the supportive role of R & D in

domestic firms for developing or emerging countries, including the Czech Republic (Kinoshita, 2001), India (Kanturia, 2000; 2001; 2002).

The results, however, indicate that gap in productivity does not interact with the FDI spillover measure to affect domestic firms' productivity even at the 10 percent level of significance. This result conflicts with the findings of Farole and Winkler (2012) who found that gap in productivity matters for FDI spillover effect on domestic firms' productivity. According to Panora and Wei (2014), increased competition from foreign firms may compel domestic firms to operate on less-efficient scales of production, and hence increasing the gap in productivity. When domestic firms lose market share, lower productivity can result from spreading fixed costs over smaller output or diseconomies of scale (Aitken & Harrison, 1999; Lipsey, 2004).

Besides these studies, Girma (2005) finds a nonlinear relationship between a domestic firm's technology gap and FDI-induced productivity benefits for a sample of U.K. manufacturing firms. That is, above and below a certain threshold gap, spillover effects are limited or even negative; only between these thresholds do reductions in the technology gap increase productivity gains from FDI (Girma, 2005). The results further indicate that capital intensity exerts significant effect on domestic firms' productivity at the 1 percent level of significance. This implies that capital intensity is robust whether one uses FDI spillover potential or absorptive capacity of the domestic firms as mediating factors.

National Characteristics of the Host Country

Column C of Table 4.6.1 shows the results on national characteristics of the host country as mediating factor of FDI spillover potential on domestic firms' productivity. The study found that FDI spillover potential is also robust to the mediating factor of national characteristics of the host

country. Consistently, the result indicates that FDI spillover exerts significant effect on domestic firms' productivity at the five percent level of significance.

Again, it is interesting to note that some of national characteristics measures of the host country were statistically significant and had the correct signs. It could be observed from column C that expenditure on education of the host country interacts with FDI spillover to exert significant effect on domestic firms' productivity in the manufacturing sector in the selected countries of Sub-Saharan Africa at the 10 percent level of significance. Thus, expenditure on education of the host countries matters for FDI to stimulate productivity in domestic firms. The positive sign implies that the level of expenditure on education of the host country enhances FDI to promote domestic firms' productivity in Sub-Saharan Africa. Having higher level of expenditure on education implies most of the labour force will be receptive to technological change and transfer and thus, enhance foreign firms to smoothly transfer technology and skills to working force and thereby enhancing their productivity levels in the production process, all things equal. Indeed, the results confirm the positive role of the local innovation infrastructure for FDI spillover (see, for example, Tytell & Yudaeva, 2007; Meyer & Sinani, 2009).

The share of human capital at the firm level is influenced strongly by the local learning and innovation infrastructure, which includes the basic, higher, and vocational education system; the interaction between education and training institutions and the private sector; and the existence and embeddedness of technological research institutes. This infrastructure shapes the absorptive capacity of workers as well as, critically, managers. It also acts as an important determinant of how effectively the knowledge transmission takes place. These channels or "systems of innovation"

(Lundvall, 1992) operate at a national level and, importantly, have a strong local or regional dimension (Asheim & Isakesen, 2002).

The results further indicate that the level of trade openness interacts with FDI spillover to significantly affect domestic firms' productivity at the five percent level of significance. The results imply that the degree of openness of the host country to international trade plays a key role in enhancing FDI to stimulate domestic firms' productivity levels. Trade openness helps foreign firms to smoothly import and export the requisite tools, financial resources, equipment, and knowledge that will aid them in their operations in the host country. This, in the nutshell, makes the foreign firms to give out their best in terms of the requisite technological and knowledge transfer to the domestic firms of the host country and thereby gaining productivity improvement.

The results also support the view that FDI spillovers are larger in countries that are more open toward trade (Du, Harrison & Jefferson, 2011; Havranek & Irsova, 2011; Meyer & Sinani, 2009;). A country's trade policy shapes the amount and type of foreign investment and, thus, affects the potential for FDI spillovers. Studies have related a country's trade policy regime to its capacity to attract foreign firms in the first place. Open trade regimes may be more likely to attract foreign investors than inward-oriented regimes, since they are less constrained by the size and efficiency of the local market in the first case (Crespo &Fontoura, 2007).

Foreign investors might also be more export-oriented in an open setting, increasing chances for local suppliers to become exporters, too. Moreover, foreign investors in an open trade setting are globally more integrated and therefore tend to adopt the newest technologies (Meyer &Sinani, 2009). Local firms in an open trade regime are more exposed to competitive pressures through

international trade competition, which will prepare them to better absorb FDI spillovers (Havranek & Irsova, 2011; Meyer &Sinanim, 2009).

Trade openness also aids domestic firms to attract the resources (human, financial and physical) that they need to better exploit the spillover effects of FDI. Moreover, a country's trade policy regime affects the likelihood of domestic firms becoming exporters and learning-by exporting. Although the effect of exporting on domestic firms' absorptive capacities is ambiguous, exporting clearly moderates the direction and extent of FDI. Studies confirm that FDI spillover are larger in countries that are more open to trade (Havranek & Irsova, 2011; Lesher & Miroudot, 2008; Meyer & Sinani, 2009).

The results indicate that income level of the host country does not interact with FDI spillovers to affect domestic firms' productivity even at the 10 percent level of significance. This result is in consonance with the findings of Farole and Winkler (2012) who also found that income level does not matter for FDI spillover effect on domestic firms' productivity. The results further indicate that capital intensity exerts significant effect on domestic firms' productivity at the one percent level of significance. Again, capital intensity is robust to the choice of mediating factor of FDI spillover effect on domestic firms' productivity.

6.2 Diagnosis Test of the Regression Results

This section discusses the endogeneity test on the FDI spillover measure. The results revealed that both Durbin -Wu-Hausman test of endogeneity of FDI spillover measure are statistically insignificant even at the 10 percent level of significance.

Table 4.7.1 ***Diagnosis Test***

FDI Spillover Potential Model	Statistic	Absorptive Capacity Model	Statistic	National characteristics Model	Statistic
Heteroscedasticity	7.742471 (0.4647)	Heteroscedasticity	7.219140 (0.1710)	Heteroscedasticity	4.614222 (0.4647)
Autocorrelation	0.175651 (0.6751)	Autocorrelation	2.252097 (0.1334)	Autocorrelation	2.510115 (0.1131)
Normality	1.1395 (0.5657)	Normality	0.6743 (0.7138)	Normality	1.34 (0.5115)
Endogeneity Test	0.158968 (0.6901) 0.111356 (0.7429)	Endogeneity Test	0.198176 (0.6562) 0.13906 (0.7141)	Endogeneity Test	0.222948 (0.6368) 0.156612 (0.6975)

This implies that FDI spillover measure in the regression is exogenous therefore it is necessary to employ OLS estimation in this study for quantifying the effects of FDI spillover on domestic Firms Productivity

Also, the outcome indicates that, there is no serial correlation and heteroscedasticity in the models. Furthermore, the value of the probability from the normality test is not significant indicating the absence of non-normality of the error terms in the models.

CHAPTER SEVEN

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

7.1 Introduction

This chapter summarizes and concludes the findings of the study. Appropriate policy recommendations are distilled out of the empirical results for implementation.

7.2 Summary of the Findings

The study examined the nature of the relationship between foreign direct investment and economic growth in Sub-Saharan Africa. The Hansen threshold regression model was used to examine the nature of the relationship between FDI and economic growth as well as the mediating role of absorptive capacity of the selected countries in Sub-Saharan Africa. Battesse and Coelli stochastic frontier was employed to examine efficiency gains from FDI inflows in the selected countries of Sub-Saharan Africa. Also, Pedroni panel cointegration approach was used to assess the relevance of sectoral FDI on sectoral growth of the selected countries in Sub-Saharan Africa. Finally, the study employed OLS for the estimation of spillover effects of FDI inflows on the productivity of domestic manufacturing firms in the selected countries of Sub-Saharan Africa. The following are the summary of the findings.

7.2.1 Threshold Effects of FDI and Absorptive Capacity on Economic Growth

The study found a single threshold of the effect of FDI on economic growth in the selected countries of Sub-Saharan Africa and threshold value is $44.93 of FDI per person in constant U.S. dollars. The threshold results indicate that when FDI per person $<$ $44.93, the coefficient is significantly negative, suggesting that economic growth retards as FDI per person (flows/stock/net inflows) falls below this region. However, when FDI $\geq$ $44.93, the coefficient is significantly

positive, suggesting that economic growth improves when FDI per person increases beyond $44.93. The implication of the results is that, given the absorptive capacity of the selected host countries, the best level of FDI per capita is $44.93. This level ensures that foreign direct investment inflows are translated into growth of the selected countries in Sub-Saharan Africa.

In relation to the absorptive capacity, the study established the threshold level of trade openness of 100% of trade to GDP. When trade as a percentage of GDP < 100%, the observed relationship between FDI and economic growth turns out negative. However, this directional effect reverses and becomes statistically insignificant when trade as a percentage of GDP $\geq$100%. The implication of this threshold result is that in a regime where the economy is less open, FDI inflows is counter-productive to economic growth in Sub-Saharan Africa. Trade-protective policy induces inefficiencies. However, the result shows that in the regime of greater openness, the counterproductive nature of FDI on economic growth reverses to a productive one.

The study found double threshold values for government expenditure as a percentage of GDP to mediate between FDI and economic growth of the selected countries in Sub-Saharan Africa. The study found that when government expenditure as a percentage of GDP $\leq$13.49% < 16.21, FDI inflows reduce economic growth of these selected countries in Sub-Saharan Africa. This directional effect between FDI and economic growth reverses to positive when government expenditure as a percentage of GDP $\geq$16.21%. Therefore, the study suggests that with the current absorptive capacity of selected host countries the best level of government expenditure is 16.21% of GDP and beyond, and below 16.21% of GDP, the benefit of FDI to economic growth will decline or disappear. Most countries in Sub-Saharan Africa are classified under developing countries, hence at their early stages of development and therefore require active government involvement in the growth and development processes.

It was also found in the study that best threshold level of financial deepening measured by broad money to GDP ratio between 20.99% and 37.67%. This range of the degree of financial deepening enhances the inflow of FDI to stimulate economic growth of the selected countries in Sub-Saharan Africa. Again, the best threshold level of absorptive capacity defined in terms of technology gap is 0.6904 and beyond. This level of technological gap provides grounds for FDI inflows to promote economic growth of the selected countries in Sub-Saharan Africa. The implication of this result is that countries that are far from their technology frontier will not extract economic benefit of the inflow of FDI through productivity gains and economic growth.

7.2.2 Efficiency Gains from the Inflow of FDI in Sub-Saharan Africa

The findings from the study established that foreign direct investment has significant negative effect on technical inefficiency of the selected countries in Sub-Saharan Africa countries. The results imply that inflow of foreign direct investment reduces inefficiency in the production structure of Sub-Saharan Africa countries. Thus, Sub-Saharan Africa countries benefit from efficiency gains from the inflow of foreign direct investment. FDI inflow entails a package which includes managerial know-how, and new products. All these accompanying characteristics of FDI reduce level inefficiency in the production structure.

7.2.3 Sectoral FDI, Sectoral Growth and Economic Growth in Sub-Saharan Africa

The study found that FDI per capita emanating from primary source proffer significant effect on the economic growth of the selected countries in Sub-Saharan Africa, bearing in mind that the primary sector is backbone of most of the selected countries in the study. Investment in this sector generates quick return especially in the minerals sector such as gold and diamond which contribute

significantly to the national exports of these countries, thereby expanding the productive capacities of the selected economies and raising their growth prospects.

The study also found that secondary FDI per capita exerts no effect on economic growth of the selected countries in Sub-Saharan Africa. Again, secondary FDI per capita exerts no effect on the industry contribution to economic growth in Sub-Saharan Africa. Manufacturing FDI in Africa remains relatively undiversified, focusing on raw material (food) processing or end-product assembly, which is characterized by low value addition, even in those countries that manage to attract significant inflows.

The result shows that tertiary FDI per capita exerts significant effect on economic growth of the selected countries in Sub-Saharan Africa. Growth in the service or tertiary sector results in more inclusive growth and political stability. The tertiary sector has turned out to be one the leading sectors of the selected countries in Sub-Saharan Africa in recent years. The finance and telecommunication sectors have played significant roles in shaping the economies of the selected countries in Sub-Saharan Africa. However, foreign direct investment in this sector does not enhance the service sector to contribute to overall growth of the selected countries in Sub-Saharan Africa.

7.2.4 Spillover Effect of FDI on Domestic Manufacturing Firms' Productivity and the Role of Mediating Factors

The study established that FDI spillover exerts significant effect on domestic manufacturing firms' productivity. FDI is normally conceived to possess technological, skills and training packages transfer potentials and to mention a few which promote productivity of domestic labour.

The study also found that a sector's average share of foreign ownership in a country, average percentage of domestic input purchases of FDI firms in a country (*inp*) and sectoral FDI technology intensity in a country (*tech*) were not statistically significant. This implies that although ownership structure, domestic input purchases of FDI firms and FDI technology intensity it does not matter for domestic firms' labour productivity. The findings may be due to a missing link between high-tech FDI and the development of domestic suppliers, due largely to scale requirements as well as the sourcing strategies of multinationals.

The study found that the size of the labour force as absorptive capacity of domestic manufacturing firms interacts with FDI spillover measure to exert significant effect on domestic firms' productivity in the manufacturing sector of the selected countries in Sub-Saharan Africa. Larger firms may be better positioned to compete with multinationals and to imitate their tools as well as to fulfil supply requirements and standards and provide the volumes demanded by multinationals. Analogously, larger firms may pay better wages and therefore find it easier to attract workers employed by multinational firms.

The study further found that domestic firms' technology intensity interacts with FDI spill over measure to significantly affect domestic manufacturing firms' productivity. High level of technology diffusion in the production process of the domestic manufacturing firms help these firms to adopt and absorb these technological transfers from the foreign firms easily thereby enhancing factor inputs productivity and for that matter the domestic firm's productivity levels.
The results, however, indicate that gap in productivity does not interact with FDI spill over measure to affect domestic firms' productivity. One could explain that the gap in productivity

levels of domestic firms in Sub-Saharan Africa are almost the same, therefore any level of FDI may spill over onto domestic firms' productivity levels.

Finally, the study found that expenditure on education of the host country as national characteristics interacts with FDI spill over measure to exert significant effect on domestic firms' productivity in the manufacturing sector of the selected countries in Sub-Saharan Africa. This expenditure on education of the host countries matters for FDI to stimulate productivity of domestic manufacturing firms. The positive sign implies that the level of expenditure on education of the host country enhances FDI to promote domestic firms' productivity in Sub-Saharan Africa. The share of human capital at the firm level is influenced strongly by the local learning and innovation infrastructure, which includes the basic, higher, and vocational education system; the interaction between education and training institutions and the private sector; and the existence and embeddedness of technological research institutes. This infrastructure shapes the absorptive capacity of workers as well as, critically, managers. It also acts as an important determinant of how effectively the knowledge transmission takes place.

The study also found that the level of trade openness interacts with FDI spill over measure to significantly affect domestic firms' productivity. Foreign investors might also be more export-oriented in an open setting, increasing chances for local suppliers to become exporters, too. Local firms in an open trade regime are more exposed to competitive pressures through international trade competition, which will prepare them to better absorb FDI spillovers.

The results, however, indicate that income level of the host country does not interact with FDI spill over measure to affect domestic firms' productivity.

7.3 Conclusions

The existing literature on the nexus between FDI and economic growth in Sub-Saharan focused on the linear relationship between the aforementioned variables without exploring to examine what magnitude of the flow of FDI will be beneficial to economic growth. Thus, this study took one step ahead to explore what level FDI per capita will stimulate economic growth in Sub-Saharan Africa. It is established in this study that relationship between FDI and economic growth of the selected countries in Sub-Saharan Africa is non-linear in nature. Thus, a threshold level of FDI per capita must be met for it to be beneficial to the selected countries in Sub-Saharan Africa in terms of enhancing their growth prospects. This threshold level in this study has been estimated to be $44.93 FDI per person in constant US dollars per annum. Hence, it is concluded that the selected countries that have reached this threshold level are benefiting in terms of improvement in their growth prospects.

The study also found threshold levels of absorptive capacity of FDI inflows of the selected countries in Sub-Saharan Africa. The study found threshold of 100% of trade to GDP as threshold level for trade openness, a range of 13.49% to 16.21% as thresholds for government expenditure, a range of 20.99% to 37.67% of broad money to GDP as a threshold level of financial deepening, and a value of 0.6904 and beyond as threshold level of technological gap. This study proves that achieving a threshold level of $44 of FDI per capita inflow is a necessary condition for growth but might not be enough. To ensure sufficiency of FDI effect on economic growth, threshold levels of the absorptive capacity of the selected countries in Sub-Saharan Africa must be met to ensure sustainability of FDI-growth-enhancing effect on the selected countries in the region.

The study also found that inflows into the selected countries of Sub-Saharan Africa improve the level of efficiency in the production structure. The study concludes that FDI inflows not only stimulate economic growth but enhance factor productivity through improvement in the level of efficiency of these factor inputs.

The study further established that sectoral FDI inflow emanating from primary source proffer significant effects on the economic growth of the selected countries in Sub-Saharan Africa. Sectoral FDI inflow from secondary source does not contribute to economic growth of selected countries in Sub-Saharan Africa. However, FDI inflows from tertiary source exert significant effect on economic growth in Sub-Saharan Africa. The study therefore concludes that growth benefit from FDI inflows of the selected countries in Sub-Saharan Africa depends on the sectors in which FDI flows to. FDI inflows to primary and tertiary sectors of the selected countries in Sub-Saharan Africa are crucial in stimulating economic growth of the selected countries in Sub-Saharan Africa.

Finally, the study revealed that FDI spillover exerts significant effects on domestic manufacturing firms' productivity of the selected countries in Sub-Saharan Africa. However, the spillover potential of FDI inflows such as sector's average share of foreign ownership, average percentage of domestic input purchases of FDI firms and sectoral FDI technology intensity, play negligible role in enhancing FDI inflows to stimulate domestic manufacturing firms' productivity. However, some of the absorptive capacity of the domestic manufacturing firms enhances FDI inflow to improve the level of productivity of the firms in the region. For example, the size of labour force of the domestic manufacturing firms interacted with FDI spillover measure to stimulate domestic

manufacturing firms' productivity. Also, the domestic firms' technology intensity interacts with FDI spillover measure to significantly affect domestic manufacturing firms' productivity. Again, some of the national characteristics of the selected countries in Sub-Saharan Africa promote FDI inflows to enhance domestic manufacturing firms' productivity. Expenditure on education of the host country and the level of trade openness significantly interact with FDI spillover measure to increase domestic manufacturing firms' productivity in the region. The study therefore concludes that, FDI inflows into the selected countries of the region have spillover effects on the domestic manufacturing firms' productivity. These spillover effects are enhanced by the absorptive capacity of the domestic manufacturing firms and national characteristics of the host countries. The size of the domestic manufacturing firms and technology intensity matters for FDI spillover effect. Also, expenditure on education and the level of trade openness play crucial roles in enhancing FDI spillover effect in the host countries.

7.4 Recommendations

The following policy recommendations are made based on the empirical results. It was established in the study that a threshold level of FDI inflow should be met for it to stimulate economic growth of the selected countries in Sub-Saharan Africa. It is therefore recommended that heads of investment promotion councils of the selected countries should market their economy well to attract the required level of FDI (that is, $44 FDI per capita and beyond) to enhance the growth prospects of the economies. The marketing strategies could take the form of demand organizing international conferences on the prospects of high domestic demand of FDI products, the hospitability and hardworking nature of the country's citizens, to mention a few. These forms of marketing strategies are likely to attract the needed or required scale of FDI inflows to stimulate economic growth of the selected countries in Sub-Saharan Africa.

Again, the study revealed that threshold levels of absorptive capacity of the host countries play significant role in determining the direction of the effect of FDI inflows on economic growth of the selected countries in Sub-Saharan Africa. It is therefore recommended that the selected host countries should provide favourable grounds to fully benefit from the influx of FDI into their countries. Trade policy should be geared towards openness; at the same time, central governments of the featured countries should find innovative ways to widen the tax net to generate substantial revenue for infrastructural projects that will create the required enabling environment for local business and foreign firms to strive to promote growth prospects of their economies. Again, development of the financial sector should be at the heart of the central government and central bank of the selected countries in the region. Financial policies that promote the establishment of more financial institutions should be pursued whiles at the same time strong financial regulatory frameworks should be instituted to guard against financial crisis in the financial sector. Again, these selected countries should endeavour to improve the level of technology and create avenues for innovations in firms and business enterprises. Since innovation and knowledge to some extent are non-excludable in nature, the central governments of the selected countries in the region could institute a resource pool where funds are channelled into firms that have the potential to engage in research and development that will promote technological advancement and innovations.

The study further revealed that primary FDI and tertiary FDI exert effects on economic growth of the selected countries in the region. However, secondary FDI does not stimulate economic growth of the selected countries in the region. Since the industrial base of most of the selected countries are weak, it is imperative for these countries to put measures in place to attract FDI that are channelled to the industrial sector to modernize their economies and enjoy sustainable economic

growth that is generated through industrial growth. Thus, measures or policies such as low rate of corporate tax, import free duty on the importation of raw materials and zero export tax rate for FDI located in the industrial sector of the selected countries in the region must be put in place. This will go a long way to attract vibrant FDI to the industrial sector which will in turn drive sustainable growth of the selected countries in the region.

Finally, the results revealed that the absorptive capacity of domestic manufacturing firms and national characteristics enhances FDI spillover measure to stimulate the productivity levels of the domestic manufacturing firms of the selected countries in the region. It is therefore recommended to the management team of these domestic manufacturing firms to position their firms in terms of adopting appropriate technology that will help their firms to absorb fully the spillover effects from the presence of foreign firms in their countries. They should also scale up their operations to attract workers from the foreign firms to help them in their production and improve the level of productivity in these firms. Again, it is recommended to the central governments of the selected countries to allocate substantial amount of resources into the education sector to improve their human resources base, thereby making the labour force easily adapt to and adopt new methods of production introduced into the country by the foreign firms.

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APPENDIX A

```
. xthreg GDPpercapitaconstant2010US Inflation HumanDevelopmentIndexHDI CapitaltoGDP PoliticalRisk Corruption Mobilephone, rx( FDIpercap
> ita) qx( FDIpercapita ) thnum(2) grid(400) trim(0.01 0.01) bs(300 300)
Estimating the threshold parameters:   1st ......  2nd ......  Done
Boostrap for single threshold
.................................................. +   50
.................................................. +  100
.................................................. +  150
.................................................. +  200
.................................................. +  250
.................................................. +  300
Boostrap for double threshold model:
.................................................. +   50
.................................................. +  100
.................................................. +  150
.................................................. +  200
.................................................. +  250
.................................................. +  300

Threshold estimator (level = 95):
```

model	Threshold	Lower	Upper
Th-1	44.6702	41.5678	45.8043
Th-21	44.6702	44.0033	45.8043
Th-22	125.5624	123.3354	127.0404

Threshold effect test (bootstrap = 300 300):

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	4.39e+07	8.31e+04	114.40	0.0000	18.8136	21.5860	33.9558
Double	4.22e+07	8.00e+04	20.60	0.0533	17.2784	20.6997	33.2741

```
Fixed-effects (within) regression               Number of obs      =       550
Group variable: ID                              Number of groups   =        25

R-sq:  within  = 0.4309                         Obs per group: min =        22
       between = 0.5320                                        avg =      22.0
       overall = 0.4050                                        max =        22

                                                F(9,516)           =     43.41
corr(u_i, Xb)  = 0.5215                         Prob > F           =    0.0000
```

GDPpercapitaconstant20~S	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Inflation	-.0066013	.0067393	-0.98	0.328	-.0198411	.0066384
HumanDevelopmentIndexHDI	2605.586	315.7665	8.25	0.000	1985.24	3225.932
CapitaltoGDP	-1.372009	2.057732	-0.67	0.505	-5.414572	2.670555
PoliticalRisk	4.549704	7.958107	0.57	0.568	-11.08457	20.18398
Corruption	5.578716	20.59625	0.27	0.787	-34.88411	46.04154
Mobilephone	2.41758	.4971388	4.86	0.000	1.440915	3.394245
_cat#c.FDIpercapita						
0	-4.37107	.3868784	-11.30	0.000	-5.13112	-3.611019
1	2.817655	.6283655	4.48	0.000	1.583186	4.052125
2	.3232024	.1618264	2.00	0.046	.0052827	.6411222
_cons	501.7159	155.3201	3.23	0.001	196.5785	806.8534
sigma_u	2150.1768					
sigma_e	288.00108					
rho	.98237548	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(24, 516) = 814.72                     Prob > F = 0.0000
```

```
. xthreg GDPpercapitaconstant2010US Inflation HumanDevelopmentIndexHDI CapitaltoGDP TradeofGDP PoliticalRisk Corruption M
> ( FDIpercapita) qx( FDIpercapita) thnum(1) grid(400) trim(0.01) bs(300)
Estimating the threshold parameters:  1st ......  Done
Boostrap for single threshold
.................................................. +  50
.................................................. +  100
.................................................. +  150
.................................................. +  200
.................................................. +  250
.................................................. +  300

Threshold estimator (level = 95):
```

model	Threshold	Lower	Upper
Th-1	44.6702	43.5012	45.8043

Threshold effect test (bootstrap = 300):

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	4.36e+07	8.25e+04	113.08	0.0000	17.4779	23.3486	35.2717

```
Fixed-effects (within) regression               Number of obs      =       550
Group variable: ID                              Number of groups   =        25

R-sq:  within  = 0.4160                         Obs per group: min =        22
       between = 0.5063                                        avg =      22.0
       overall = 0.3796                                        max =        22

                                                F(9,516)           =     40.85
corr(u_i, Xb)  = 0.5019                         Prob > F           =    0.0000
```

GDPpercapitaconstant20~S	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Inflation	-.0058481	.0068613	-0.85	0.394	-.0193277	.0076314
HumanDevelopmentIndexHDI	2774.412	321.1338	8.64	0.000	2143.522	3405.303
CapitaltoGDP	1.328364	2.225222	0.60	0.551	-3.043244	5.699973
TradeofGDP	-2.144912	1.115112	-1.92	0.055	-4.33563	.0458067
PoliticalRisk	5.004703	8.072867	0.62	0.536	-10.85503	20.86443
Corruption	.360353	20.90131	0.02	0.986	-40.70178	41.42249
Mobilephone	2.440376	.5047862	4.83	0.000	1.448687	3.432064
_cat#c.FDIpercapita						
0	-4.271128	.3928567	-10.87	0.000	-5.042923	-3.499333
1	.3131589	.1640469	1.91	0.057	-.009123	.6354408
_cons	545.2945	162.8191	3.35	0.001	225.4246	865.1644
sigma_u	2166.3673					
sigma_e	291.73338					
rho	.9821884	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(24, 516) = 798.17                     Prob > F = 0.0000
```

```
. xthreg GDPpercapitaconstant2010US Inflation HumanDevelopmentIndexHDI CapitaltoGDP TradeofGDP Domesticcredittoprivatesecto Politic
> sk Corruption Mobilephone, rx( FDIpercapita) qx( FDIpercapita) thnum(2) grid(400) trim(0.01 0.01) bs(300 300)
Estimating the threshold parameters:  1st ......  2nd ......  Done
Boostrap for single threshold
.................................................. +   50
.................................................. +  100
.................................................. +  150
.................................................. +  200
.................................................. +  250
.................................................. +  300
Boostrap for double threshold model:
.................................................. +   50
.................................................. +  100
.................................................. +  150
.................................................. +  200
.................................................. +  250
.................................................. +  300

Threshold estimator (level = 95):
```

model	Threshold	Lower	Upper
Th-1	44.6702	43.4357	45.8043
Th-21	63.1025	58.3277	64.2247
Th-22	125.5624	107.4701	127.0404

```
Threshold effect test (bootstrap = 300 300):
```

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	4.08e+07	7.72e+04	105.08	0.0000	19.2815	25.2718	57.2723
Double	3.94e+07	7.47e+04	18.09	0.0867	17.5857	22.3232	32.8079

```
Fixed-effects (within) regression               Number of obs      =       550
Group variable: ID                              Number of groups   =        25

R-sq:  within  = 0.4744                         Obs per group: min =        22
       between = 0.6481                                        avg =      22.0
       overall = 0.5316                                        max =        22

                                                F(11,514)          =     42.17
corr(u_i, Xb)  = 0.6159                         Prob > F           =    0.0000
```

GDPpercapitaconstant2010US	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Inflation	-.0054574	.006522	-0.84	0.403	-.0182706	.0073557
HumanDevelopmentIndexHDI	2213.444	314.2867	7.04	0.000	1595.999	2830.888
CapitaltoGDP	.3774452	2.140207	0.18	0.860	-3.827184	4.582075
TradeofGDP	-1.673202	1.077828	-1.55	0.121	-3.790693	.4442888
Domesticcredittoprivatesecto	13.28605	2.204423	6.03	0.000	8.955265	17.61684
PoliticalRisk	7.924113	7.685404	1.03	0.303	-7.174556	23.02278
Corruption	14.46244	20.02112	0.72	0.470	-24.87084	53.79573
Mobilephone	1.45494	.4992004	2.91	0.004	.4742155	2.435664
_cat#c.FDIpercapita						
0	-3.946018	.3635248	-10.85	0.000	-4.660196	-3.231841
1	3.206134	.6728955	4.76	0.000	1.88417	4.528098
2	.2577087	.1532325	1.68	0.093	-.0433303	.5587478
_cons	503.5584	154.8778	3.25	0.001	199.287	807.8298
sigma_u	2061.8539					
sigma_e	277.31212					
rho	.9822321	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(24, 514) = 600.20                     Prob > F = 0.0000
```

```
. xthreg GDPpercapitaconstant2010US Inflation HumanDevelopmentIndexHDI CapitaltoGDP TradeofGDP BroadmoneyofGDP PoliticalRisk
>  Mobilephone, rx( FDIpercapita) qx( FDIpercapita) thnum(1) grid(400) trim(0.01) bs(300)
Estimating  the  threshold  parameters:   1st ......  Done
Boostrap for single threshold
.................................................. +   50
.................................................. +  100
.................................................. +  150
.................................................. +  200
.................................................. +  250
.................................................. +  300

Threshold estimator (level = 95):
```

model	Threshold	Lower	Upper
Th-1	44.6702	43.4357	45.8043

Threshold effect test (bootstrap = 300):

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	4.32e+07	8.18e+04	109.66	0.0000	18.3987	26.3511	35.5630

```
Fixed-effects (within) regression               Number of obs      =       550
Group variable: ID                              Number of groups   =        25

R-sq:  within  = 0.4212                         Obs per group: min =        22
       between = 0.5459                                        avg =      22.0
       overall = 0.3986                                        max =        22

                                                F(10,515)          =     37.47
corr(u_i, Xb)  = 0.5225                         Prob > F           =    0.0000
```

GDPpercapitaconstant20~S	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Inflation	-.0067486	.0068507	-0.99	0.325	-.0202073	.0067101
HumanDevelopmentIndexHDI	2749.758	320.2356	8.59	0.000	2120.629	3378.887
CapitaltoGDP	1.135296	2.219396	0.51	0.609	-3.224888	5.49548
TradeofGDP	-2.557088	1.127867	-2.27	0.024	-4.772874	-.3413022
BroadmoneyofGDP	3.599884	1.683558	2.14	0.033	.2923984	6.907369
PoliticalRisk	5.183263	8.045501	0.64	0.520	-10.62278	20.9893
Corruption	10.61919	21.37475	0.50	0.620	-31.37323	52.61162
Mobilephone	2.102286	.5273114	3.99	0.000	1.06634	3.138232
_cat#c.FDIpercapita						
0	-4.221761	.392184	-10.76	0.000	-4.992238	-3.451283
1	.2890166	.1638714	1.76	0.078	-.0329221	.6109552
_cons	479.2823	165.1693	2.90	0.004	154.7939	803.7707
sigma_u	2163.0248					
sigma_e	290.72879					
rho	.98225495	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(24, 515) = 757.46                     Prob > F = 0.0000
```

Appendix A.2

```
. xthreg GDPpercapitaconstant2010US Inflation HumanDevelopmentIndexHDI CapitaltoGDP PoliticalRisk Corruption Mobilephone, rx( FDIp
> ita) qx( TradeofGDP ) thnum(1) grid(400) trim(0.01) bs(300)
Estimating the threshold parameters:   1st ......  Done
Boostrap for single threshold
................................................... +   50
................................................... +  100
................................................... +  150
................................................... +  200
................................................... +  250
................................................... +  300

Threshold estimator (level = 95):
```

model	Threshold	Lower	Upper
Th-1	99.9267	98.9209	104.4381

```
Threshold effect test (bootstrap = 300):
```

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	4.97e+07	9.41e+04	39.51	0.1133	43.4593	59.1429	89.2355

```
Fixed-effects (within) regression               Number of obs      =       550
Group variable: ID                              Number of groups   =        25

R-sq:  within  = 0.3364                         Obs per group: min =        22
       between = 0.2838                                        avg =      22.0
       overall = 0.2152                                        max =        22

                                                F(8,517)           =     32.75
corr(u_i, Xb)  = 0.3437                         Prob > F           =    0.0000
```

GDPpercapitaconstant20~S	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Inflation	-.0099552	.00726	-1.37	0.171	-.0242178	.0043075
HumanDevelopmentIndexHDI	2968.16	339.3291	8.75	0.000	2301.527	3634.793
CapitaltoGDP	-1.769094	2.197555	-0.81	0.421	-6.086329	2.548142
PoliticalRisk	4.581921	8.617925	0.53	0.595	-12.34854	21.51238
Corruption	12.91756	22.47432	0.57	0.566	-31.23466	57.06978
Mobilephone	3.256656	.5370983	6.06	0.000	2.201492	4.311819
_cat#c.FDIpercapita						
0	-1.510174	.2213552	-6.82	0.000	-1.94504	-1.075307
1	.0496016	.1809912	0.27	0.784	-.3059671	.4051703
_cons	362.4743	168.3067	2.15	0.032	31.82515	693.1234
sigma_u	2246.8544					
sigma_e	310.70018					
rho	.9812368	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(24, 517) = 867.32                     Prob > F = 0.0000
```

```
. xthreg GDPpercapitaconstant2010US Inflation HumanDevelopmentIndexHDI TradeofGDP CapitaltoGDP PoliticalRisk Corruption Mo
> ( FDIpercapita) qx( TradeofGDP ) thnum(1) grid(400) trim(0.01) bs(300)
Estimating the threshold parameters:  1st ......  Done
Boostrap for single threshold
.................................................. +  50
.................................................. +  100
.................................................. +  150
.................................................. +  200
.................................................. +  250
.................................................. +  300

Threshold estimator (level = 95):
```

model	Threshold	Lower	Upper
Th-1	99.9267	98.9209	104.4381

Threshold effect test (bootstrap = 300):

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	4.87e+07	9.22e+04	45.98	0.1167	48.1179	58.9457	81.4162

```
Fixed-effects (within) regression               Number of obs      =       550
Group variable: ID                              Number of groups   =        25

R-sq:  within  = 0.3493                         Obs per group: min =        22
       between = 0.2151                                        avg =      22.0
       overall = 0.1640                                        max =        22

                                                F(9,516)           =     30.77
corr(u_i, Xb)  = 0.2806                         Prob > F           =    0.0000
```

GDPpercapitaconstant20~S	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Inflation	-.0073775	.007241	-1.02	0.309	-.021603	.006848
HumanDevelopmentIndexHDI	3097.599	338.766	9.14	0.000	2432.068	3763.129
TradeofGDP	-3.803355	1.189128	-3.20	0.001	-6.139482	-1.467227
CapitaltoGDP	1.043962	2.349059	0.44	0.657	-3.570934	5.658858
PoliticalRisk	6.608806	8.565487	0.77	0.441	-10.21871	23.43632
Corruption	10.04862	22.2944	0.45	0.652	-33.75034	53.84758
Mobilephone	3.129649	.533846	5.86	0.000	2.08087	4.178428
_cat#c.FDIpercapita						
0	-1.54262	.2196397	-7.02	0.000	-1.974118	-1.111122
1	.1408202	.1816497	0.78	0.439	-.2160438	.4976842
_cons	499.9078	172.269	2.90	0.004	161.4729	838.3427
sigma_u	2270.7212					
sigma_e	307.9633					
rho	.98193847	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(24, 516) = 855.95                     Prob > F = 0.0000
```

```
. xthreg GDPpercapitaconstant2010US Inflation HumanDevelopmentIndexHDI TradeofGDP Domesticcredittoprivatesecto CapitaltoGDP PoliticalRi
> sk Corruption Mobilephone, rx( FDIpercapita) qx( TradeofGDP ) thnum(2) grid(400) trim(0.01 0.01) bs(300 300)
Estimating the threshold parameters:   1st ......  2nd ......  Done
Boostrap for single threshold
................................................... +   50
................................................... +  100
................................................... +  150
................................................... +  200
................................................... +  250
................................................... +  300
Boostrap for double threshold model:
................................................... +   50
................................................... +  100
................................................... +  150
................................................... +  200
................................................... +  250
................................................... +  300

Threshold estimator (level = 95):
```

model	Threshold	Lower	Upper
Th-1	99.9267	98.9209	101.3605
Th-21	99.9267	95.9748	101.3605
Th-22	97.7315	96.7902	105.3377

```
Threshold effect test (bootstrap = 300 300):
```

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	4.41e+07	8.35e+04	57.65	0.0700	46.6443	62.5380	95.0461
Double	4.20e+07	7.95e+04	26.34	0.0767	24.6314	30.3612	44.4715

```
Fixed-effects (within) regression               Number of obs      =       550
Group variable: ID                              Number of groups   =        25

R-sq:  within  = 0.4282                         Obs per group: min =        22
       between = 0.3544                                        avg =      22.0
       overall = 0.3171                                        max =        22

                                                F(11,514)          =     34.99
corr(u_i, Xb)  = 0.3964                         Prob > F           =    0.0000
```

GDPpercapitaconstant2010US	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Inflation	-.0071101	.0068023	-1.05	0.296	-.0204738	.0062535
HumanDevelopmentIndexHDI	2530.017	326.7395	7.74	0.000	1888.108	3171.926
TradeofGDP	-4.471596	1.120474	-3.99	0.000	-6.672869	-2.270323
Domesticcredittoprivatesecto	16.69736	2.289199	7.29	0.000	12.20002	21.1947
CapitaltoGDP	-1.045616	2.220348	-0.47	0.638	-5.40769	3.316458
PoliticalRisk	6.886907	8.057083	0.85	0.393	-8.941957	22.71577
Corruption	31.18126	21.15036	1.47	0.141	-10.37053	72.73305
Mobilephone	2.077625	.5209172	3.99	0.000	1.054236	3.101014
_cat#c.FDIpercapita						
0	-1.28159	.2174662	-5.89	0.000	-1.708822	-.8543584
1	-5.541175	1.008803	-5.49	0.000	-7.523058	-3.559291
2	.2711162	.1713124	1.58	0.114	-.0654424	.6076749
_cons	496.8131	162.0053	3.07	0.002	178.539	815.0871
sigma_u	2144.0482					
sigma_e	289.25074					
rho	.98212498	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(24, 514) = 646.86                  Prob > F = 0.0000
```

```
. xthreg GDPpercapitaconstant2010US Inflation HumanDevelopmentIndexHDI TradeofGDP BroadmoneyofGDP CapitaltoGDP PoliticalRisk Corruption
>  Mobilephone, rx( FDIpercapita) qx( TradeofGDP ) thnum(1) grid(400) trim(0.01) bs(300)
Estimating  the  threshold  parameters:   1st ......  Done
Boostrap for single threshold
.................................................. +   50
.................................................. +  100
.................................................. +  150
.................................................. +  200
.................................................. +  250
.................................................. +  300

Threshold estimator (level = 95):
```

model	Threshold	Lower	Upper
Th-1	99.9267	98.9209	101.3605

```
Threshold effect test (bootstrap = 300):
```

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	4.76e+07	9.01e+04	50.86	0.0667	43.7728	55.4009	107.4696

```
Fixed-effects (within) regression               Number of obs      =       550
Group variable: ID                              Number of groups   =        25

R-sq:  within  = 0.3634                         Obs per group: min =        22
       between = 0.2382                                        avg =      22.0
       overall = 0.1764                                        max =        22

                                                F(10,515)          =     29.39
corr(u_i, Xb)  = 0.2971                         Prob > F           =    0.0000
```

GDPpercapitaconstant20~S	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Inflation	-.0086666	.0071792	-1.21	0.228	-.0227708	.0054376
HumanDevelopmentIndexHDI	3056.308	335.623	9.11	0.000	2396.949	3715.666
TradeofGDP	-4.525115	1.19655	-3.78	0.000	-6.875834	-2.174396
BroadmoneyofGDP	5.968921	1.767226	3.38	0.001	2.497063	9.440779
CapitaltoGDP	.7735612	2.327098	0.33	0.740	-3.798212	5.345334
PoliticalRisk	7.326574	8.483049	0.86	0.388	-9.339063	23.99221
Corruption	28.41119	22.73258	1.25	0.212	-16.24879	73.07118
Mobilephone	2.573952	.5535572	4.65	0.000	1.486444	3.66146
_cat#c.FDIpercapita						
0	-1.607772	.2183115	-7.36	0.000	-2.036662	-1.178881
1	.1525021	.1798783	0.85	0.397	-.2008833	.5058876
_cons	386.0155	173.8589	2.22	0.027	44.45564	727.5754
sigma_u	2265.6332					
sigma_e	304.90363					
rho	.98221103	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(24, 515) = 849.21                     Prob > F = 0.0000
```

Appendix A.3

```
. xthreg GDPpercapitaconstant2010US Inflation HumanDevelopmentIndexHDI CapitaltoGDP PoliticalRisk Corruption Mobilephone, rx( FDIpercap
> ita) qx( ExpenditurtoGDP ) thnum(1) grid(400) trim(0.01) bs(300)
Estimating the threshold parameters:   1st ......  Done
Boostrap for single threshold
................................................... +   50
................................................... +  100
................................................... +  150
................................................... +  200
................................................... +  250
................................................... +  300

Threshold estimator (level = 95):
```

model	Threshold	Lower	Upper
Th-1	13.4869	13.4634	13.6287

```
Threshold effect test (bootstrap = 300):
```

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	4.92e+07	9.33e+04	44.46	0.0233	22.6523	26.2233	52.0200

```
Fixed-effects (within) regression               Number of obs      =       550
Group variable: ID                              Number of groups   =        25

R-sq:  within  = 0.3452                         Obs per group: min =        22
       between = 0.3721                                        avg =      22.0
       overall = 0.2729                                        max =        22

                                                F(8,517)           =     34.07
corr(u_i, Xb)  = 0.4092                         Prob > F           =    0.0000
```

GDPpercapitaconstant20~S	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Inflation	-.010941	.0072078	-1.52	0.130	-.0251011	.0032192
HumanDevelopmentIndexHDI	2925.732	336.877	8.68	0.000	2263.916	3587.548
CapitaltoGDP	-3.33185	2.199589	-1.51	0.130	-7.653081	.9893805
PoliticalRisk	4.204539	8.546863	0.49	0.623	-12.58631	20.99539
Corruption	-2.900314	22.04599	-0.13	0.895	-46.21105	40.41043
Mobilephone	3.068802	.5310145	5.78	0.000	2.02559	4.112013
_cat#c.FDIpercapita						
0	-1.838738	.2475885	-7.43	0.000	-2.325141	-1.352334
1	-.1189353	.1638303	-0.73	0.468	-.4407902	.2029196
_cons	443.8299	166.196	2.67	0.008	117.3273	770.3325
sigma_u	2224.2271					
sigma_e	308.61526					
rho	.98111161	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(24, 517) = 883.74                     Prob > F = 0.0000
```

```
. xthreg GDPpercapitaconstant2010US Inflation HumanDevelopmentIndexHDI CapitaltoGDP TradeofGDP PoliticalRisk Corruption Mobilephone, rx
> ( FDIpercapita) qx( ExpenditurtoGDP ) thnum(1) grid(400) trim(0.01) bs(300)
Estimating the threshold parameters:   1st ......  Done
Boostrap for single threshold
.................................................. +   50
.................................................. +  100
.................................................. +  150
.................................................. +  200
.................................................. +  250
.................................................. +  300

Threshold estimator (level = 95):
```

model	Threshold	Lower	Upper
Th-1	13.4869	13.4634	13.6287

Threshold effect test (bootstrap = 300):

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	4.86e+07	9.20e+04	47.01	0.0200	26.0568	36.0159	48.9001

```
Fixed-effects (within) regression               Number of obs      =       550
Group variable: ID                              Number of groups   =        25

R-sq:  within  = 0.3541                         Obs per group: min =        22
       between = 0.3051                                        avg =      22.0
       overall = 0.2251                                        max =        22

                                                F(9,516)           =     31.43
corr(u_i, Xb)  = 0.3555                         Prob > F           =    0.0000
```

GDPpercapitaconstant20~S	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Inflation	-.0089095	.0072066	-1.24	0.217	-.0230673	.0052483
HumanDevelopmentIndexHDI	3027.915	337.1203	8.98	0.000	2365.618	3690.212
CapitaltoGDP	-1.051133	2.349231	-0.45	0.655	-5.666367	3.564101
TradeofGDP	-3.118186	1.173522	-2.66	0.008	-5.423655	-.8127164
PoliticalRisk	5.625951	8.514028	0.66	0.509	-11.10047	22.35237
Corruption	-6.537586	21.96061	-0.30	0.766	-49.68078	36.60561
Mobilephone	2.94605	.5299468	5.56	0.000	1.904931	3.987168
_cat#c.FDIpercapita						
0	-1.832251	.2461621	-7.44	0.000	-2.315855	-1.348648
1	-.0729046	.1637971	-0.45	0.656	-.3946958	.2488865
_cons	563.1273	171.2217	3.29	0.001	226.75	899.5047
sigma_u	2243.4325					
sigma_e	306.82222					
rho	.98163887	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(24, 516) = 881.24                     Prob > F = 0.0000
```

```
. xthreg GDPpercapitaconstant2010US Inflation HumanDevelopmentIndexHDI CapitaltoGDP TradeofGDP Domesticcredittoprivatesecto PoliticalRi
> sk Corruption Mobilephone, rx( FDIpercapita) qx( ExpenditurtoGDP ) thnum(2) grid(400) trim(0.01 0.01) bs(300 300)
Estimating the threshold parameters:   1st ......  2nd ......  Done
Boostrap for single threshold
.................................................. +   50
.................................................. +  100
.................................................. +  150
.................................................. +  200
.................................................. +  250
.................................................. +  300
Boostrap for double threshold model:
.................................................. +   50
.................................................. +  100
.................................................. +  150
.................................................. +  200
.................................................. +  250
.................................................. +  300

Threshold estimator (level = 95):
```

model	Threshold	Lower	Upper
Th-1	13.4869	13.4634	13.6287
Th-21	11.8109	11.7625	11.8600
Th-22	10.6782	10.3063	10.7320

Threshold effect test (bootstrap = 300 300):

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	4.49e+07	8.50e+04	47.10	0.0067	25.0922	32.8063	45.4373
Double	4.28e+07	8.10e+04	26.17	0.0633	21.7650	27.9463	39.4733

```
Fixed-effects (within) regression               Number of obs      =       550
Group variable: ID                              Number of groups   =        25

R-sq:  within  = 0.4293                         Obs per group: min =        22
       between = 0.4509                                        avg =      22.0
       overall = 0.4009                                        max =        22

                                                F(11,514)          =     35.14
corr(u_i, Xb)  = 0.4774                         Prob > F           =    0.0000
```

GDPpercapitaconstant2010US	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Inflation	-.0084338	.0067876	-1.24	0.215	-.0217687	.0049011
HumanDevelopmentIndexHDI	2388.945	326.3801	7.32	0.000	1747.742	3030.148
CapitaltoGDP	-1.998722	2.216442	-0.90	0.368	-6.353122	2.355678
TradeofGDP	-4.323155	1.114564	-3.88	0.000	-6.512816	-2.133494
Domesticcredittoprivatesecto	16.67232	2.286303	7.29	0.000	12.18067	21.16397
PoliticalRisk	5.650652	8.014275	0.71	0.481	-10.09411	21.39542
Corruption	15.90515	20.89335	0.76	0.447	-25.1417	56.95201
Mobilephone	1.827954	.5203695	3.51	0.000	.805641	2.850266
_cat#c.FDIpercapita						
0	.5694986	.4758918	1.20	0.232	-.3654338	1.504431
1	-4.515811	.5063197	-8.92	0.000	-5.510522	-3.521101
2	.0220323	.1542033	0.14	0.886	-.2809139	.3249786
_cons	586.5881	161.3669	3.64	0.000	269.5683	903.608
sigma_u	2095.1549					
sigma_e	288.97418					
rho	.98133183	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(24, 514) = 600.06                     Prob > F = 0.0000
```

```
. xthreg GDPpercapitaconstant2010US Inflation HumanDevelopmentIndexHDI CapitaltoGDP TradeofGDP BroadmoneyofGDP PoliticalRisk Corruption
>  Mobilephone, rx( FDIpercapita) qx( ExpenditurtoGDP ) thnum(2) grid(400) trim(0.01 0.01) bs(300 300)
Estimating  the  threshold  parameters:   1st ......  2nd ......  Done
Boostrap for single threshold
.................................................. +   50
.................................................. +  100
.................................................. +  150
.................................................. +  200
.................................................. +  250
.................................................. +  300
Boostrap for double threshold model:
.................................................. +   50
.................................................. +  100
.................................................. +  150
.................................................. +  200
.................................................. +  250
.................................................. +  300

Threshold estimator (level = 95):
```

model	Threshold	Lower	Upper
Th-1	13.4869	13.4634	13.6287
Th-21	21.0895	20.7979	21.2151
Th-22	16.3256	16.2114	16.6937

```
Threshold effect test (bootstrap = 300 300):
```

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	4.79e+07	9.07e+04	47.07	0.0133	21.7663	29.2903	47.2451
Double	4.60e+07	8.72e+04	21.60	0.0800	20.1612	28.4849	51.3404

```
Fixed-effects (within) regression               Number of obs      =       550
Group variable: ID                              Number of groups   =        25

R-sq:  within  = 0.3867                         Obs per group: min =        22
       between = 0.2940                                        avg =      22.0
       overall = 0.2122                                        max =        22

                                                F(11,514)          =     29.47
corr(u_i, Xb)  = 0.3386                         Prob > F           =    0.0000
```

GDPpercapitaconstant20~S	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Inflation	-.0110096	.0070519	-1.56	0.119	-.0248638	.0028445
HumanDevelopmentIndexHDI	2748.734	331.3241	8.30	0.000	2097.818	3399.65
CapitaltoGDP	1.52933	2.311442	0.66	0.509	-3.011706	6.070366
TradeofGDP	-4.003898	1.173673	-3.41	0.001	-6.309685	-1.698112
BroadmoneyofGDP	5.057461	1.730128	2.92	0.004	1.65847	8.456452
PoliticalRisk	4.372252	8.309859	0.53	0.599	-11.95321	20.69772
Corruption	-4.499049	22.03568	-0.20	0.838	-47.79013	38.79204
Mobilephone	2.177168	.5463013	3.99	0.000	1.10391	3.250426
_cat#c.FDIpercapita						
0	-.9919619	.1665013	-5.96	0.000	-1.319069	-.6648551
1	1.178815	.2564696	4.60	0.000	.674957	1.682672
2	-1.302334	.4688407	-2.78	0.006	-2.223414	-.3812544
_cons	576.2625	170.5471	3.38	0.001	241.2074	911.3176
sigma_u	2248.5369					
sigma_e	299.54717					
rho	.98256225	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(24, 514) = 906.77                     Prob > F = 0.0000

.
```

Appendix A.4

```
. xthreg GDPpercapitaconstant2010US Inflation HumanDevelopmentIndexHDI CapitaltoGDP PoliticalRisk Corruption Mobilephone, rx( FDIpercap
> ita) qx( Domesticcredittoprivatesecto ) thnum(2) grid(400) trim(0.01 0.01) bs(300 300)
Estimating the threshold parameters:   1st ......  2nd ......  Done
Boostrap for single threshold
................................................... +   50
................................................... +  100
................................................... +  150
................................................... +  200
................................................... +  250
................................................... +  300
Boostrap for double threshold model:
................................................... +   50
................................................... +  100
................................................... +  150
................................................... +  200
................................................... +  250
................................................... +  300

Threshold estimator (level = 95):
```

model	Threshold	Lower	Upper
Th-1	25.2461	24.2566	25.2488
Th-21	25.2461	24.2566	25.2488
Th-22	10.6880	10.3539	10.7348

```
Threshold effect test (bootstrap = 300 300):
```

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	4.58e+07	8.68e+04	87.37	0.0033	40.0012	47.3732	67.3886
Double	4.09e+07	7.76e+04	62.66	0.0033	28.1976	37.9041	53.9607

```
Fixed-effects (within) regression               Number of obs      =       550
Group variable: ID                              Number of groups   =        25

R-sq:  within  = 0.4555                         Obs per group: min =        22
       between = 0.3609                                        avg =      22.0
       overall = 0.2373                                        max =        22

                                                F(9,516)           =     47.96
corr(u_i, Xb)  = 0.3660                         Prob > F           =    0.0000
```

GDPpercapitaconstant20~S	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Inflation	-.0135996	.0065817	-2.07	0.039	-.0265299	-.0006694
HumanDevelopmentIndexHDI	2531.234	309.0884	8.19	0.000	1924.007	3138.46
CapitaltoGDP	-5.259289	2.019678	-2.60	0.009	-9.227093	-1.291485
PoliticalRisk	6.671873	7.793164	0.86	0.392	-8.638358	21.9821
Corruption	-17.07438	20.12872	-0.85	0.397	-56.61871	22.46994
Mobilephone	2.170145	.4888603	4.44	0.000	1.209744	3.130547
_cat#c.FDIpercapita						
0	-1.865263	.1902625	-9.80	0.000	-2.239048	-1.491479
1	-.0980558	.1726666	-0.57	0.570	-.4372717	.2411601
2	2.609465	.3294669	7.92	0.000	1.962203	3.256726
_cons	662.926	152.4339	4.35	0.000	363.4586	962.3935
sigma_u	2238.8097					
sigma_e	281.704					
rho	.98441418	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(24, 516) = 1057.83                 Prob > F = 0.0000
```

```
. xthreg GDPpercapitaconstant2010US Inflation HumanDevelopmentIndexHDI TradeofGDP CapitaltoGDP PoliticalRisk Corruption Mobilephone, rx
> ( FDIpercapita) qx( Domesticcredittoprivatesecto ) thnum(2) grid(400) trim(0.01 0.01) bs(300 300)
Estimating the threshold parameters:   1st ......  2nd ......  Done
Boostrap for single threshold
.................................................. +   50
.................................................. +  100
.................................................. +  150
.................................................. +  200
.................................................. +  250
.................................................. +  300
Boostrap for double threshold model:
.................................................. +   50
.................................................. +  100
.................................................. +  150
.................................................. +  200
.................................................. +  250
.................................................. +  300

Threshold estimator (level = 95):
```

model	Threshold	Lower	Upper
Th-1	25.2461	24.2566	25.2488
Th-21	25.2461	24.2566	25.2488
Th-22	10.6880	10.3539	10.7348

```
Threshold effect test (bootstrap = 300 300):
```

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	4.46e+07	8.45e+04	98.02	0.0067	40.6776	50.9262	73.8317
Double	3.98e+07	7.54e+04	63.77	0.0067	26.1555	30.4700	48.2402

```
Fixed-effects (within) regression               Number of obs      =       550
Group variable: ID                              Number of groups   =        25

R-sq:  within  = 0.4706                         Obs per group: min =        22
       between = 0.2329                                        avg =      22.0
       overall = 0.1680                                        max =        22

                                                F(10,515)          =     45.79
corr(u_i, Xb)  = 0.2757                         Prob > F           =    0.0000
```

GDPpercapitaconstant20~S	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Inflation	-.0109784	.0065317	-1.68	0.093	-.0238104	.0018536
HumanDevelopmentIndexHDI	2649.549	306.61	8.64	0.000	2047.189	3251.909
TradeofGDP	-4.114853	1.072126	-3.84	0.000	-6.221132	-2.008574
CapitaltoGDP	-2.257687	2.141262	-1.05	0.292	-6.46437	1.948995
PoliticalRisk	8.602899	7.70794	1.12	0.265	-6.539974	23.74577
Corruption	-22.57066	19.91769	-1.13	0.258	-61.70058	16.55926
Mobilephone	1.969144	.4853171	4.06	0.000	1.0157	2.922589
_cat#c.FDIpercapita						
0	-1.830091	.188004	-9.73	0.000	-2.19944	-1.460742
1	-.0720553	.1705487	-0.42	0.673	-.4071121	.2630015
2	2.814508	.3295285	8.54	0.000	2.167122	3.461893
_cons	828.676	156.5212	5.29	0.000	521.1774	1136.174
sigma_u	2265.9516					
sigma_e	278.02919					
rho	.98516833	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(24, 515) = 1069.09                     Prob > F = 0.0000
```

```
. xthreg GDPpercapitaconstant2010US Inflation HumanDevelopmentIndexHDI TradeofGDP Domesticcredittoprivatesecto CapitaltoGDP PoliticalRi
> sk Corruption Mobilephone, rx( FDIpercapita) qx( Domesticcredittoprivatesecto ) thnum(2) grid(400) trim(0.01 0.01) bs(300 300)
Estimating the threshold parameters:   1st ......  2nd ......  Done
Boostrap for single threshold
.................................................. +   50
.................................................. +  100
.................................................. +  150
.................................................. +  200
.................................................. +  250
.................................................. +  300
Boostrap for double threshold model:
.................................................. +   50
.................................................. +  100
.................................................. +  150
.................................................. +  200
.................................................. +  250
.................................................. +  300

Threshold estimator (level = 95):
```

model	Threshold	Lower	Upper
Th-1	25.2461	24.2566	25.2488
Th-21	25.2461	24.2566	25.2488
Th-22	10.7348	10.3870	10.7586

```
Threshold effect test (bootstrap = 300 300):
```

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	4.23e+07	8.02e+04	81.82	0.0000	36.5300	47.5916	65.3765
Double	3.79e+07	7.19e+04	60.89	0.0000	22.9728	27.6074	33.4183

```
Fixed-effects (within) regression               Number of obs      =       550
Group variable: ID                              Number of groups   =        25

R-sq:  within  = 0.4954                         Obs per group: min =        22
       between = 0.3114                                        avg =      22.0
       overall = 0.2634                                        max =        22

                                                F(11,514)          =     45.88
corr(u_i, Xb)  = 0.3545                         Prob > F           =    0.0000
```

GDPpercapitaconstant2010US	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Inflation	-.0105939	.0063836	-1.66	0.098	-.023135	.0019472
HumanDevelopmentIndexHDI	2315.959	306.9673	7.54	0.000	1712.894	2919.024
TradeofGDP	-4.367074	1.048921	-4.16	0.000	-6.427774	-2.306374
Domesticcredittoprivatesecto	10.98696	2.18566	5.03	0.000	6.693034	15.28089
CapitaltoGDP	-3.169565	2.100444	-1.51	0.132	-7.296077	.956947
PoliticalRisk	8.91593	7.533143	1.18	0.237	-5.883606	23.71547
Corruption	-8.303351	19.66873	-0.42	0.673	-46.94435	30.33765
Mobilephone	1.341765	.4902703	2.74	0.006	.3785854	2.304946
_cat#c.FDIpercapita						
0	-1.722337	.1849602	-9.31	0.000	-2.085708	-1.358966
1	-.0407669	.1668197	-0.24	0.807	-.3684993	.2869654
2	2.574053	.3256054	7.91	0.000	1.934372	3.213734
_cons	791.8678	153.132	5.17	0.000	491.0262	1092.709
sigma_u	2190.4663					
sigma_e	271.7069					
rho	.98484706	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(24, 514) = 838.06                     Prob > F = 0.0000

.
```

```
. xthreg GDPpercapitaconstant2010US Inflation HumanDevelopmentIndexHDI CapitaltoGDP PoliticalRisk Corruption Mobilephone, rx( FDIpercap
> ita) qx( BroadmoneyofGDP ) thnum(2) grid(400) trim(0.01 0.01) bs(300 300)
Estimating the threshold parameters:   1st ......  2nd ......  Done
Boostrap for single threshold
................................................... +   50
................................................... +  100
................................................... +  150
................................................... +  200
................................................... +  250
................................................... +  300
Boostrap for double threshold model:
................................................... +   50
................................................... +  100
................................................... +  150
................................................... +  200
................................................... +  250
................................................... +  300

Threshold estimator (level = 95):
```

model	Threshold	Lower	Upper
Th-1	37.6749	37.4754	37.7661
Th-21	37.6749	37.4754	37.7661
Th-22	20.9925	20.6057	21.0259

```
Threshold effect test (bootstrap = 300 300):
```

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	4.31e+07	8.17e+04	125.54	0.0000	34.5998	45.8800	67.7979
Double	3.94e+07	7.46e+04	50.34	0.0233	24.7581	33.9610	81.9974

```
Fixed-effects (within) regression               Number of obs      =       550
Group variable: ID                              Number of groups   =        25

R-sq:  within  = 0.4764                         Obs per group: min =        22
       between = 0.3501                                        avg =      22.0
       overall = 0.2458                                        max =        22

                                                F(9,516)           =     52.16
corr(u_i, Xb)  = 0.3672                         Prob > F           =    0.0000
```

GDPpercapitaconstant20~S	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Inflation	-.0135679	.0064537	-2.10	0.036	-.0262467	-.0008891
HumanDevelopmentIndexHDI	2577.975	302.9322	8.51	0.000	1982.843	3173.107
CapitaltoGDP	-4.594003	1.968317	-2.33	0.020	-8.460904	-.7271017
PoliticalRisk	3.228049	7.625665	0.42	0.672	-11.75312	18.20922
Corruption	-7.861007	19.76364	-0.40	0.691	-46.6881	30.96609
Mobilephone	2.017973	.4795142	4.21	0.000	1.075933	2.960013
_cat#c.FDIpercapita						
0	-1.978344	.1950456	-10.14	0.000	-2.361525	-1.595163
1	-.3954276	.1684403	-2.35	0.019	-.7263407	-.0645146
2	2.862551	.3163139	9.05	0.000	2.241129	3.483972
_cons	630.1105	149.3748	4.22	0.000	336.653	923.568
sigma_u	2227.8922					
sigma_e	276.24744					
rho	.98485805	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(24, 516) = 1093.48                 Prob > F = 0.0000

.
```

```
. xthreg GDPpercapitaconstant2010US Inflation HumanDevelopmentIndexHDI TradeofGDP CapitaltoGDP PoliticalRisk Corruption Mobilephone, rx
> ( FDIpercapita) qx( BroadmoneyofGDP ) thnum(2) grid(400) trim(0.01 0.01) bs(300 300)
Estimating the threshold parameters:   1st ......  2nd ......  Done
Boostrap for single threshold
................................................... +   50
................................................... +  100
................................................... +  150
................................................... +  200
................................................... +  250
................................................... +  300
Boostrap for double threshold model:
................................................... +   50
................................................... +  100
................................................... +  150
................................................... +  200
................................................... +  250
................................................... +  300

Threshold estimator (level = 95):
```

model	Threshold	Lower	Upper
Th-1	37.6749	37.4754	37.7661
Th-21	37.6749	37.4754	37.7661
Th-22	20.9925	20.6057	21.0259

```
Threshold effect test (bootstrap = 300 300):
```

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	4.21e+07	7.97e+04	135.46	0.0000	32.7971	42.8985	76.1526
Double	3.81e+07	7.22e+04	55.38	0.0267	26.7311	38.2403	77.0726

```
Fixed-effects (within) regression               Number of obs      =       550
Group variable: ID                              Number of groups   =        25

R-sq:  within  = 0.4933                         Obs per group: min =        22
       between = 0.2403                                        avg =      22.0
       overall = 0.1798                                        max =        22

                                                F(10,515)          =     50.14
corr(u_i, Xb)  = 0.2837                         Prob > F           =    0.0000
```

GDPpercapitaconstant20~S	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Inflation	-.0108312	.0063888	-1.70	0.091	-.0233825	.00172
HumanDevelopmentIndexHDI	2708.08	299.9258	9.03	0.000	2118.851	3297.309
TradeofGDP	-4.337274	1.045385	-4.15	0.000	-6.391017	-2.28353
CapitaltoGDP	-1.468711	2.079341	-0.71	0.480	-5.553744	2.616322
PoliticalRisk	5.18304	7.523379	0.69	0.491	-9.597246	19.96333
Corruption	-13.0871	19.50098	-0.67	0.502	-51.39836	25.22416
Mobilephone	1.811514	.4747685	3.82	0.000	.8787926	2.744235
_cat#c.FDIpercapita						
0	-1.976493	.1920521	-10.29	0.000	-2.353795	-1.599191
1	-.3406922	.1663785	-2.05	0.041	-.6675562	-.0138281
2	3.031208	.3140999	9.65	0.000	2.414133	3.648282
_cons	802.4445	152.8344	5.25	0.000	502.189	1102.7
sigma_u	2255.8975					
sigma_e	272.00694					
rho	.98566979	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(24, 515) = 1110.71                 Prob > F = 0.0000

.
```

```
. xthreg GDPpercapitaconstant2010US Inflation HumanDevelopmentIndexHDI TradeofGDP BroadmoneyofGDP CapitaltoGDP PoliticalRisk Corruption
>  Mobilephone, rx( FDIpercapita) qx( BroadmoneyofGDP ) thnum(2) grid(400) trim(0.01 0.01) bs(300 300)
Estimating  the  threshold  parameters:   1st ......  2nd ......  Done
Boostrap for single threshold
.................................................. +   50
.................................................. +  100
.................................................. +  150
.................................................. +  200
.................................................. +  250
.................................................. +  300
Boostrap for double threshold model:
.................................................. +   50
.................................................. +  100
.................................................. +  150
.................................................. +  200
.................................................. +  250
.................................................. +  300

Threshold estimator (level = 95):
```

model	Threshold	Lower	Upper
Th-1	37.6749	37.4754	37.7661
Th-21	37.6749	37.4754	37.7661
Th-22	20.9925	20.6057	21.0259

```
Threshold effect test (bootstrap = 300 300):
```

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	4.20e+07	7.96e+04	127.56	0.0033	35.2919	42.8417	68.7481
Double	3.81e+07	7.21e+04	54.86	0.0267	27.4403	38.0095	62.3065

```
Fixed-effects (within) regression               Number of obs      =       550
Group variable: ID                              Number of groups   =        25

R-sq:  within  = 0.4938                         Obs per group: min =        22
       between = 0.2414                                        avg =      22.0
       overall = 0.1809                                        max =        22

                                                F(11,514)          =     45.58
corr(u_i, Xb)  = 0.2848                         Prob > F           =    0.0000
```

GDPpercapitaconstant20~S	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Inflation	-.0110788	.0064022	-1.73	0.084	-.0236565	.0014988
HumanDevelopmentIndexHDI	2702.535	300.1874	9.00	0.000	2112.79	3292.28
TradeofGDP	-4.446202	1.057827	-4.20	0.000	-6.524398	-2.368005
BroadmoneyofGDP	1.0997	1.597848	0.69	0.492	-2.039417	4.238817
CapitaltoGDP	-1.509993	2.081268	-0.73	0.468	-5.598832	2.578846
PoliticalRisk	5.22248	7.527444	0.69	0.488	-9.565861	20.01082
Corruption	-9.832907	20.07571	-0.49	0.624	-49.27345	29.60763
Mobilephone	1.714753	.4953805	3.46	0.001	.7415333	2.687972
_cat#c.FDIpercapita						
0	-1.970745	.1923317	-10.25	0.000	-2.348598	-1.592892
1	-.3417292	.1664704	-2.05	0.041	-.6687753	-.0146831
2	2.992337	.3192953	9.37	0.000	2.365052	3.619621
_cons	779.8754	156.3893	4.99	0.000	472.6347	1087.116
sigma_u	2255.0465					
sigma_e	272.14604					
rho	.98564466	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(24, 514) = 1089.53                 Prob > F = 0.0000

.
```

APPENDIX B

sfpanel lngdp lnexpenditure lncpi lnhdi lncapital lnmoney Regime , usigma (TradeofGDP FDIpercapita HumanDevelopmentIndexHDI) model (tfe)

Iteration 23: Log likelihood = 478.08883

True fixed-effects model (exponential) Number of obs = 1114

Group variable: ID Number of groups = 41

Time variable: Year Obs per group: min = 2

avg = 27.2

max = 36

Prob > chi2 = 0.0000

Log likelihood = 478.0888 Wald chi2(6) = 700.12

---

lngdp	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]
Frontier					
lnexpenditure	.1089793	.0123095	8.85	0.000	.0848531 .1331055
lncpi	-.0206531	.0042826	-4.82	0.000	-.0290467 -.0122594

```
              lnhdi |   .0148017   .0213662     0.69   0.488    -.0270752    .0566786
          lncapital |   .0760959   .0068957    11.04   0.000     .0625806    .0896111
            lnmoney |   -.003511   .0190213    -0.18   0.854     -.040792     .03377
             Regime |  -.0491956   .0185761    -2.65   0.008    -.0856041    -.012787
----------------------+------------------------------------------------------------------
Usigma                |
        TradeofGDP |   .0262523   .0033501     7.84   0.000     .0196864    .0328183
      FDIpercapita |  -.0019451   .0008711    -2.23   0.026    -.0036524   -.0002378
HumanDevelopmentIndexHDI |  -1.005635   1.406293    -0.72   0.475    -3.761918    1.750648
             _cons |  -6.176448   .5515192   -11.20   0.000    -7.257406    -5.09549
----------------------+------------------------------------------------------------------
Vsigma                |
             _cons |  -4.272909   .1111304   -38.45   0.000     -4.49072   -4.055097
----------------------+------------------------------------------------------------------
  E(sigma_u) |    .162793                      .1105212    .2150649
     sigma_v |   .1180728   .0065607    18.00   0.000     .1058894    .1316579
------------------------------------------------------------------------------
```

APPENDIX C

Pedroni Residual Cointegration Test

Series: GDP_PER_CAPITA__CONSTANT BROAD_MONEY____OF_GDP

_ CAPITAL_PER_CAPITA CONSUMER_PRICE_INDEX

HUMAN_DEVELOPMENT_INDEX_ PRIMARY_PER_CAPITA

TRADE____OF_GDP_

Date: 03/31/18 Time: 06:58

Sample: 2003 2017

Included observations: 75

Cross-sections included: 5

Null Hypothesis: No cointegration

Trend assumption: Deterministic intercept and trend0=++KK=6---- 999/KMMMMMMMMMMMMMMMMMMMM MMMMM=?m+===MMMM

Automatic lag length selection based on SIC with a max lag of 0

Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

			Weighted	
	Statistic	Prob.	Statistic	Prob.
Panel v-Statistic	8.377532	0.0000	2.457506	0.0070
Panel rho-Statistic	3.021149	0.9987	3.045125	0.9988
Panel PP-Statistic	-3.214038	0.0007	-8.039962	0.0000
Panel ADF-Statistic	-2.015916	0.0219	-3.356738	0.0004

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	3.752418	0.9999
Group PP-Statistic	-13.49369	0.0000
Group ADF-Statistic	-4.620796	0.0000

Pedroni Residual Cointegration Test

Series: GDP_PER_CAPITA__CONSTANT CAPITAL_PER_CAPITA

CONSUMER_PRICE_INDEX HUMAN_DEVELOPMENT_INDEX_

PRIMARY_PER_CAPITA TRADE____OF_GDP_ DOMESTIC_CREDI

T_TO_PRIVA

Date: 03/31/18 Time: 07:03

Sample: 2003 2017

Included observations: 75

Cross-sections included: 5

Null Hypothesis: No cointegration

Trend assumption: Deterministic intercept and trend

Automatic lag length selection based on SIC with a max lag of 0

Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

			Weighted	
	Statistic	Prob.	Statistic	Prob.
Panel v-Statistic	5.611313	0.0000	0.377720	0.3528
Panel rho-Statistic	3.304112	0.9995	2.868216	0.9979
Panel PP-Statistic	-2.611750	0.0045	-5.960747	0.0000
Panel ADF-Statistic	-1.104565	0.1347	-3.285557	0.0005

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	4.018743	1.0000
Group PP-Statistic	-5.726762	0.0000
Group ADF-Statistic	-2.522085	0.0058

Cross section specific results

Pedroni Residual Cointegration Test

Series: GDP_PER_CAPITA__CONSTANT CAPITAL_PER_CAPITA

CONSUMER_PRICE_INDEX DOMESTIC_CREDIT_TO_PRIVA

HUMAN_DEVELOPMENT_INDEX_
SECONFDIPERCAPITA

TRADE____OF_GDP_

Date: 05/08/18 Time: 02:00

Sample: 2003 2017

Included observations: 75

Cross-sections included: 5

Null Hypothesis: No cointegration

Trend assumption: Deterministic intercept and trend

Automatic lag length selection based on SIC with a max lag of 0

Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

			Weighted	
	Statistic	Prob.	Statistic	Prob.
Panel v-Statistic	0.417713	0.3381	-0.443842	0.6714
Panel rho-Statistic	3.158910	0.9992	2.927978	0.9983
Panel PP-Statistic	-1.581137	0.0569	-4.943969	0.0000
Panel ADF-Statistic	-1.155246	0.1240	-3.007067	0.0013

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	4.057139	1.0000
Group PP-Statistic	-3.614594	0.0002

Group ADF-Statistic -2.400536 0.0082

Pedroni Residual Cointegration Test

Series: GDP_PER_CAPITA__CONSTANT BROAD_MONEY____OF_GDP

_ CAPITAL_PER_CAPITA PRIMARY_PER_CAPITA

TRADE____OF_GDP_ GROSS_ENROLMENT CONSUMER_PRICE

_INDEX

Date: 03/31/18 Time: 06:38

Sample: 2003 2017

Included observations: 75

Cross-sections included: 5

Null Hypothesis: No cointegration

Trend assumption: Deterministic intercept and trend

Automatic lag length selection based on SIC with a max lag of 0

Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

			Weighted	
	Statistic	Prob.	Statistic	Prob.
Panel v-Statistic	14.66744	0.0000	2.204090	0.0138
Panel rho-Statistic	2.526718	0.9942	2.754122	0.9971
Panel PP-Statistic	-3.287845	0.0005	-5.682045	0.0000
Panel ADF-Statistic	-4.001736	0.0000	-4.165604	0.0000

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	3.491797	0.9998
Group PP-Statistic	-17.07967	0.0000
Group ADF-Statistic	-5.396374	0.0000

Pedroni Residual Cointegration Test

Series: GDP_PER_CAPITA__CONSTANT CAPITAL_PER_CAPITA

CONSUMER_PRICE_INDEX DOMESTIC_CREDIT_TO_PRIVA

HUMAN_DEVELOPMENT_INDEX_ TERFDIPERCAPITA

TRADE____OF_GDP_

Date: 05/09/18 Time: 09:17

Sample: 2003 2017

Included observations: 75

Cross-sections included: 5

Null Hypothesis: No cointegration

Trend assumption: Deterministic intercept and trend

Automatic lag length selection based on SIC with a max lag of 0

Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

Weighted

	Statistic	Prob.	Statistic	Prob.
Panel v-Statistic	5.376701	0.0000	0.785034	0.2162
Panel rho-Statistic	2.294858	0.9891	2.821029	0.9976
Panel PP-Statistic	-7.187666	0.0000	-5.577052	0.0000
Panel ADF-Statistic	-5.752378	0.0000	-3.303045	0.0005

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	3.699173	0.9999
Group PP-Statistic	-11.50767	0.0000
Group ADF-Statistic	-4.403389	0.0000

Pedroni Residual Cointegration Test

Series: SERIES01 CAPITAL_PER_CAPITA CONSUMER_PRICE_INDEX

DOMESTIC_CREDIT_TO_PRIVA HUMAN_DEVELOPMENT_INDEX_

TERFDIPERCAPITA TRADE____OF_GDP_

Date: 05/09/18 Time: 09:23

Sample: 2003 2017

Included observations: 75

Cross-sections included: 4 (1 dropped)

Null Hypothesis: No cointegration

Trend assumption: No deterministic intercept or trend

Automatic lag length selection based on SIC with a max lag of 1

Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

			Weighted	
	Statistic	Prob.	Statistic	Prob.
Panel v-Statistic	-0.287478	0.6131	-2.029289	0.9788
Panel rho-Statistic	2.572123	0.9949	2.751329	0.9970
Panel PP-Statistic	-0.659282	0.2549	-1.754148	0.0397
Panel ADF-Statistic	-3.465353	0.0003	-4.448686	0.0000

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	3.746195	0.9999
Group PP-Statistic	-1.735362	0.0413
Group ADF-Statistic	-4.228436	0.0000

Pedroni Residual Cointegration Test

Series: INDUSTRY_GDP CAPITAL_PER_CAPITA CONSUMER_PRICE_I

NDEX DOMESTIC_CREDIT_TO_PRIVA HUMAN_DEVELOPMENT_I

NDEX_ SECONFDIPERCAPITA TRADE____OF_GDP_

Date: 05/09/18 Time: 09:45

Sample: 2003 2017

Included observations: 75

Cross-sections included: 4 (1 dropped)

Null Hypothesis: No cointegration

Trend assumption: Deterministic intercept and trend

Automatic lag length selection based on SIC with a max lag of 0

Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

			Weighted	
	Statistic	Prob.	Statistic	Prob.
Panel v-Statistic	0.873802	0.1911	-2.748658	0.9970
Panel rho-Statistic	2.290615	0.9890	2.356624	0.9908
Panel PP-Statistic	-2.198847	0.0139	-14.85902	0.0000
Panel ADF-Statistic	-1.989745	0.0233	-5.288722	0.0000

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	3.066780	0.9989
Group PP-Statistic	-12.26052	0.0000
Group ADF-Statistic	-5.142302	0.0000

Dependent Variable: GDP_PER_CAPITA__CONSTANT

Method: Panel Fully Modified Least Squares (FMOLS)

Date: 03/31/18 Time: 07:02

Sample (adjusted): 2004 2015

Periods included: 12

Cross-sections included: 5

Total panel (balanced) observations: 60

Panel method: Grouped estimation

Long-run covariance estimates (Bartlett kernel, Newey-West fixed bandwidth)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DOMESTIC_CREDIT_TO_PRIVA	17.51353	3.408428	5.138302	0.0000
CAPITAL_PER_CAPITA	9.257784	1.442281	6.418851	0.0000
CONSUMER_PRICE_INDEX	-6.749054	1.740368	-3.877947	0.0003
HUMAN_DEVELOPMENT_INDEX_	6003.709	599.6478	10.01206	0.0000
PRIMARY_PER_CAPITA	0.567912	0.180633	3.144004	0.0027
TRADE____OF_GDP_	-0.619791	1.596059	-0.388326	0.6993

R-squared	-5.441181	Mean dependent var	3027.809
Adjusted R-squared	-6.037587	S.D. dependent var	2324.543

S.E. of regression	6166.652	Sum squared resid	2.05E+09
Long-run variance	3385.527		

Dependent Variable: GDP_PER_CAPITA__CONSTANT

Method: Panel Fully Modified Least Squares (FMOLS)

Date: 05/08/18 Time: 02:02

Sample (adjusted): 2004 2015

Periods included: 12

Cross-sections included: 5

Total panel (balanced) observations: 60

Panel method: Grouped estimation

Long-run covariance estimates (Bartlett kernel, Newey-West fixed bandwidth)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CAPITAL_PER_CAPITA	8.986970	1.497666	6.000650	0.0000
CONSUMER_PRICE_INDEX	-7.088513	1.684051	-4.209204	0.0001
DOMESTIC_CREDIT_TO_PRIVA	13.52750	2.741724	4.933937	0.0000
HUMAN_DEVELOPMENT_INDEX_	6523.243	499.0642	13.07095	0.0000
SECONFDIPERCAPITA	1.004144	0.625202	1.606111	0.1141
TRADE____OF_GDP_	0.056318	1.284752	0.043836	0.9652

R-squared	-5.033632	Mean dependent var	3027.809
Adjusted R-squared	-5.592302	S.D. dependent var	2324.543

S.E. of regression	5968.375	Sum squared resid	1.92E+09
Long-run variance	2349.466		

Dependent Variable: GDP_PER_CAPITA__CONSTANT

Method: Panel Fully Modified Least Squares (FMOLS)

Date: 05/09/18 Time: 09:36

Sample (adjusted): 2004 2015

Periods included: 12

Cross-sections included: 5

Total panel (balanced) observations: 60

Panel method: Grouped estimation

Cointegrating equation deterministics: C

Long-run covariance estimates (Bartlett kernel, Newey-West fixed bandwidth)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CAPITAL_PER_CAPITA	2.876876	3.125274	0.920520	0.3618
CONSUMER_PRICE_INDEX	-4.401136	2.437863	-1.805326	0.0772
DOMESTIC_CREDIT_TO_PRIVA	-4.757091	5.336279	-0.891462	0.3770
HUMAN_DEVELOPMENT_INDEX_	11140.03	1410.553	7.897637	0.0000
TERFDIPERCAPITA	4.094615	2.003648	2.043580	0.0464
TRADE____OF_GDP_	0.080946	1.793026	0.045145	0.9642

R-squared	-7.753937	Mean dependent var	3027.809

Adjusted R-squared	-9.540455	S.D. dependent var	2324.543
S.E. of regression	7546.877	Sum squared resid	2.79E+09

CHANG, S.-C. (2015). Threshold Effect of Foreign Direct Investment on Environmental Degragation. In P. E. J.

Dependent Variable: SERIES01

Method: Panel Fully Modified Least Squares (FMOLS)

Date: 05/09/18 Time: 09:39

Sample (adjusted): 2004 2015

Periods included: 12

Cross-sections included: 4

Total panel (balanced) observations: 48

Panel method: Grouped estimation

Cointegrating equation deterministics: C

Long-run covariance estimates (Bartlett kernel, Newey-West fixed bandwidth)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CAPITAL_PER_CAPITA	0.596652	0.149143	4.000547	0.0003
CONSUMER_PRICE_INDEX	-0.214323	0.107133	-2.000539	0.0526
DOMESTIC_CREDIT_TO_PRIVA	-0.436007	0.094164	-4.630286	0.0000

HUMAN_DEVELOPMENT _INDEX_	118.9814	40.41576	2.943936	0.0055
TERFDIPERCAPITA	0.037346	0.033211	1.124519	0.2678
TRADE____OF_GDP_	-0.083081	0.030118	-2.758522	0.0089

R-squared	-1041.289542	Mean dependent var	51.10258
Adjusted R-squared	-1288.147592	S.D. dependent var	13.09418
S.E. of regression	470.1428	Sum squared resid	8399301.
Long-run variance	1.022646		

Dependent Variable: INDUSTRY_GDP

Method: Panel Fully Modified Least Squares (FMOLS)

Date: 05/10/18 Time: 01:33

Sample (adjusted): 2004 2015

Periods included: 12

Cross-sections included: 4

Total panel (balanced) observations: 48

Panel method: Grouped estimation

Long-run covariance estimates (Bartlett kernel, Newey-West fixed bandwidth)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CAPITAL_PER_CAPITA	-0.402735	0.143622	-2.804136	0.0076

CONSUMER_PRICE_INDEX	-0.076988	0.136059	-0.565846	0.5745
DOMESTIC_CREDIT_TO_PRIVA	-0.017723	0.043796	-0.404678	0.6878
HUMAN_DEVELOPMENT_INDEX_	70.16178	22.53305	3.113727	0.0033
SECONFDIPERCAPITA	0.068646	0.056241	1.220564	0.2291
TRADE____OF_GDP_	0.104637	0.020381	5.134073	0.0000

R-squared	-2011.498751	Mean dependent var	27.00100
Adjusted R-squared	-2251.081936	S.D. dependent var	6.683970
S.E. of regression	317.1952	Sum squared resid	4225737.
Long-run variance	1.373899		

APPENDIX D

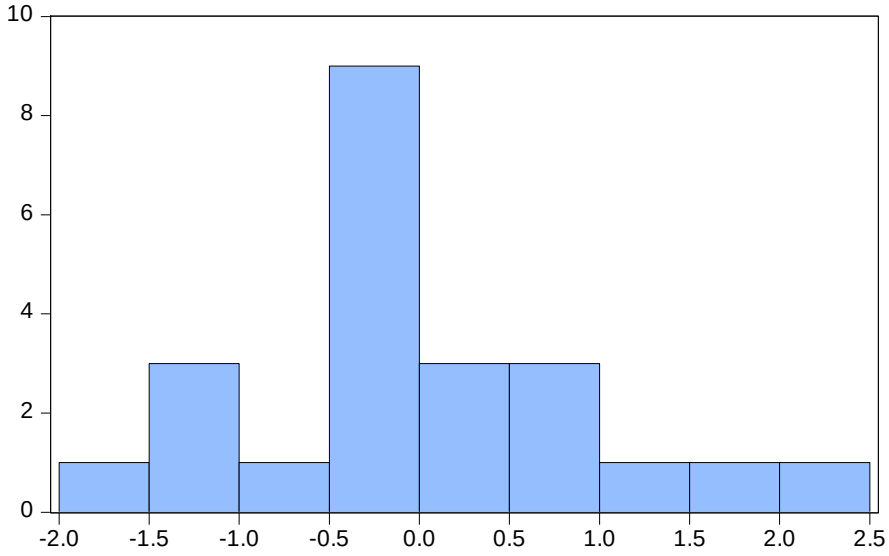
Appendix D.1

Dependent Variable: LNPRODUCTIVITY
Method: Least Squares
Date: 04/23/19 Time: 13:15
Sample: 1 23
Included observations: 23
White heteroskedasticity-consistent standard errors and covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNCAPITAL_INTENSITY	0.276215	0.140504	1.965888	0.0710
FDISPILLOVER	2.723458	0.982317	2.772486	0.0176
DLOWFDI_FTECH	-5.316025	2.578881	-2.061369	0.0599
DLOWFDI_INPUT	0.049475	0.090871	0.544451	0.5953

DLOWFDI_OWN	0.521805	0.172818	3.019395	0.0099
FDI_INPUT	-0.084528	0.093167	-0.907276	0.3808
FDI_OWN	0.004493	0.071068	0.063216	0.9506
FDI_FTECH	0.485534	1.691438	0.287054	0.7786
DLOW	-3.885921	0.877624	-4.427776	0.0007
C	13.21947	1.491925	8.860684	0.0000

R-squared	0.866359	Mean dependent var	16.01678
Adjusted R-squared	0.773838	S.D. dependent var	2.577929
S.E. of regression	1.225973	Akaike info criterion	3.544368
Sum squared resid	19.53914	Schwarz criterion	4.038061
Log likelihood	-30.76023	Hannan-Quinn criter.	3.668530
F-statistic	9.363919	Durbin-Watson stat	1.820044
Prob(F-statistic)	0.000226	Wald F-statistic	16.99632
Prob(Wald F-statistic)	0.000008		



Series: Residuals
Sample 1 23
Observations 23

Mean	-5.84e-16
Median	-0.170385
Maximum	2.448959
Minimum	-1.786428
Std. Dev.	0.942413
Skewness	0.582172
Kurtosis	3.602726
Jarque-Bera	1.647350
Probability	0.438816

Dependent Variable: LNPRODUCTIVITY
Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.582917	Prob. F(9,13)	0.0587
Obs*R-squared	14.75087	Prob. Chi-Square(9)	0.0980
Scaled explained SS	6.132635	Prob. Chi-Square(9)	0.7266

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.106252	Prob. F(1,12)	0.7501

Obs*R-squared	0.201863	Prob. Chi-Square(1)	0.6532

Method: Least Squares

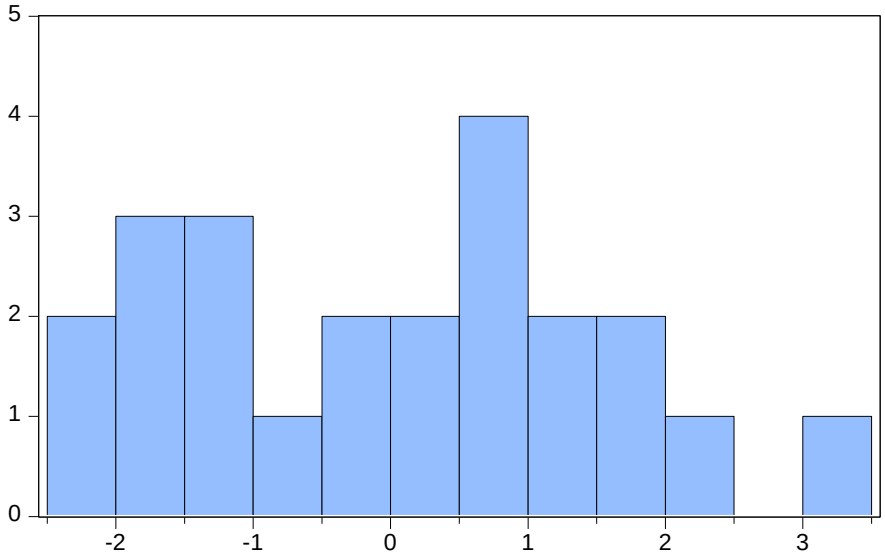
Date: 10/23/18 Time: 01:52

Sample: 1 23

Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FDISPILLOVER	6.451863	2.95957	2.1978	0.0248
LNCAPITAL_INTENSITY	0.639985	0.125276	5.108620	0.0001
FDI_INPUT	-0.107644	0.077637	-1.386507	0.1835
FDI_OWN	-0.089915	0.135869	-0.661779	0.5170
FDI_FTECH	0.920406	2.482767	0.370718	0.7154
C	5.851848	1.932967	3.027392	0.0076

R-squared	0.637967	Mean dependent var	16.01678
Adjusted R-squared	0.531487	S.D. dependent var	2.577929
S.E. of regression	1.764541	Akaike info criterion	4.193116
Sum squared resid	52.93127	Schwarz criterion	4.489332
Log likelihood	-42.22084	Hannan-Quinn criter.	4.267614
22F-statistic	5.991419	Durbin-Watson stat	1.822173
Prob(F-statistic)	0.002261		



Series: Residuals	
Sample 1 23	
Observations 23	
Mean	7.72e-16
Median	0.003972
Maximum	3.191982
Minimum	-2.148986
Std. Dev.	1.551118
Skewness	0.235937
Kurtosis	2.016971
Jarque-Bera	1.139470
Probability	0.565675

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.123132	Prob. F(1,16)	0.7302
Obs*R-squared	0.175651	Prob. Chi-Square(1)	0.6751

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.725339	Prob. F(5,17)	0.1827
Obs*R-squared	7.742471	Prob. Chi-Square(5)	0.1710
Scaled explained SS	2.150801	Prob. Chi-Square(5)	0.8279

APPENDIX D.2

Dependent Variable: LNPRODUCTIVITY

Method: Least Squares

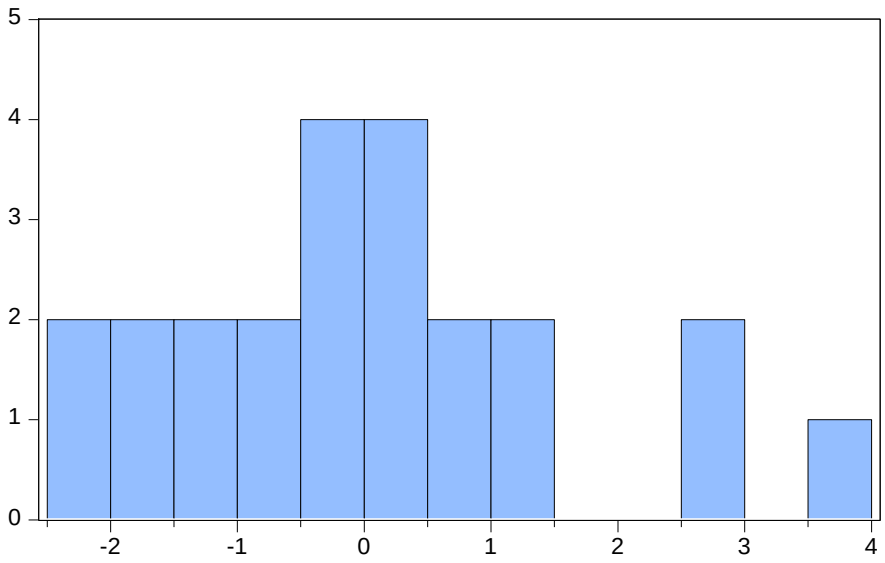
Date: 10/23/18 Time: 04:33

Sample: 1 23

Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FDISPILLOVER	2.263189	0.97378	2.3241	0.0214
LNCAPITAL_INTENSITY	0.604749	0.147251	4.106924	0.0007
FDI_EDUC	0.020814	0.01203	1.72345	0.0817
FDI_GDP_PER_CAPITA	1.017532	1.208417	0.842037	0.4115
FDI_TRADE	0.036451	0.016743	2.178049	0.0418
C	6.259660	2.305380	2.715240	0.0147

R-squared	0.604322	Mean dependent var	16.01678
Adjusted R-squared	0.487946	S.D. dependent var	2.577929
S.E. of regression	1.844713	Akaike info criterion	4.281983
Sum squared resid	57.85045	Schwarz criterion	4.578199
Log likelihood	-43.24281	Hannan-Quinn criter.	4.356481
F-statistic	5.192840	Durbin-Watson stat	1.413926
Prob(F-statistic)	0.004496		



Series: Residuals	
Sample 1 23	
Observations 23	
Mean	-3.63e-16
Median	-0.181335
Maximum	3.854036
Minimum	-2.471078
Std. Dev.	1.621594
Skewness	0.590906
Kurtosis	3.047885
Jarque-Bera	1.340683
Probability	0.511534

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.853288	Prob. F(5,17)	0.5315
Obs*R-squared	4.614222	Prob. Chi-Square(5)	0.4647
Scaled explained SS	2.581168	Prob. Chi-Square(5)	0.7642

APPENDIX D.3

Dependent Variable: LNPRODUCTIVITY

Method: Least Squares

Date: 10/23/18 Time: 01:55

Sample: 1 23

Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FDISPILLOVER	6.088598	2.85825	2.13018	0.029
LNCAPITAL_INTENSITY	0.583550	0.117163	4.980672	0.0001
FDI_DTECH	4.646653	2.491438	1.865048	0.0795
FDI_GAP	-0.234375	0.635565	-0.368767	0.7169
FDI_SIZE	2.011211	0.989240	2.033088	0.0580
C	6.540813	1.823466	3.587021	0.0023

R-squared	0.687647	Mean dependent var	16.01678
Adjusted R-squared	0.595778	S.D. dependent var	2.577929
S.E. of regression	1.639006	Akaike info criterion	4.045516
Sum squared resid	45.66781	Schwarz criterion	4.341732
Log likelihood	-40.52343	Hannan-Quinn criter.	4.120013
F-statistic	7.485121	Durbin-Watson stat	1.377644
Prob(F-statistic)	0.000709		

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.736732	Prob. F(1,16)	0.2061
Obs*R-squared	2.252097	Prob. Chi-Square(1)	0.1334

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.555370	Prob. F (5,17)	0.2256
Obs*R-squared	7.219140	Prob. Chi-Square (5)	0.2048
Scaled explained SS	3.348752	Prob. Chi-Square (5)	0.6464