Empirical Studies on Foreign Direct Investment

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Dedication

To my heart and beloved wife, Evelyn for your affection, patience and endurance.

To my beautiful angels and the greatest gift from God, Papa, Nana, Maame and Junior for the time sacrificed over the years.

To my late mother, Madam Sarah Obu you gave me encouragement.

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Abstract

Foreign direct investment (FDI) plays a crucial role in providing resources to finance the development strategies of developing nations. Therefore, policy makers and development agencies alike believe that FDI is growth enhancing, as suggested by their policy measures to promote FDI. This dissertation consists of three empirical essays that seek to examine the determinants of FDI and its growth enhancing effects without hurting future generations.

The first empirical study examines the effect of financial market development (FMD) as both pull and push factors in the determination of bilateral flow of FDI using the gravity model with a panel dataset of 20 source countries and 33 host countries over the period 2001-2012. Using equity to total assets and net loans to total assets ratios as novel measures of FMD, the results from both linear estimation and non-linear estimation methods suggest especially in the host country that, porous financial market hurts the bilateral flow of FDI.

The second empirical study looks at the growth enhancing effects of FDI conditioned on FMD. The novelty of this chapter is that it uses a unique banking dataset on financial fragility indicators by Andrianova et al. (2015) to account for the possible market fragility in FMD in the FDI-growth nexus. Under the instrumental variable approach, the study reveals that FDI inflows has a marginally significant positive impact on economic growth, indicating that fragility in financial market development can weaken the growth effect of FDI inflows.

The third empirical study focuses on the impact of inward FDI on the environment. Under both static and dynamic panel data estimations, the results show a positive relationship between FDI inflows and environmental pollution. Additionally, results of a group-wise estimation indicate that there are differences in terms of the impact of FDI inflows on the environment by the various groupings.

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Declaration

I declare that, except where explicit reference is made to the contribution of others, that this dissertation is the result of my own work and has not been submitted for any other degree at the University of Leicester or any other institution.

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Abbreviations

ARDL	Autoregressive distributed lag
ASEAN	Association of Southeast Asian Nations
CEPII	Centre d´Etudes Prospectives et d'Informations Internationals
CES	Constant Elasticity of Substitution
CO_2	Carbon dioxide
EMEs	Emerging market economies
EKC	Environmental Kuznets curve
EPI	Environmental performance index
FDI	Foreign direct investment
FMD	Financial market development
FINSAPs	Financial Sector Adjustment Programmes
GCC	Gulf Co-operation Council
GDP	Gross domestic product
GFCF	Gross fixed capital formation
GNI	Gross national income
GMM	Generalised Method of Moments
ICRG	International Country Risk Guide
IMF	International Monetary Fund
IV	Instrumental variable
KP	Kleibergen-Paap
LM	Lagrange multiplier
M&A	Mergers and acquisitions
MERCOSUR	Mercado Comun del Sur (South American trade bloc)
MNCs	Multinational corporations
MRTs	Multilateral resistance term
NEPAD	New partnership for Africa's development
NLS	Non-linear least squares
OECD	Organisation for Economic Co-operation and Development
OLI	Ownership-Location-Internalisation
OLS	Ordinary least squares
PHH	Pollution haven hypothesis
PMG	Pool mean group
PPML	Poisson Pseudo-Maximum Likelihood

R&D	Research and development
SDG	Sustainable Development Growth
SO_2	Sulphur dioxide
SSA	Sub-Saharan Africa
TEP	Total environmental pollution
2SLS	Two stage least squares
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNEP	United Nations Environment Programme
US	United States
USD	United States Dollars
WDI	World Development Indicators
WIR	World Investment Reports

Chapter 1
General Introduction

1.1. Background and Motivation

In September 2015, the United Nations (UN) adopted a set of goals to end poverty, protect the planet and ensure prosperity for all as part of the new Sustainable Development Growth (SDG) agenda. This thesis contributes to our understanding of how SDG targets[1] can be achieved by exploring economic growth prospects through globalisation and its consequential effect on the environment in Africa.

Globalisation has become an important tool for economic growth, advancement and prosperity through co-operation between the developed and developing countries. Countries all over the world are interconnected through trade, investment and communication. According to Thirlwall and Pacheco-López (2017, p.15) " [d]eveloping countries depend on developed countries for resource flows and technology, while developed countries depend heavily on developing countries for raw materials, food and oil, and as markets for industrial goods".

Financial resources herein referred to as foreign direct investment (FDI) has become the most important determinant in the globalisation process and this is changing the economies of many countries in the world. Therefore, the role FDI plays in ensuring the economic development of emerging and transition economies is very essential. The United Nations Conference on Trade and Development (UNCTAD), defines FDI "as an investment involving a long-term relationship and reflecting a lasting interest and control of a resident entity in one economy (foreign direct investor or parent enterprise) in an enterprise resident in an economy other than that of the foreign direct investor". It provides a means for creating direct, stable and long-lasting links between economies and under the right policy environment, it can serve as an important engine for economic growth.

Developing countries are afflicted by low saving and are virtually shut-out of the international capital markets (Gertler et al., 2004; Oatley, 2015). Therefore, policy makers in these countries place great confidence in FDI to address economic woes, reflected in their

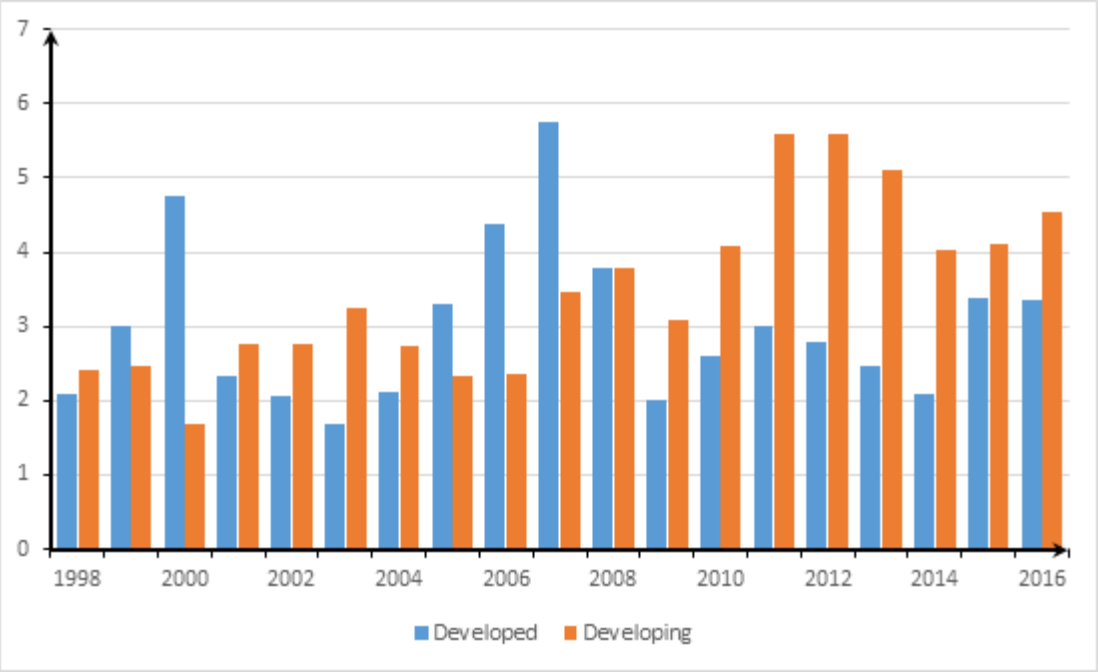
[1] Such as SGD 1: End poverty in all its forms everywhere; and part of SDG 8: Promote sustained, inclusive and sustainable economic growth, particularly for developing countries, and for that matter Africa.

vigorous policy competition to attract FDI. The significance of FDI has emerged from the activities of multinational corporations (MNCs) in creating positive externalities for economic growth through the provision of job creation, financial resources, transferring technological know-how, managerial and organisational skills, and enhancing competitiveness (Kobrin 2005; Adams 2009).

Consequently, FDI inflows have increased significantly in developing countries, due to the fact that it is the most stable and prevalent component of foreign capital inflows (Adams 2009). Similarly, UNCTAD (2008) reports that FDI inflows have the potential to create employment, increase productivity, transfer skills and technology, boost exports and continue the long-term economic growth and development of developing countries. Hence, developing countries and emerging market economies have come increasingly to recognise FDI as a potential source of economic development and modernisation, investment, income growth and employment. Thus, the bigger the capital investment in an economy, the more favourable its future prospects, so that FDI can be seen as an important source of capital investment and a determinant of the future growth rate of an economy.

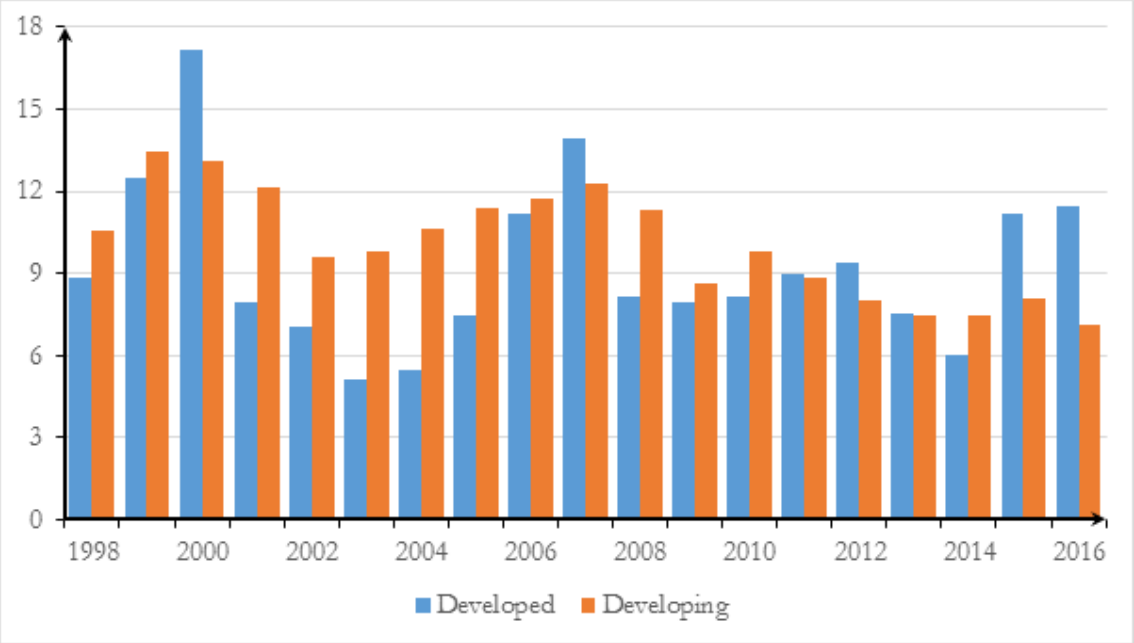
From Figures 1.1 and 1.2, by comparing the ratio of FDI as a share of gross domestic product (GDP) and gross fixed capital formation (GFCF) in developed and developing economies, it shows that the FDI/GDP and FDI/GFCF ratios are slightly higher in developing economies, as compared with the ratios in developed economies. This offers the greatest support for how important FDI is to developing economies.

Figure 1.1: FDI inflows as a share of GDP



Source: World Bank (2015), World Development Indicators (WDI, database).

Figure 1.2: FDI inflows as a share of GFCF



Source: UNCTAD (2015), World Investment Report (WIR).

Based on the potential embedded in FDI and sustainable environment, three key research questions are outlined by this study: Using the gravity model, is financial market development a key driver of bilateral flows of FDI? Does fragility in the development of the financial market play any role in the FDI-growth nexus in Africa? Are there differences in the magnitude of the impact of FDI on the environment (in terms of pollution) in Africa according to the various classifications?

To shed light on the above, we posit that developing countries have liberalised their investment regimes and pursued other policies to create the enabling environment for the attraction of FDI inflows. Given the necessary host-country policies (absorptive capacities) and a basic level of development, the majority of studies have shown that FDI triggers technological transfer, supports human capital formation, contributes to international trade integration, creates a more competitive business atmosphere and boosts innovativeness development. All of the above promote higher economic growth, which is the most effective tool for reducing poverty in developing nations, thus the realisation of SDG 1.

In pursuance of higher economic growth prospects, African countries have faced inadequate capital needed for growth. This has created a resource gap and thus the need to bridge this gap. FDI has become one of the additional sources of capital that can augment the existing capital for economic growth and development. For instance, Sub-Saharan Africa (SSA) as a region now has to depend very much on FDI for so many reasons some of which are highlighted by Asiedu (2002). The effort by several African countries to improve their business climate stems from the desire to attract FDI. According to Funke and Nsouli (2003), one of the pillars on which the new partnership for Africa's development (NEPAD) was launched was to increase available capital through a combination of reforms, resource mobilisation and a conducive environment for FDI.

The neoclassical researchers regard FDI and international capital flows as closing the savings gap in developing countries (Chenery and Bruno, 1962). De Mello (1999) argues that FDI is a composite of bundle of capital stock and technology that can augment the existing stock of knowledge in the host economy through labour training, skill acquisition and diffusion, the introduction of new managerial practices and organizational arrangements. Therefore, FDI has become an important source of private external finance for developing countries. There is a theoretical basis to suggest that FDI will improve developing countries economic

performance. In this light, policy makers across developing countries create policies that are favourable to FDI. Gorg and Greenaway (2004) demonstrate that FDI is a key driver of economic growth and development. Thus, FDI not only boosts capital formation but also improves the quality of investment.

This thesis commences by examining the drivers of bilateral flow of FDI with emphasis on financial market development (FMD) using the gravity modelling approach. The service sector has been recognised as the largest sector in Africa's stock of FDI (WIR, 2015). In addition, Mensah et al. (2016) have indicated that in terms of sectoral composition, the service sector has been the dominant sector. Hence, the possibility to advance Africa's economy is substantial and growing attractiveness for services FDI. Therefore, Chapter 3, the first empirical part of this thesis focuses on one aspect of the service sector (financial sector) and specifically, examines the determinants of bilateral flows of FDI with the emphasis on FMD in both host and source countries. FMD is recognised as one of the factors that may condition the growth effect of FDI. Thus, it has been seen as one of the absorptive capacities in the host economies to ensure the growth promoting effect of FDI.

Following from the above, the second empirical part (Chapter 4) of this thesis investigates the effect of FDI on economic growth conditioned on a financial system that accounts for financial market fragility. A financial system is said to be fragile when banks are unsound or the financial markets are unstable. These elements of financial market fragility affect the development of the financial market and thereby hurt economic growth. Therefore, the need to account for fragility in the development of the financial market. It has been argued that the mechanism through which the benefits of financial market development on growth can be weakened is that of financial fragility (Demetriades et al., 2017).

However, the upsurge in economic activities such as globalisation can cause extensive environmental damage and this can affect the developmental goals of future generation. In other words, the development today should not affect future generations (sustainable development). Increase in FDI has a deep implication for the process of economic growth and this may have worrisome impact on the host country's ecosystem. Researchers over the years have been cognisant of the potential for the increase in the flow of FDI to negatively affect the environment. For instance, an internal World Bank memo signed by Chief Economist Lawrence Summers and leaked to the Economist (1992). In this memo, Summers

appeared to have urged the World Bank economists to encourage pollution intensive industries to migrate to developing countries. He argued that it is cost-effective to site these industries in developing economies where the loss of earnings due to increased mortality and morbidity is small. This event has brought the question of whether the surge in international trade or the flow of FDI is good or bad for the environment.

FDI to developing countries have been rising sharply over the past decades. As such, Africa today is a 'bright spot' (UNCTAD, 2013) for FDI as it remains a fast growing destination. At the same time, the connection between FDI and environmental issues, particularly in developing countries have been a subject of considerable debate. For this reason, in order to attain sustainable economic growth, an aspect of SDG 8, in Chapter 5, the third empirical part of this thesis looks at the relationship between FDI and environmental pollution. It is generally argued that multinational firms engaged in highly polluting activities move to developing countries with lax environmental standards, where the cost of complying with environmental regulations is very low, thus giving rise to the so-called "pollution havens." Thus from environmental perspective, this chapter tries to investigate the impact of FDI to African countries on their environment in terms of pollution and to prescribe the right policies measures to be implemented in order to derive the maximum benefit from FDI to attain SDG 8.

1.2. Contributions of the thesis

The main contributions of this thesis are as follows: first, it has been observed that a better and a well-developed financial market acts as one of the conditions that determine the absorptive capacity of FDI receiving country (Hermes and Lensink, 2003; Alfaro et al., 2004; Levine, 2005). Hence, empirical evidences have shown that it is not only pull factors but also push factors are responsible for bilateral FDI flows (Alfaro et al., 2004; Bilir et al., 2014; Klein et al.; 2002). However, in addressing the above issue, existing studies have used various indicators as proxies to measure the impact of financial market development on FDI. These indicators have focused exclusively on commercial banks to the neglect of deposit-taking institutions and investment banks. Thus, in the first empirical chapter, the contribution of this study is the usage of a unique dataset on the financial sector to measure the development of the financial market, which have a wider coverage than the existing ones, thereby complementing the existing literature. In addition, the thesis explores the gravity model to

examine financial market development in both host and source countries on bilateral flows of FDI on which there is a very scarce empirical literature pertaining to Africa.

Secondly, empirical studies have provided evidence to support the significant role of financial markets in ensuring the growth promoting effects of FDI. However, there seems to be a missing link in the role of financial market development in the FDI-growth link. Existing studies have ignored the impact of financial fragility in the development of the financial market, thereby affecting its role in the above link. Therefore, the second empirical chapter of this thesis contributes to the existing literature by investigating the FDI-growth nexus while accounting for financial fragility in the development of the financial market. To the best of my knowledge, this is the first paper to attempt a comprehensive study on the effect of FDI on economic growth contingent on financial fragility in financial market development.

Lastly, from the pollution haven effect, pollution intensive firms may relocate to developing countries where there are laxity in environmental standards. Therefore, the increase in the cost of production for these firms in developed countries due to high environmental tax makes such firms find developing countries an attractive destination. However, the literature on FDI and its links to environmental pollution is scarce in Africa, a region that has become a good destination for the attraction of FDI. For this reason, in the third empirical chapter of this thesis, I extend the literature by providing direct evidence from Africa on the relationship between FDI and environmental pollution. This paper adds to existing literature by conducting a comprehensive analysis of the effects of FDI on the environment based on income groupings, natural resource endowment and environmental performance.

In conclusion, this study has used three panel approaches to provide evidence on the role of FDI in spurring economic growth and its eventual impact on sustainable environmental development in Africa. The study combines appropriate methodologies that satisfy internal and external validity tests that authenticate our results for policy purposes. Hence conclude that FDI's true effect on economic growth and poverty reduction (if not poverty alleviation) is contingent on a strong financial market development. This study recommends measures that will help build strong financial markets, as it is key in harnessing the full potential of FDI in Africa. However, it is understood that this positive role on growth is not without its negative effect on sustainable environmental development. Therefore, the study

recommends that Africa in its quest to attract FDI should not be oblivious of its associated impact on the environment. Thus, somewhat stringent environmental regulations that attract FDI within the context of environmental friendliness is highly recommended.

1.3. Structure of the thesis

To achieve the aim and to examine the arguments of this thesis, it is designed to include six chapters. Chapter one is the general introduction. Chapter two presents a background of an illustrative framework on gravity modelling, micro-foundations of the gravity model and economic growth, FDI and financial system. In addition, chapter two provides a brief review of theories of economic growth, environmental regulatory competition and FDI. Chapter three is the first empirical chapter, titled as *'Financial Market Development and Bilateral FDI in Africa: Evidence from the Gravity model.'* This chapter empirically investigates the determinants of bilateral FDI in Africa focusing on financial market development in the host and source country under the gravity model framework. Chapter four is the second empirical chapter, titled as *'FDI-Growth Nexus in Africa: Evidence from the new financial fragility measure.'* This chapter provides an empirical evidence of the FDI-growth nexus in Africa conditioned on financial market development that accounts for financial fragility. Chapter five is the third empirical chapter, titled as *'Foreign Direct Investment and Environmental Pollution: Evidence from Africa.'* This chapter examines the effects of FDI on environmental pollution in Africa by disaggregating the continent into various groupings such as income status, natural resource endowment and environmental performance. Finally, chapter six concludes this thesis by highlighting the summary of key findings, policy implications, limitations of the study and recommendations for further study.

Chapter 2

Theoretical Framework and Description of Gravity modelling, FDI, Economic Growth and Environmental regulations.

2.1. Introduction

This chapter presents an illustrative framework on the gravity modelling as well as the micro-foundations of the gravity model. In addition, the chapter focuses on a brief description of growth theories and a theoretical framework that explains the link between economic growth, FDI and financial system. The latter will provide the explanation for how FDI affects economic growth in the host country via the financial system. Finally, this chapter also presents a review on theories of environmental regulations and FDI.

2.2. Gravity-modelling framework

The gravity equation is an empirical model that explains trade between two countries in terms of their incomes or populations and factors stimulating or restraining bilateral trade among them. The model has been used in empirical studies in international trade, however recently it has been employed in studies of bilateral flows of FDI. The model used to suffer from the absence of theoretical underpinnings until it began to attract more attention from theoretical economists. Over the last decade, it has been given a solid theoretical foundation in the trade literature. In search of an acceptable theory, a number of different theories have been developed in support of the gravity model. The differences in these theories help to explain the various forms of the gravity equations and the differences among the results.

The earliest gravity model emerged in the 1960s as an empirical model with hand-waving theoretical underpinnings. The formulation of the model is rooted in physics and the approach was based on the physical laws of gravity and electrical forces. The conclusion was that the volume of economic transaction between two countries is equal to the product of the potential trade capacities of the two countries divided by any trade resistance such as the distance factor. This can be seen in studies by (Tinbergen, 1962 and Poyhonen, 1963) which conclude that incomes of the trading partners and the distance between them are statistically significant of their expected signs.

Linnemann (1966) introduced another approach of deriving the gravity model. The model is based on the Walrasian general equilibrium model, with each country having its own supply and demand function for all goods. Aggregate incomes in two countries proxy the level of demand in the importing country and the level of supply in the exporting country. In this

approach, the gravity model is seen as a reduced form of equation for trade volume and transport costs proxy by distance that drive a wedge between demand and supply.

There is also an explanation for the gravity equation (Leamer and Stern, 1970) based on the probability model. They tried to predict the flow of trade between countries and regarded it as a stochastic trade flow event. In their famous 1970 book provided some foundations and based on the 'potluck assumption', nations produce their goods and throw them all into a pot; then each nation draws its consumption from the pot in proportion to its income. The expected value of nation- i's consumption produced by nation- j will amount to the product of nation- i's share of world gross domestic product (GDP) times nation-j's share of world GDP. Hence, bilateral trade is proportional to the product of the GDP shares.

However, recent micro-foundations approach to the gravity model asserts that the other approaches lack strong theoretical foundations. Anderson (1979) seems to be the first to provide clear micro-foundations by assuming product differentiation with Cobb-Douglas and Constant Elasticity of Substitution (CES) preferences. He argued that products were differentiated by country of origin (Armington assumption) and modelled preferences over traded goods only. It is important to note that, the strength of Anderson's theory rested on assumption that was viewed as ad hoc at the time, namely that each nation produced a unique good that was only imperfectly substitutable with other nation's goods. None the less, in the 1970s and 1980s, the gravity model fell into disrepute and for instance, Deardorff (1984), refers to the gravity model as having 'somewhat dubious theoretical heritage'.

The next set of theoretical foundations for the gravity model came when Bergstrand (1985) sought to provide theoretical foundations based on the old trade theory. He also used CES preferences over Armington-differentiated goods to derive a reduced form of equation for bilateral trade that involves price indices. In particular, he developed a theoretical link between factor endowments and bilateral trade. Bergstrand estimated his system in order to test the assumption of product differentiation. His empirical result reveals that goods were not perfect substitutes rather imports were closer substitutes for each other than for domestic goods.

Bergstrand (1989) re-examined his earlier effort using the Helpman-Krugman model (1985) that combined the new and old trade theory. He assumed monopolistic competition and therefore product differentiation among firms rather than countries. This line of research has been supported by the claim of (Helpman and Krugman, 1985; Helpman, 1987) that monopolistic competition is the source of gravity in international trade. The emergence of the new trade theories in the late 1970s and early 1980s started a trend where gravity equations moved from having too few theoretical foundations to having too many.

Eaton and Kortum (2002), more recently provide micro-foundations for the gravity model by using a similar framework to homogeneous goods with gravitational forces**.** In the midst of various attempts to underpin the theoretical foundation of the gravity model, many researchers have evaluated the usefulness of the gravity model in testing alternative theoretical models of trade. For instance, Deardorff (1998) argues that it is not very difficult to justify even simple forms of the gravity equation from standard trade theories. Anderson and van Wincoop (2003), is also a recent well-known effort to micro-found the gravity model. They derive the gravity equation in a practical way by using the full expenditure system to estimate the key parameters on cross-section data as well as the use of nation dummies. In addition, Head and Ries (2008) have provided theoretical micro-foundations for gravity model of FDI.

From the above discussion, it is clear that gravity models can be derived from a number of models including; the Ricardian, Armington, Monopolistic Competition and Heckscher-Ohlin models. Grossman (1998), points out that it is not the monopolistic competition but the specialisation that generates the force of gravity. In summary, a basic formulation of the gravity model involves the combination of three sets of factors in determining the size of bilateral trade flow namely: the economic forces at the origin of flow, economic forces at the destination of flow and economic forces either stimulating or resisting the movement of flow from the origin to the destination.

2.2.1. Micro-Foundations of the Gravity model

Borrowed from the physics literature, Isaac Newton's law of universal gravitation states that the force of gravity between two objects is proportional to the product of the masses of the two objects divided by the square of the distance between them. Mathematically, the law of universal gravitation can be written as follows:

$$F = G\frac{M_1 M_2}{r^2} \tag{2.1}$$

which states that the force of gravity, F between two objects is proportional to the product of the masses of the two objects $(M_1 and M_2)$ divided by the square of the distance, r , between them and G is a constant. In trade or bilateral flows of FDI literature, the force of gravity is replaced with the value of bilateral trade or FDI, the masses $M_1 and M_2$ are the income levels of the two countries and r is the distance between them. Following Baldwin and Taglioni (2007), the simplest way to derive theoretically the gravity model is to impose a market-clearing condition on the expenditure equation as well as using the CES preferences for differentiated varieties.

The expenditure share identity for a single good exported from the source country to the destination country is given by:

$$P_{ij}X_{ij} = \ share_{ij}E_j \tag{2.2}$$

where X_{ij} is the quantity of bilateral exports of a single variety from the source country i to the destination country j, P_{ij} is the price of good in the destination country also called the landed price and E_j reflects the GDP in the destination country. Hence, the right hand side of equation 2.2 is the share of expenditure in the destination country on typical variety from the source country.

Adopting the CES demand function and assuming that all goods are traded, the destination country imported good's expenditure share is linked to its relative price by:

$$Share_{ij} = \left(\frac{P_{ij}}{P_j}\right)^{1-\sigma} \tag{2.3}$$

where the left hand side represents total spending in the host country j on a variety produced in the source country i, P_{ij} is the consumer price in the host country of a variety produced in source country, P_j is the price index of all traded goods in the host country and σ is the elasticity of substitution among all varieties (all varieties from each nation are assumed to symmetric). The microeconomics explanation from equation (2.3) is that expenditure shares depend on relative prices and income levels, however in this case, the expenditure share is assumed to depend on relative prices only.

For profit maximisation by producers in the source country, we assume that the price-cost mark-up is a parameter (as in Dixit-Stiglitz monopolistic competition or perfect competition

with Armington model). The landed price in the host country of goods produced in the source country are linked to the production costs in source country and therefore, the bilateral mark-up and bilateral trade costs is shown in equation (2.4)

$$P_{ij} = P_i \tau_{ij} \tag{2.4}$$

where P_i is the producer price in the source country and τ_{ij} represents all bilateral trade costs. Assuming symmetry of varieties for convenience and aggregating across individual goods yields:

$$V_{ij} = n_0 share_{ij} E_j \tag{2.5}$$

where V_{ij} is the aggregate value of bilateral trade flow from the source country to the destination country and n_0 is the number of varieties produced in source country and sold in the destination country. From equation (2.5) and combining equations (2.3) and (2.4), we obtain the expenditure function:

$$V_{ij} = n_0 \left(P_i \tau_{ij}\right)^{1-\sigma} \frac{E_j}{P_j^{1-\sigma}} \tag{2.6}$$

The market-clearing condition requires that supply and demand match, thus summing equation (2.6) over all destinations is set equal to the source country's total output (Y_i). In addition, it is assumed that $i = j$, to allow for trade within countries borders. This implies:

$Y_i = \sum_{j=i}^{R} V_{ij}$, where R is the number of countries from which the destination country trade with.

Therefore, the market clearing condition for source country becomes:

$$Y_i = n_0 P_i^{1-\sigma} \sum_{j=1}^{R} \left(\tau_{ij}^{1-\sigma} \frac{E_j}{P_j^{1-\sigma}}\right) \tag{2.7}$$

Solving for $n_0 P_i^{1-\sigma}$ in equation (2.7) gives $n_0 P_i^{1-\sigma} = \frac{Y_i}{\mathbb{\Pi}_i}$, where $\mathbb{\Pi}_i = \sum_{j=1}^{R} \left(\tau_{ij}^{1-\sigma} \frac{E_j}{P_j^{1-\sigma}}\right)$

Substituting this market –clearing condition in the expenditure function (equation 2.6) yields the gravity equation:

$$V_{ij} = \tau_{ij}^{1-\sigma} \left(\frac{Y_i E_j}{\mathbb{\Pi}_i P_j^{1-\sigma}}\right) \tag{2.8}$$

Equation (2.9) is the micro-founded gravity equation, which is identical to Anderson and van Wincoop (2003). For econometric implementation of equation (2.8), E_j is proxied by

destination country's GDP, Y_i is proxied by the source country's GDP, $\mathbb{\Pi}_i P_j^{1-\sigma}$ is the unobservable multilateral trade resistance term, which reflects third-country effects and σ is a parameter greater than 1 that denotes the constant elasticity of substitution between varieties for countries i and j . Finally, τ is proxied by bilateral distance between source and destination country. The interpretation of the model is that bilateral trade is a positive function of the size of the trade partners and it is a negative function of the distance between them. This framework according to Anderson (2011) can be used for factor flows such as bilateral FDI.

2.3. Growth Theories

Growth theory explains the conditions, which are essential for growth to occur. It also provides models, mechanisms, explanations and a predictive framework for understanding the factors that encourage economic growth. According to De Jager (2004), there have been many theoretical and empirical attempts to identify the factors that can propel economic growth and performance in order to offer suggestions for policymakers to fill the gap between developed and developing countries, and to create sustainable development. Therefore, this section presents the growth theories, namely the exogenous growth theory and the endogenous growth theory. These carefully investigate the recent developments in economic growth theories. Thus, examine the important drivers of economic growth in the short run and long run.

2.3.1. Exogenous Growth Theory

Solow (1956) pioneered the exogenous growth theory, also known as the neoclassical growth model or Solow- Swan growth model. In this theory, the neoclassical production function used relates output to factor inputs, which consist of the stock of accumulated physical capital goods and labour. The theory assumes that sustained economic growth occurs through exogenous factors of production such as the stock of capital accumulation and labour (Barro and Sala-I-Martin, 1995).

According to this growth theory, an increase in the stock of capital goods will lead to a less than proportionate increase in output, provided the amount of labour employed and the level of technology remain constant (Barro and Sala-I-Martin, 1995; De Jager, 2004). Therefore, economic growth occurs only in the short run and this is determined by capital stock accumulation, which is determined by the rate of saving and the rate of capital depreciation.

However, in the neoclassical growth model, per capita output grows in the long run only because of exogenous technological progress and this takes the form of labour augmentation (Barro and Sala-I-Martin, 1995). Thus, the growth of the economy depends on capital stock accumulation and the augmentation of labour force by technological progress. Generally, this model postulates that FDI boosts capital stock in the host economy and therefore, promotes economic growth towards a new steady state due to accumulation of capital formation. Hence, FDI affects economic growth in the short run through diminishing returns to capital.

The main limitation of this growth theory is that though it identifies technological progress as determinant of economic growth, the model leaves unexplained what determines the technological advancement as well as long run economic growth. The dissatisfaction with neoclassical growth theory led to the development of the endogenous growth theory; also known as the new growth theory.

2.3.2. Endogenous Growth Theory

In the mid-1980s, it became increasingly clear that the exogenous growth model was theoretically unsatisfactory as a tool to explore the determinants of long run growth (Barro and Sala-I-Martin, 1995). Therefore, Romer (1990), who assumed that aggregate productivity is an increasing function of the degree of product variety, initiated endogenous growth theory, generally known as 'innovation-based' growth theory. The endogenous growth theory is an economic theory that argues that economic growth is generated from within a system as a direct result of internal processes. More specifically, the theory suggests that the improvement of a nation's human capital will lead to economic growth by means of the development of new forms of technology and efficient and effective means of production.
Economic growth is derived from the stock of human capital and technological changes (De Jager 2004). This theory explains long run economic growth from a model of technological progress and therefore, endogenizes the rate of technical change, a variable unexplained in the neoclassical growth model. The fundamental feature of this theory is the absence of diminishing returns to capital in the long run. The theory argues that technological progress is improved endogenously by taking knowledge for instance, from research and development (R&D) and that the development of this knowledge can create positive externalities and growth spillover effects (Barro and Sala-I-Martin 1995).

Endogenous growth theory identifies economic growth as promoted in the long run by the introduction of new technological production processes in the host country, and that FDI is assumed more productive (De Mello, 1999). Therefore, FDI promotes economic growth through technological spillovers. In addition, FDI is expected to enhance the existing stock of knowledge in the host country, through labour training and skill acquisition and technology diffusion. The Romer growth model is particularly relevant for developing economies, because it deals with technological spillovers that are common features of recent globalisation and industrialization processes.

It is worth noting that, the comparison of the impact of FDI through buying existing factories (M&A) with that of Greenfield FDI assumes that the two modes of foreign entry constitute alternatives from the perspective of both host nations and MNCs. An acquisition is the buying of ownership in an existing local firm in an amount sufficient to confer some control while, a Greenfield investment refers to a start-up investment through establishing new production capacity. The differences between these two modes of entry are usually analysed in the framework of FDI entry mode literature. The entry mode decision is affected by firm, industry and country-specific determinants. However, in this chapter the focus is on Greenfields investments only as this is what the data covers.

2.4. Theoretical framework on economic growth, FDI and financial system

In this section, we present a simple endogenous growth model in which FDI has a positive effect on growth contingent on the local financial market as an absorptive capacity. The relevance of the local financial market as a precondition in the FDI-growth link can be illustrated with a simple model of technological change. The model is in line with recent theories that emphasise the role of FDI in enhancing technological change through technological diffusion especially via the imitation channel.

Following the framework of the technological change models developed by Hermes and Lensink (2003) adopted from Barro and Sala-i-Martin (1995 and 2004) and Borensztein et al. (1998), it is possible to express a formal model that shows how the positive effects of FDI on economic growth contingent on the development of the domestic financial market. In the model, technical progress is assumed to be represented through the variety of capital goods available. There are three types of agents in this model. First, the producers of final goods hire labour and intermediate inputs and combine them to produce the final good.

Second, R&D firms (innovators) that devote resources to invent new products and finally, consumers or households maximise utility subject to the budget constraint.

The production function for firm i follows Spence (1976), Dixit and Stiglitz (1977) type:

$$Y_i = AL_i^{1-\alpha}\left(\sum_{j=1}^{N} X_{ij}^{\alpha}\right) \tag{2.9}$$

where Y_i is output, L_i is labour inputs, X_{ij} is the varieties of intermediate goods, N is the number of varieties of intermediate goods and α is a measure of substitutability, which lies within the range $0 < \alpha < 1$. A is the productivity parameter, which is also the overall measure of productivity or efficiency. The productivity parameter A can represent the differences in the level of technology and therefore, differences in output for a given values of N, $L_i$andX_{ij}.

For an increase in N varieties, the quantity of output is given by:

$$Y_i = AL_i^{1-\alpha}(NX_i)^{\alpha} \tag{2.10}$$

From this equation, given N implies that production function exhibits constant returns to scale in L_i and NX_i, the total quantity of intermediate inputs.

The production function from equation (2.9) implies that the marginal product of the j^{th} intermediate good is given by:

$$\frac{\partial Y_i}{\partial X_{ij}} = \alpha AL_i^{1-\alpha}X_{ij}^{\alpha-1} \tag{2.11}$$

Since producers are competitive and therefore take the cost of input, W (wage rate) and the prices of intermediate goods as given, this yields the usual equality between the factor prices and marginal products. Hence, the marginal product of the j^{th} intermediate good is equal to it factor price, P_j resulting in the following equation and the price of output is set to unity.

$$P_j = \alpha AL_i^{1-\alpha}X_{ij}^{\alpha-1} \tag{2.12}$$

Solving for X_{ij} and by rearranging equation (2.12), the quantity demanded of j^{th} input, X_{ij} as a function of its factor price P_j.

$$X_{ij} = L_i\left(\frac{\alpha A}{P_j}\right)^{\frac{1}{1-\alpha}} \tag{2.13}$$

The R&D firms rely on technology to produce N varieties of intermediate goods. Hence, expansion of the number N demands a technological advance in the form of an invention, which allows the production of a new intermediate good. Therefore, the present value of returns from inventing or discovering the j^{th} intermediate good (see Barro and Sala-i-Martin, 2004) is given by:

$$V(t) = \int_t^{\infty} \pi_j(\vartheta).\, e^{-\bar{r}(t,\vartheta)(\vartheta - t)} d\vartheta \tag{2.14}$$

where $\pi_j(\vartheta)$ is the profit flow at date ϑ, and $\bar{r}(t,\vartheta)$ is the average interest rates between times t and ϑ. Thus, the producer's revenue at each date will be equal to the price times the amount of goods sold. Therefore, the flow of profit equals revenue less cost. Assuming the marginal cost of production and average cost of production is a constant and normalised to one (1), then the profit flow is given by:

$$\pi_j(\vartheta) = \left[P_j(\vartheta) - 1\right].X_j(\vartheta) \tag{2.15}$$

where $X_j(\vartheta) = \sum_i X_{ij}(\vartheta)$, substituting $X_{ij}(\vartheta)$ at a date ϑ from equation (2.13), gives the following equation:

$$X_j(\vartheta) = L\left(\frac{A\alpha}{P_j(\vartheta)}\right)^{\frac{1}{1-\alpha}} \tag{2.16}$$

The profit maximization problem follows from equations (2.15) and (2.16) as:

$$\pi_j(\vartheta) = \left[P_j(\vartheta) - 1\right].L.\left(\frac{A\alpha}{P_j(\vartheta)}\right)^{\frac{1}{1-\alpha}} \tag{2.17}$$

By rearranging and simplifying equation (2.17), gives the following:

$$\pi_j(\vartheta) = \left[P_j(\vartheta)\right]^{\frac{-\alpha}{1-\alpha}}.L(A\alpha)^{\frac{1}{1-\alpha}} - L\,(A\alpha)^{\frac{1}{1-\alpha}}.P_j(\vartheta)^{\frac{-1}{1-\alpha}}$$

From the first order condition, maximum profit requires that $\frac{\partial \pi_j(\vartheta)}{\partial P_j(\vartheta)} = 0$.

$$\frac{\partial \pi_j(\vartheta)}{\partial P_j(\vartheta)} = \frac{-\alpha}{1-\alpha}\left[P_j\,(\vartheta)\right]^{\frac{-1}{1-\alpha}}.L(A\alpha)^{\frac{1}{1-\alpha}} - \frac{-1}{1-\alpha}\left[P_j(\vartheta)\right]^{\frac{-2+\alpha}{1-\alpha}}.L(A\alpha)^{\frac{1}{1-\alpha}}$$

Simplifying and rearranging the above equation yields:

$$P_j(\vartheta) = \frac{1}{\alpha} \tag{2.18}$$

The second order condition for profit maximization requires that $\frac{\partial^2 \pi_j(\vartheta)}{\partial P_j(\vartheta)} < 0$ and therefore from the first order condition,

$$\frac{\partial^2 \pi_j(\vartheta)}{\partial P_j(\vartheta)} = \frac{\alpha}{(1-\alpha)^2}\left[P_j(\vartheta)\right]^{\frac{-2+\alpha}{1-\alpha}} . L(A\alpha)^{\frac{1}{1-\alpha}} - \frac{2-\alpha}{(1-\alpha)^2}\left[P_j(\vartheta)\right]^{\frac{-3+2\alpha}{1-\alpha}} . L(A\alpha)^{\frac{1}{1-\alpha}}$$

The second order derivative simplifies to $\frac{\alpha}{2-\alpha} < \left[P_j(\vartheta)\right]^{-1}$

Rearranging the above equation gives the sufficient condition for profit maximization:

$$P_j(\vartheta) < \frac{2-\alpha}{\alpha} \tag{2.19}$$

Given that α lies within the range $0 < \alpha < 1$ and the maximum profit $P_j(\vartheta) = \frac{1}{\alpha}$, it implies that $P_j(\vartheta)$ is always greater than 1. The second order condition $\frac{\partial^2 \pi_j(\vartheta)}{\partial P_j(\vartheta)} < 0$, therefore implies that $P_j(\vartheta) - \frac{2-\alpha}{\alpha} < 0$. Hence, this is satisfied for every value of α in the range.

Equation (2.18) is the monopoly price. The monopoly price is the mark up on the marginal cost of production and this price is the same for all goods.

Substituting P_j from equation (2.18) into equation (2.13), the solution yields the aggregate quantity produced of each intermediate good:

$$X_j = A^{\frac{1}{1-\alpha}} . \alpha^{\frac{2}{1-\alpha}} . L \tag{2.20}$$

Substituting for P_j and X_j from equations (2.18) and (2.20) into equation (2.15), the solution gives the flow of profit:

$$\pi_j(\vartheta) = LA^{\frac{1}{1-\alpha}} . \left[\frac{1-\alpha}{\alpha}\right] . \alpha^{\frac{2}{1-\alpha}} \tag{2.21}$$

Finally, from the present value return, equation (2.14) and substituting for $\pi_j(\upsilon)$ from equation (2.20) yields the inventor's net present value of profit at time t:

$$V(t) = LA^{\frac{1}{1-\alpha}} . \left[\frac{1-\alpha}{\alpha}\right] . \alpha^{\frac{2}{1-\alpha}} . \int_t^{\infty} e^{-\bar{r}(\vartheta - t)} d\vartheta \tag{2.22}$$

If there is free entry into R&D business and at equilibrium, quantity of R&D is non-zero at each point in time, then the constant cost of invention δ must be equal to $V(t)$, thus:

$$V(t) = \delta \tag{2.23}$$

From equation (2.23), differentiating the free entry condition with respect to time, using the formula for $V(t)$ from equation (2.22)[2] , gives:

$$r(t) = \frac{\pi}{V(t)} + \frac{\dot{V}(t)}{V(t)} \tag{2.24}$$

The above equation (2.23) implies that the rate of return on bonds, $r(t)$ equals the rate of return to investing in R&D. The rate of return from R&D equals the profit rate, $\frac{\pi}{V(t)}$ plus the rate of capital gain or loss due to the change in value of the research firm, $\frac{\dot{V}(t)}{V(t)}$ since δ is constant, the free entry condition in equation (2.23) implies that $\dot{V}(t) = 0$. From equation (2.24), it follows that the interest rate (rate of return) is constant and equal to $r = \frac{\pi}{\delta}$. Thus, interest rate (rate of return) r is the ratio of profit flow to R&D cost. Substituting for π from equation (2.21), yields the interest rate in the economy:

$$r = \left(\frac{L}{\delta}\right).A^{\frac{1}{1-\alpha}}.\left(\frac{1-\alpha}{\alpha}\right).\alpha^{\frac{2}{1-\alpha}} \tag{2.25}$$

where α denotes capital's share of income, L is labour input, A represents the productivity augmenting parameter (level of technology) and δ is R&D cost.

FDI enters the model through δ (R&D cost), assuming there are fixed maintenance costs, equal to 1 and fixed set up cost. Thus, the costs of innovation are assumed to be the same for all goods. Markusen (1995), points out that FDI by multinational corporations is one of the major sources of advanced technologies for developing countries. The knowledge spillovers may take place through imitation, competition, linkages and training. From the imitation channel, domestic firms may become more productive by imitating the more advanced technologies. Therefore, in the absence of FDI, acquiring necessary information for inventing new technologies will be too costly for domestic firms. In line with this, Borensztein et al. (1998) demonstrate that the cost of R&D depends on FDI, hence the higher the FDI inflow leads to a decline in the innovation cost. Thus, it is cheaper to imitate than to innovate. From the above, R&D cost (cost of discovering a new good) can be modelled using FDI:

$$\delta = f(FDI), \text{ where } \frac{\partial \delta}{\partial FDI} < 0.$$

[2] Leibniz's rule for differentiation of a definite integral. See the discussion in the mathematical appendix of Barro and Sala-i- Martin (2004).

The effect of the financial system enters the model through the productivity augmenting parameter A, often interpreted as capturing the level of technology. It is evident that, a well-developed financial sector may improve the growth of an economy. Thus, a well-developed financial system acts as a productivity-augmenting factor leading to higher economic growth. This implies that, A is a function of development of the financial sector (FMD) hence,

$$A = h(FMD), \text{ where } \frac{\partial A}{\partial FMD} > 0.$$

Equation (2.24), with the introduction of FDI and the financial sector can be written as:

$$r = \left[\frac{L}{f(FDI)}\right].h(FMD)^{\frac{1}{1-\alpha}}.\left(\frac{1-\alpha}{\alpha}\right).\alpha^{\frac{2}{1-\alpha}} \tag{2.26}$$

To link economic growth to equation (2.26), the model is closed and this describes the process of capital accumulation that is driven by the savings behaviour of households. Assuming that households maximise a standard intertemporal utility function:

$$U = \int_0^{\infty}\left(\frac{c^{1-\sigma}-1}{1-\sigma}\right).e^{-\rho t}\,dt \tag{2.27}$$

where $\rho > 0$ is the rate of time preference and $\sigma > 0$ is the magnitude of the elasticity of marginal utility of consumption. From the utility function, the intertemporal elasticity of substitution is given by $\frac{1}{\sigma}$.

Maximisation of the above utility, subject to a standard budget constraint and using the present value Hamiltonian, yields the well –known Euler condition for the growth rate of consumption:

$$\frac{\dot{C}}{C} = \frac{1}{\sigma}(r-\rho) \tag{2.28}$$

In a steady state, the growth rate of consumption equals the growth rate of output g.

Finally, substituting equation (2.26) into (2.28), gives the expression for the growth rate of the economy:

$$g = \frac{1}{\sigma}\left[\left(\frac{L}{f(FDI)}\right).h(FMD)^{\frac{1}{1-\alpha}}.\left(\frac{1-\alpha}{\alpha}\right).\alpha^{\frac{2}{1-\alpha}} - \rho\right] \tag{2.29}$$

From equation (2.29). It is now easy to verify that an increase in FDI inflow leads to an increase in the rate of growth of output (g) and that positive effect of FDI economic growth depends on the development of the financial sector. For instance, higher FDI inflow reduces set up costs (for the adaption of technology). This raises the rate of return on asset (r), thereby increasing savings as well as higher growth rate in consumption and output. The positive effect of FDI on growth will be greater the higher the productivity augmenting parameter (the level of technology), that is a well-developed financial sector. The more developed the financial system, the better it will be able to mobilise savings, screen and monitor investment projects that will contribute to higher economic growth.

2.5. Theories on Environmental Regulatory Competition

This section reviews the various theories on environmental regulatory competition in order to understand how countries adopt environmental policies in relation to the activities of MNCs.

2.5.1. Regulatory Chill theory

This theory refers to a situation where countries refrain from implementing stricter environmental standards in response to the fear of losing a competitive edge against other countries in obtaining FDI. In developing countries with little or no environmental regulations, this phenomenon is called 'stuck at the bottom effect'. Regulatory chill effect is common in developing countries, where governments are reluctant to revise or upgrade their environmental policies and regulations in response to the possibility of losing investors to other countries having lesser environmental regulations. Evidence on whether host countries alter their environmental regulatory system to attract FDI is not consistent and perhaps limited by the availability of information and data from host countries. There is however concerns that environmental laws and their enforcement can be subject to pressure to attract foreign investment. In order to understand how environmental regulations in developing countries affect FDI, a distinction between de jure and de facto regulatory chill theory is very crucial. De jure regulation are those comprising of official, formal rules and they may or may not be enforced and followed in practice. On the other hand, de facto regulation are reflected by practices and outcomes.

2.5.2. Race to the Top (Pollution Halo Effect)

This is a counter theory to the pollution haven and race to the bottom hypotheses. The theory asserts that strict or more stringent environmental policy and regulation can improve competitiveness in the market place by ensuring innovations and efficient ways of attracting foreign investors. This theory is expressed under the Porter's hypothesis and is also known as pollution halo effect or California effect (Vogel, 1995), where higher air standards in California led to other United States (US) adopting similar levels. However, this theory cannot be applied universally and it occurs mainly in high technology and energy intensive sectors.

2.5.3. Race to the Bottom

Closely related with the pollution haven hypothesis is race to the bottom. This is when host countries attempt to exempt or loosen their regulatory requirements in order to attract FDI. This competition for FDI inflow may result in 'race to the bottom' of environmental, labour and other standards. Thus, due to the intense competition for foreign investment, developing nations will seek to entice industry by lowering their domestic environmental standards. Due to international flow of goods and services, countries may adopt a race-to-the-bottom regulatory practice by setting lax environmental regulations in order to gain strategic trade advantages, in order to show that they are on the rising part of the environmental Kuznets curve.

2.5.4. Pollution Havens Hypothesis

Increasing FDI may have worrying impacts for the host country's ecosystems and social development. Foreign investors may relocate to countries that have a less strict or non-existent, regulatory regime and this is termed as pollution haven theory. In other words, investors will seek other countries to locate their industries where it will be cheaper as well as more efficient as regards to environmental regulatory requirements. The environmental Kuznets curve (EKC) is a reflection of the pollution haven hypothesis. This model suggests that the relationship between economic growth and environmental pollution due to expansion in economic activity conforms to an inverted-U curve. That is as per capita GDP increases, the amount of pollution after certain point decreases. A country's amount of pollution rises with development and industrialization up to a turning point, after which they fall again as the country uses its increased income to reduce the pollution level, suggesting

that the cleaner environment in developed countries comes at the expense of a dirtier environment in developing countries.

One factor that has contributed to pollution in countries with lax regulations has been FDI. In order to know the role of FDI in determining the extent of pollution in host developing countries; the next section reviews the various theories of FDI that expounds on the location and type of FDI inflows.

2.6. Theories of FDI

The neo-classical researchers regard international flow of capital and FDI as bridging the savings gap in developing countries (Chenery and Bruno, 1962). Therefore, we expect capital to flow from developed to developing countries as suggested by developments in the Heckscher-Ohlin approach to trade (Mundell, 1957). This is because capital is scarce in developing countries and that should lead to profitable investment opportunities for capital in developing countries. Currently, the location advantages are at the core of the investment decision-making process. Hence, the choice of location is influenced by the behaviour of the firm as regards its motivation. Dunning (1992) highlights the important role of the location advantages in investor's decision –making process.

2.6.1. The OLI paradigm

International business economists such as Dunning (2001) has explained the emergence of multinationals using an eclectic paradigm for FDI, the Ownership-Location-Internalisation (OLI) framework. This concept is seen as the benchmark for explaining the appearance, structure and location of FDI in recent times. The paradigm incorporates elements from different theories: international trade, investment location, monopoly and internalization advantages and ownership advantages. The internationalization of production arises because of three factors: ownership advantages (O), location advantages (L) and internalization advantages (I). Dunning argues that all the three advantages are important for establishing the size and structure of FDI. Multinationals need to have some firm specific asset that differentiates them from domestic firms to compensate for the extra costs in terms of local knowledge that a foreign firm must incur to operate in foreign markets. The firm specific asset (tangible and intangible) is called an ownership advantage. The tangible assets (such as natural resource, labour force and available capital) and intangible assets (information and technology, managerial and entrepreneurial skills, organizational systems, the brand

awareness). The internalization advantage (I) is ability of the multinationals to produce and trade through the network of its subsidiaries. The location advantage (L) is mainly the pull factors as regards to the host country's factor endowment, the market structure, legal system and among others. Dunning concludes that the O and I advantages are regarding the microeconomic theory of the firm, while the L advantages can be encompassed by the macroeconomic theory of the firm.

Dunning then defines four types of MNCs: Market-seeking (MNCs that serve market through investment rather than through exports), efficiency-seeking (MNCs using low labour costs), natural resources-seeking, and strategic asset seeking (seeking technology, skills or take over brand names). He identifies the size and growth of domestic and regional markets, the availability and cost of skilled labour, quality of infrastructure and institutional competence, agglomeration economies and service support systems, and macroeconomic policies of the host government as the factors influencing market-seeking FDI. With the efficiency-seeking FDI, he observes that the key significant determining factors are mainly production cost-related. Nonetheless, most emphasis is placed on factors such as the skill and professional elements of labour, the competitiveness of related firms, the quality of local infrastructure and institutions, human resource development, macroeconomic policies, and the relationship of all these with knowledge intensive FDI.

For natural resource seeking FDI, according to him, the most important factors influencing location include the availability, costs and quality of natural resources and their development, infrastructural development necessary for the exploitation of these resources, availability of joint-venture partners as well as investment incentives. Lastly, strategic asset-seeking FDI is influenced more by factors such as the availability of knowledge-related assets and the geographical dispersion of such assets, institutional and other variables influencing access to such assets by foreign investors.

2.6.2. The new trade theory

This theory is an alternative to the classical trade theories for explaining trade flows. The theory recognises that there are other reasons for FDI than differences in factor endowments and factor prices. Therefore, embraces increasing returns, imperfect competition and product differentiation in addition to the traditional comparative advantage paradigm.

Markusen (1984) and Helpman (1984) made the first attempt to integrate horizontal multinationals and vertical multinationals into the trade theory respectively.

2.6.2. a. The horizontal FDI model

Horizontal multinationals are multi-plant firms selling similar products in different locations. The main motivation for the investor is the market with growth potential in order to sell the product. The model is used to explain the pattern of global investment and the flow of FDI are determined by the dimension and growth potential of the host countries. The horizontal FDI can be substitute for exports. As opposed to the vertical model, Markusen and Maskus (2002) demonstrate that horizontal model is capable of explaining FDI inflow determinants which is supported by econometric evaluations. Markusen et al. (1996) present a unified approach to horizontal multinationals and suggest that horizontal FDI inflows are more likely to emerge if countries are similar in terms of size and factor endowment.

2.6.2. b. The vertical FDI model

Vertical multinationals separate production geographically into different plants to intra-industry trade. Helpman (1984) states that FDI incentives are due to differences in factor prices. The rational of this model is contained in the countries' different endowments with different factors of production (Markusen and Maskus, 2002). In this model, each stage of the process of production is achieved in different geographical regions. Thus, foreign investors will prefer countries with the lower cost of production factors. Lattore (2009) argues that the vertical model includes the existence of a minimum share of skilled labour in the host country, without which investment cannot take place.

2.6.3. Institutional theory and FDI fitness

This theory underscores the important role of institutions for attracting FDI. Assuncao et al. (2011) presents that FDI inflows are because of the competition or game between various governments. With respect to this, institutions in the various countries are seen as the ones that create the rules for the game. In line with this, Benassy-Quere et al. (2007) point to the increasing impact of institutions in the attraction of FDI inflows. The institutional FDI fitness is similar to the institutional theory, developed by (Wilhelms and Witter, 1998). The theory demonstrates the importance and active role of governments in taking economic measures as well as public policies in order to attract FDI. The author suggests that for the case of African countries, what matters for the attraction of FDI is the institutional variables

that can be changed through the actions of governments and not the traditional determinants of FDI. Therefore, the capacity of a nation to attract FDI depends on its ability to adapt or fit to the internal and external demand of economic agents. Government fitness is seen in terms of economic openness, low degree of intervention on trade and exchange rates, low corruption and high transparency. Market fitness on the other hand are the factors to generate high volume of trade, low transaction costs and quick access to finance. The fitness of a country depends on not only its capacity of attracting FDI but also absorbing and retaining FDI. Thus, the most attractive countries for FDI will be the ones that are more capable to adjust their environments.

From the above, it is seen that in addition to the traditional determinants of FDI inflows, the role of governments is essential, as governments may become an active partner for MNCs, having the possibility to create the enabling environment for investments and doing business in order to achieve sustainable development.

Chapter 3

Financial Market Development and Bilateral FDI in Africa: Evidence from the Gravity model.

Abstract

From the empirical literature, a well-developed financial market is recognised as one of the absorptive capacities not only a pull factor but also push factor in attracting bilateral flows of FDI. Previous studies have used various indicators that exclusively focused on commercial banks to measure financial market development (FMD) and examine its effects on bilateral flow of FDI. We use unique indicators on financial fragility as new measures of FMD and examine its effects on bilateral flow of FDI using the gravity model. The results from the linear estimation methods suggest that FMD in host country measured by liquidity is negative and significant implying that increase in this ratio affects the development of the market, thus discourages FDI inflows. In addition, when FMD is measured by bank capitalisation, the result reveals positive and significant coefficients for both host and source countries indicating that FMD is crucial in determining bilateral FDI. For the non-linear estimation method, the study finds similar results when FMD in the host country is measured by liquidity. However, for the source country, we rather found the result to be positive and significant, implying an increase in this ratio, which makes the market less liquid, rather encourages FDI. This could be attributed to fact that FDI depends less on the liquidity ratio of developing countries. In general, the study demonstrates that FMD is a push and pull factor in the determination of bilateral flow of FDI.

3.1. Introduction

Foreign direct investment (FDI) has remained one of the most important forms of cross-border capital flow into developing countries. According to a report by Science, Technology and Skills for Africa's Development (World Bank, March 2014) in 2012, FDI inflow into developing countries amounted to more than US$790 billion, exceeding by a wide margin the size of inward remittance (US$406 billion) and official development aid (US$126 billion) from traditional Organisation for Economic Co-operation and Development (OECD) donors. In addition, Africa today is a 'bright spot' (UNCTAD, 2013) for FDI as it remains a fast growing destination. As such, an unprecedented number of foreign investors have located their activities into Africa. Moreover, multinational corporations (MNCs) facilitate the transfer of resources, human capital and technological advancement between countries and thereby represent an important means by which the transitional economies can undergo growth and development. FDI enhances domestic innovation through the transfer of technology, leads to human capital development through the transfer of management skills and knowledge, provides market access, enhances productivity through the stimulation of competition in the domestic economy, and it reduces costs and improves economies of scale through the integration of the domestic economy with international economic activity.

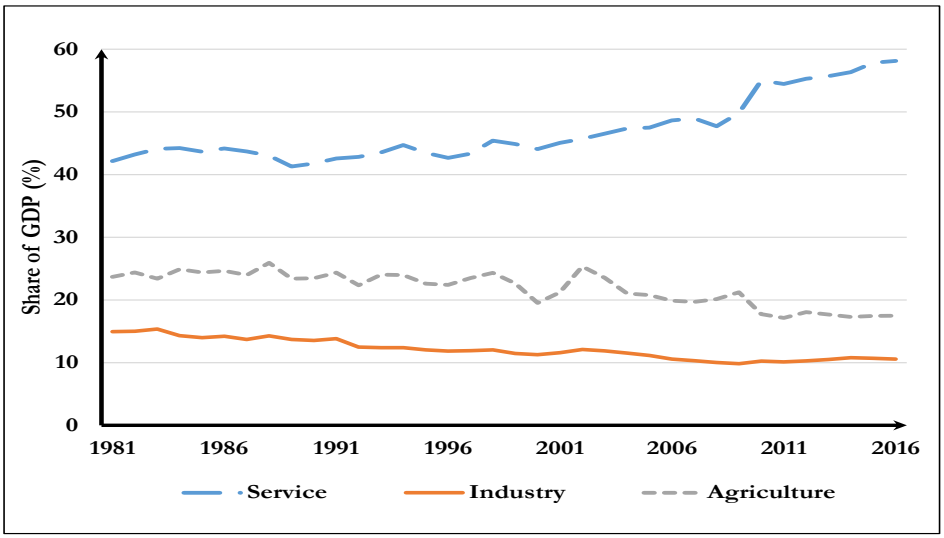
In effect, these capital inflows have provided the basis of much needed investment in the transitional-developing economies and a vital ingredient in their growth performance. Economic growth needs capital investment and the well-known Harrod-Domar model gives this relationship. It is worth noting that FDI adds to gross capital formation as well as increases the productivity of capital through improved competition, positive technological externalities and accelerated spill over effect. Hence, in order to attract more FDI, many African countries have designed policies that seek to improve their investment climate, liberalisation of their investment regulations, privatisation of state-owned enterprises and offer incentives to foreign investors. These policies are implemented to market the opportunities, raise the potential returns and reduce the obstacles and risks associated with FDI.

These goals have motivated many researchers to find the main drivers of bilateral flow of FDI, since they are identified as a cross-country investigation. They have focused on the host-country features with the view of designing policies to attract more FDI. Therefore,

analysing the driving factors of FDI from developed to transitional economies has received increased attention in recent years (Bevan & Estrin, 2004; Blonigen, 2005; Maatev, 2008).

Over the past decade, the service sector has spearheaded the growth of developing economies. Menash et al. (2016), point out that in terms of sectoral composition, data from the World Bank indicates that the service sector has been the dominant sector for African economies. A trend analysis of the contribution of each sector to GDP is shown in the figure below. The contribution of the service sector has seen an increasing trend between 1965 and 2013.

Figure 3.1: Trend Analysis of Sectoral Value Added to GDP



Source: World Bank (2015), World Development Indicators (WDI).

More so, World Investment Reports (WIR) 2015 indicate that the service sector is the largest recipient in Africa's stock of FDI. Available data shows that Africa's service FDI stock increased four-fold between 2001 and 2012. In addition, by 2012 more than half of Africa's service FDI stock was held in finance. Therefore, the potential to develop Africa's economy is significant and increasing attractiveness for services FDI, constitute an opportunity for policy makers. Hence many countries on the continent have reformed their investment laws, liberalising trade, improving the financial system and among others. From all indicators, the service sector is currently driving the economies of African countries. This study is motivated to look at one aspect of the service sector (financial sector) and examine its impacts on bilateral FDI to Africa.

It has been argued that the spillovers effect of FDI on economic growth can only be efficient under certain features of the environment in the host country. These conditions determine the absorptive capacity of the FDI-receiving country. This absorptive capacity (known as the pull factor) has been analysed from different angles. For instance, Borensztein et al. (1998) suggest that the human capital policies as the necessary condition for FDI's growth promoting effects. In addition, there are number of channels through which the positive effect of FDI on economic growth works. These are along the lines of market size, natural resource endowment, trade liberalisation policies and a host of other factors.

Recent empirical literature provides evidence that a better and a well-developed financial market lowers the costs of conducting transactions and ensures that savings are channelled to productive investment as well as allowing for risk diversification. Therefore, a developed financial market has been described as one of the conditions that also determine the absorptive capacity of FDI receiving country (Hermes and Lensink, 2003; Alfaro et al., 2004; Levine, 2005). Generally, it is believed that the financial systems in Africa are relatively less developed compared to other regions of the world (Honohan and Beck, 2007; Andrianova et al., 2010; Allen et al., 2011; Kuada, 2016). Up to date, African countries are working towards integrating with the world economy with a liberalized financial system as the key policy device for stimulating high growth performance. In other words, policy makers and various governments on the African continent have embraced the financial system liberalization and reform agenda. This reform agenda (see: Kim and Singal, 2000; Bekaert et al., 2005 and among others) has widely been accepted. Therefore, influential international development organizations, such as the International Monetary Fund (IMF) and World Bank have bought into it and are pushing for financial system reform, liberalization and development among its member states; especially the developing and emerging economies.

Countries that have fragile financial markets are susceptible to shocks that make the development of their financial markets extremely vulnerable and this has a negative effect in attracting FDI. Empirical works by Bilir et al. (2014) and Alfaro et al. (2010) suggest that financially developed countries are able to attract more MNC subsidiaries. That is better developed local financial markets that are resilient tend to be associated with higher aggregate FDI inflows. Hence, the benefits of a better financial market development in the host country makes easy availability of intermediate input and this encourages FDI, because foreign firms depend on such local input (Alfaro et al., 2010). In addition, a well-developed

financial market expands local market size thereby promoting market-seeking FDI (Desbordes and Wei, 2017). Thus better financial market development in host countries attracts FDI.

In addressing host country conditions necessary for FDI's growth promoting effects, it is important to consider the source country's condition (known as the push factor); therefore, the development of the financial market in the source country also matters. For instance, foreign investors might be credit constrained at home and this might affect their ability to invest abroad. Studies by Desbordes and Wei (2017) suggest that FDI consists of fixed costs since an affiliate has to be established or acquired in the host country. The availability of fund makes it easier and thus access to financing depends on how developed the financial market is in the source country. In a similar vein, Klein et al. (2002) in their relative access to credit hypothesis, postulates that outward FDI depends on the ability of potential investors to raise funds. In their study, they find that firms 'associated with less healthy banks' are less likely to engage in FDI. Hence, it is expected that a better financial market development in the source will result in higher outward FDI.

From the above discussions, it is evident that both pull and push factors are necessary in attracting FDI and thus it is crucial for policy makers to know the forces of attraction (the determinants) of bilateral FDI in order to ascertain the desired benefits. It is against this background that this study examines the determinants of bilateral FDI in Africa. In particular, it emphasises the role of financial institutions and argues that the absence of a well-developed financial market as a pull and push factor can limit the economy's ability to take advantage of potential FDI spillovers. It is unclear whether what matters for bilateral FDI aside from the core gravity model variables (market size and distance) is only host countries characteristics, source countries characteristics or both. It is important to note that addressing both characteristics in host and source countries simultaneously might enable the source –host pair to ascertain the desired targets. For instance, favourable source characteristics will increase the ability and capacity to invest abroad. On the other hand, for the host countries, favourable characteristics will help attract more FDI for their economic development.

Previous studies have used various indicators (domestic credit to the private sector, ratio of M3 to GDP, stock market capitalization ratio to GDP, bank deposit to GDP and among others) as proxy to measure the development of financial market and its effects on inward FDI. The existing financial sector datasets (which are narrow) focus exclusively on commercial banks to the neglect of other deposit-taking institutions and investment banks. Bordo (2008), reports the pivotal role played by investment banks and real estate and mortgage banks in the latest global financial crisis. It is therefore likely that, their omission may lead to under-measurement of financial fragility thereby affecting the development of the financial market. It is believed that a financial system which is fragile, is unsound and therefore, does not create the enabling environment that is conducive for attracting FDI.

In the voluminous FDI literature, very little has been published about the gravity model on the African continent. However, it is worth noting that this study complements few studies such as (Gast, 2008; Tansey and Touray, 2010; Didia et al., 2015), which have used gravity models on African data. Africa provides an interesting context in which to study FDI, as a substantial share of economic growth in Africa is directly attributed to FDI (Whalley and Weisbrod, 2012). This chapter contributes to the existing literature in several ways. Primarily, it uses unique banking data on the financial sector by Andrianova et al. (2015) to measure the development of the financial market and examine its effects on the bilateral flow of FDI. This new data set has a wider coverage thus; it incorporates all deposit-taking institutions and investment banks. Furthermore, the present study examines the impact of the development of the financial market in both host and source countries by estimating a gravity equation for bilateral FDI stock. Therefore, the study provides comprehensive insight into the potential effect of the development of the financial market on the bilateral flow of FDI to African countries.

In order to achieve this objective, the study uses panel data on bilateral FDI stock to investigate whether the development of the financial market in both host and source countries influence bilateral flows of FDI to the host economies. Using both linear and non-linear estimation techniques of the gravity model, the study finds that a better-developed financial market in the host country especially is a vital ingredient for the attraction of bilateral FDI.

The rest of the chapter is structured as follows: Section 3.2 presents an in-depth review of existing studies on source or host county characteristics and bilateral FDI. In addition, a review on the core variables of the gravity model, financial market development and bilateral FDI. Section 3.3 details the empirical framework, Section 3.4 introduces the data set used, Section 3.5 discusses the estimation results and Section 3.6 summarizes the findings and presents policy implications.

3.2. Empirical Review

3.2.1. Host or Source Country Characteristics and Bilateral Flows of FDI

Most authors have used the gravity model with an additional vector of explanatory variables to explain the determinants of bilateral flows of FDI. In line with the gravity model, inward bilateral FDI is explained by either source country characteristics or host country characteristics. These variables can be described as the pull or push factors. Empirical research has focused mostly on the pull factors, however very few on the push factors and a combination of both factors.

UNCTAD (1998) sets out a set of core policies that are designed to influence the investment decision. These policies relate to the rules and regulations governing the entry, operations of foreign investors, and the standards of treatment of foreign affiliates as well as the functioning of markets. The absence of these policies are likely to affect the operations of MNCs and FDI will simply not take place. The policies affecting foreign investors' location decisions include privatisation policy, trade policy and regional integration. However, a number of additional variables are used depending on the interest of the researcher reflecting the natural resource and efficiency seeking motives of FDI; these are mostly macroeconomic policy variables and institution variables.

- Trade liberalisation and Openness

UNCTAD (1998) points out that a change in the direction of openness has an asymmetric effect on the location of FDI. In other words, greater openness attracts FDI, but does not guarantee it will take place. In line with this, Asiedu (2002) has also found trade openness to be positively associated with FDI inflows. Habib and Zurawicki (2002) provide an evidence to support the argument that countries open to international trade offer a good stage for global business operations as well as country's international orientation reflect its competitiveness. Contrary to the above empirical evidence, using the sum of exports and imports as a ratio to GDP, Harms (2002) follows a different line of argument and reveals a

negative coefficient for the trade variable. Castilho and Zignago (2000) use a gravity model to examine the determinants of the FDI flows from OECD members to the MERCOSUR (South American trade bloc) economies, considering the economic integration process. They conclude that regional integration did not play an important role in FDI attraction; instead, macroeconomic stability, liberal economic reforms and privatization processes were the key explanatory variables for these economies.

- Macroeconomic Stability

Brewer (1991) suggests greater macroeconomic stability and low risk perception are essential in explaining the concentration of foreign investment in a limited number of upper-middle-income countries. On the other hand, countries with less stability and perceived to be of high risk tend to receive less direct investment. This is because foreign investors are risk-averse and due to uncertainty affecting the return on investment, foreign investors therefore are sensitive to high political, economic and financial risks. Inflation as a proxy for macroeconomic instability has been found to adversely affect FDI inflows (Nnadozie and Osili, 2004) however, Brahmasrene and Jiranyakul (2001) find empirical evidence suggesting otherwise. The influence of exchange rate on inward FDI has produced varied results. Studies by Kyereboah-Coleman and Agyire-Tettey (2008) on the volatility of real exchange rate reveals that volatility of real exchange rate has a detrimental effect on FDI inflows. On the other hand, Brahmasrene and Jiranyakul (2001) find no statistically significant association between the level of exchange rate and FDI inflows.

- Infrastructural Development

Infrastructure facilities are important in attracting FDI flows and therefore, a good infrastructure system is even more crucial for FDI into African countries. Akinkugbe (2005), in a panel regression covering African countries for the period 1970-2000 asserts that the level of infrastructural development and a host of other factors are the drivers of the volume of investment flows to these countries. Consistent with the above findings, Asiedu (2002) and Hailu (2010) find good infrastructure to be positive and statistically significant in affecting FDI inflows. Likewise, empirical evidence by Bellak et al. (2009), using a panel econometric analysis for the time span of 1995-2004 and augmented gravity model, demonstrate that both taxes and infrastructure play an important role in the location decisions made by MNCs. More specifically, telecommunication and transport infrastructure

are of special importance to FDI and the tax- rate sensitivity of FDI decreases with the level of infrastructure endowment.

- Role of Institutions

The role of institution is seen as a catalyst in the development process as a result, many researchers have analysed its effect through the transmission mechanism on FDI. Wei (2000) focuses on the impact of the level of corruption and points out corruption as a significant negative effect on bilateral FDI. Similarly, Benassy-Quere et al. (2007), in their study the institutional determinants of foreign direct investment using the gravity framework, find that institutions matter independently of GDP per capita. In particular, they point out that bureaucracy, corruption as well as legal institutions are important determinants of inward FDI. Thus, good institutions increase the amount of FDI received. However, Stein and Daude (2001) challenge this finding. They argue that high collinearity between corruption and GDP per capita, can lead to spurious regression results when GDP per capita is not added to the equation. Using a wider range of institution variables (six governance indicators by Kaufman et al., 1999), only voice and accountability indicator appears to be an insignificant determinant of FDI. Further regressions by Quazi (2007), using economic freedom indices finds that it increased FDI in East Asian countries. In addition, Bengoa and Sanchez-Robles (2003) find a positive relationship between economic freedom and FDI in Latin America.

From the source country point of view, Roberts and Almahmood (2009) focus on the gravity model to analyse source countries characteristics and inflow of FDI into Saudi Arabia for a panel of 33 countries in the period 1980-2005 using negative binomial and Tobit regressions. In most of their specifications, the variable of interest economic freedom index is positive and significant suggesting that investing countries are characterised by an advanced business environment. Globerman and Shapiro (2002) report that a country's governance infrastructure – defined in terms of its political, institutional and legal environment – is a plausible determinant of FDI for a broad sample of both developed and developing country locations between 1995 and 1997. They argue that good institutions could influence positively on FDI outflows because they create favourable conditions for MNCs to emerge and invest abroad. Therefore, they estimate the effect of the first principal component of the six governance indicators by Kaufman et al. (1999) on both inflows and outflows of FDI.

Their findings reveal that good governance impact positively both on FDI inflows and outflows.

3.2.2. Core Gravity Factors and Bilateral Flows of FDI

In recent years, many researchers have relied on the gravity model in empirical analyses of the determinants of bilateral flow of FDI from individual source to host economies, usually using countries' market size factors denoted by GDPs and geographical distance between the respective countries' capitals. The dependence of inward FDI on the host country's economic size has become to be known as the market size hypothesis. The size of national markets is very important in traditional explanations of FDI behaviour. Barba-Navaretti and Venables (2004) argue that firms maintain competitiveness either by increasing existing market share or by gaining access to new markets. Furthermore, large foreign markets provide opportunities for economies in the production of tradable goods and thereby increase the likelihood that MNCs will recoup the fixed costs associated with foreign plants.

An indicator of the host and source countries market size usually draw on some variation of GDP either its absolute value, its ratio relative to the income of the population or its growth rate. In line with this, UNCTAD (1998) focuses on all three-market size indicators: GDP, per capita GDP and the growth of per capita GDP to examine the determinants of FDI for a large sample of 142 countries over the period 1980 to 1995. According to UNCTAD, the growth rate of GDP provides an indication of the host country's development potential, hence yielding a predictor of its future market size. Also representing a country's level of economic development, Schneider and Frey (1985) contend that the higher the income per capita, the better is the nation's economic health and the greater are the prospects for profitable direct investment. Based on Anderson (1979), using a general form of the gravity equation, in the form of the log – linear model, the authors explore the host country's demand conditions, the source country's supply conditions and other economic factors either resisting or promoting the flows. The study confirms that FDI flows in the region are determined by market size factors of the source country and income in the source. Most of the previous studies have singled out market size as one of the major significant positive determinants of FDI. Nonetheless, for Mexico the size of the source country turned out to be negatively related to the level of FDI (Thomas and Grosse, 2001). Derado (2013) finds similar evidence of a negative and significant coefficient of GDP per capita in source

countries, implying that high-income countries reduce their bilateral FDI activity to transition economies.

The distance between the source and destination economy is expected to have a negative effect on the size of FDI stocks, because of costly adoptions of goods to local preferences (Johnson, 2006) and high transportation cost. The variable distance is measured by the actual route distance from the economic centres (generally, capital cities) between the source and host countries, in kilometres. Greater distance between the source country and host country may reduce the flows of FDI. This is because; the geographical distance implies the cost of transportation and the barriers to trade. Hence, greater distance implies not only transportation cost but also difficulties in obtaining information or managing the business as well as legal, institutional and other costs. Besides geographical distance, cultural differences are also expected to reduce the flow of FDI between countries. A common language or the existence of a common border (Gao, 2005) often captures cultural similarities. Following from the above, Buch et al (2004) show that GDP per capita, common language and common legal system had a positive impact on FDI stocks, whereas FDI restriction in the host country and distance had a negative impact on FDI inflows in the host country. The negative effect of distance on trade flows (and more recently also on FDI) has also been reported in many cross-section studies (e.g. Egger and Pfaffermayr, 2004b).

Bevan and Estrin (2004), using panel data and a gravity model for the period 1994-2000, examine the flow of FDI from source countries like the USA, Switzerland, the EU, Korea and Japan to Central East European host countries. Their findings confirmed the expected results, showing that the most important determinants of FDI were unit labor cost, distance and market size variables denoted by GDP. In similar vein, Resmini (2000) finds that greater distance presents weaker trade ties between the FDI source country and the host country, thus providing for lower FDI stock levels. The role of distance is amplified by the work of Brenton et al. (1999), they apply gravity rules in their paper, using population as a measure for origin-country mass and trade as an additional enabler for FDI. In addition, Hunya (2000) who argues that the market size of the home and host country and the distance between them matter reinforces these results in a related study.

3.2.3. Financial Market Development and Bilateral Flows of FDI

The development of the local financial system in the host economy is crucial in channelling FDI to the productive sectors of the economy. The financial system is a sector in the economy that uses productive resources to enable capital formation through the provision of a wide range of financial tools to meet the different requirements of borrowers and lenders. Thus, it plays a crucial role in mobilizing and intermediating saving, and ensuring these resources are allocated efficiently to productive sectors of the economy. In a comprehensive article, Levine (1997) classifies the functions of financial systems into the following five categories such as allocating resources, mobilising savings, reducing risks, facilitating transactions and exercising corporate control.

According to the emerging literature on FDI, FMD has a vital role in absorbing FDI. The role of financial market development has been described as one of the conditions that also determines the absorptive capacity of the host economy (Hermes and Lensink, 2003; Alfaro et al., 2004; Levine, 2005). In other words, the growth promoting effect of FDI is strongly dependent on the ability of the host country to absorb and internalise new technology from the source country. Thus, the spill over effect of FDI on economic growth can only be efficient under certain features of the environment in the host country.

The understanding is that a well-functioning financial market contributes to growth by mobilizing savings and channelling them through its financial intermediaries to investors that have identified productive investment opportunities (Adjasi and Biekpe, 2006). In addition, it reduces the costs of gathering, processing, and monitoring investment information, and therefore helps reduce problems of asymmetric information that are inherent in the relationships between investors (Naceur and Ghazouani, 2007). Financial markets can play a critical role in this respect and thus, the savings-investment-growth link remains central to the question of financial sector development and the ability of financial institutions to ensure their intermediary role. Putting in place well-functioning infrastructure in the financial market is crucial for catalysing domestic and foreign resources for growth and investment.

Munemo (2017), in a panel study of 92 developing countries provides an empirical evidence that the ability of FDI to crowd-in business start-ups significantly depends on financial market development in the host economy. Boateng et al. (2017) also provide empirical support on the complementarity effect of financial market development in Sub-Saharan

Africa (SSA). They employ static panel data estimations for 16 SSA countries from 1980 to 2014 and find that financial market development complements FDI inflows to augment domestic investment in SSA. In addition, Adjasi et al. (2012) in a similar study on 32 African countries, show that FDI is more productive in the presence of well-functioning local financial market. In another related study, Otchere et al. (2016) using a panel data for African countries from 1996 to 2009 and accounting for potential endogeneity problems by adopting systems of simultaneous equations confirm the positive relationship between FDI and financial market development.

Furthermore, foreign investors may also rely on local financial markets as a hedging device against exchange rate fluctuations. As noted by Harrison et al. (2004), enterprise surveys suggest that local financing constraints tend to impede investment (both domestic and foreign) particularly in developing countries. Alfaro et al. (2010), by relaxing the credit constraints of local firms argue that financial market development allows for greater variety of intermediate inputs in the host country. Hence, easier availability of intermediates, in turn, encourages higher FDI to the extent that foreign firms depend on such local inputs. Using firm-level data for the United States (US) as source country, Antràs et al. (2009) demonstrate that weak financial market conditions in the host country lessen the scale of activities by US-based MNCs, while such conditions strengthen the reliance of local subsidiaries on capital inflows from the parent company. Likewise Bilir et al. (2014) rely on similar data and conclude from their study that financially advanced countries attract more MNCs subsidiaries. This is because, robust financial institutions in the host economy also raise aggregate affiliate sale.

More generally, better-developed financial markets may promote FDI by facilitating interactions between foreign and local firms (Kinda, 2010). Desai et al. (2006) argue that because a considerable fraction of the funding for local affiliates of multinational investors often comes from the local debt markets, higher interest rates due to capital control increase the cost of capital and this discourages FDI. Asteriou and Moudatsou (2014) investigate whether the level of financial development can make a significant contribution to foreign direct investment's positive impact on economic growth. Using yearly macroeconomic data for a sample of 73 developing countries from the period 1988-2009 and panel-growth regressions, their results suggest that the FDI makes substantial contribution to growth rate

where financial systems function effectively, such as high-income countries, while the FDI impact is found to be insignificant in cases where relatively weaker financial systems exist.

Adenyi et al. (2015) examine how financial development influences the relationship between FDI and economic growth in selected SSA countries. The study focuses on three alternative measures of financial development and their impacts on the FDI-growth linkage. The results reveal a positive influence of FDI on economic growth and financial system development had growth-promoting impact in the presence of FDI flows when potential endogeneity was accounted for using a well-known instrumental variable (IV) estimator. In policy terms, the study concludes that SSA countries will reap more growth benefits from foreign capital flows especially if financial reforms are sustained. Using banking sector and stock market indicators to capture the development of the financial market, Hajilee and Nasser (2015) find that financial market development (FMD) link is both a short run and a long run phenomena in the majority of the countries. Performing Granger causality tests, they show that the link between FDI and the banking sector is uni-directional while the link between FDI and stock market is bi-directional. In their 'relative access to credit hypothesis', Klein et al. (2002) report that MNCs' ability to undertake FDI depends on their chances to raise external funds. Specifically, Klein et al. demonstrate that the links between Japanese MNCs and troubled banks at home help explain the decline of Japanese FDI in the US in the 1990s. Thus, firms "associated with less healthy banks" are less likely to engage in FDI. Buch et al. (2014) observe that financially constrained German firms are less likely to embark on FDI financing. Focusing on the analysis of the determinants of mergers and acquisitions (M&A) deals during the 1990s, Di Giovanni (2005) reveals that stock market capitalization in the home country of the acquiring firms is significantly and positively related with their M&A activity abroad.

FMD is not only a pull factor in attracting inward FDI in transition economies but also a push factor and therefore, it encourages outward FDI. FDI consists of high fixed costs upfront since an affiliate has to be established in the host country. Hence, the accessibility of external financing makes it easier to cover the fixed costs of undertaking FDI. A recent study by Desbordes and Wei (2017) support the above statement. Using the difference-in-differences approach, they show that a sophisticated as well as a well-functioning financial system in the source and destination countries greatly facilitates the international expansion of firms through foreign direct investment, especially in financially vulnerable sectors. Similarly, Donaubauer et al. (2016) estimate gravity-type models to assess the effects of

financial market development in the host and source countries on bilateral FDI stocks. They address potential reverse causality, inter alia by performing instrumental variable estimations. Their finding reveals that bilateral flow of FDI increases with better-developed financial markets in both the host and the source country.

In conclusion, the above literature review suggests previous studies have analysed financial market development as either pull or push factor in attracting bilateral flow of FDI. However, it is important to note that analysing financial market development as a feature in both host and source countries simultaneously might enable the source-destination pair to achieve the desired effect of financial market development as a determinant of bilateral flow of FDI. Therefore, the current study examines the effect of financial market development as both pull and push factor in attracting bilateral flow of FDI for Africa using the gravity model. To the best of my knowledge, empirical works on financial market development as a determinant of FDI have used various indicators as proxies to measure financial market development. These measures have focused exclusively on commercial banks to the neglect of investment banks and other deposit –taking institutions. To fill this gap, the present relies on unique banking data on financial sector by Andrianova et al. (2015), which has a wider coverage as proxies to measure financial market development in both host and source countries and examining its effect on bilateral flow of FDI to Africa, which is quite novel.

3.3. Empirical framework

3.3.1. Empirical model

The gravity model has become the workhorse econometric model for bilateral trade flows and recently used to analyse bilateral flows of FDI. From the empirical literature, most studies on FDI location are based on some variation of the gravity model, which is the standard specification in empirical models of bilateral trade. Therefore, it has become increasingly popular in the literature for analysing the driving forces of FDI. (Wei, 2000; Brainard, 1997; Carr et al., 2001; Razin and Sadka, 2007; Blonigen et al., 2007). In practice, the gravity equation has been specified in different ways according to the researchers' interest. In its simplest formulation, it posits that bilateral FDI stocks in our case depend positively on the product of the GDPs of both economies (host and source) and negatively on the distance between them. Thus, the crude form of gravity model specification relates the volume of bilateral FDI to the GDPs of both host and source countries and to the geodesic distance between them. However, other variables such as GDP per capita, as well

as dummies indicating whether the two countries share a common border, a common language, past colonial links, etc. are included to the simplest gravity model specification in the trade literature.

The present study slightly modifies equation (2.8); see section 2.2.1 and follows the models of Buch et al. (2004), Bevan and Estrin (2004). These studies are based on the theoretical models of Helpman (1984), which largely explains FDI flows by factor endowment considerations (including institutions and by viewing FDI flows, as determined by gravity factors, like market size factors represented by gross domestic product of source and host countries and transaction factors represented by distance between countries). Hence, the basic gravity model of FDI, in this study, is augmented by considering also host country factors as well as FMD in both host and source countries. Therefore, the model of bilateral stock of FDI into African countries is represented by the econometric specification below:

$$FDI_{ijt} = \beta_0 + \beta_1 lnGDP_{it} + \beta_2 lnGDP_{jt} + \beta_3 ln\left(GDPC_{it} - GDPC_{jt}\right) + \beta_4 a_{ij} + \beta_5 lnFIN_{it} + \beta_6 lnFIN_{jt} + \beta_7 lnX_{jt} + \delta_{ij} + \varphi_t + \varepsilon_{ijt} \quad (3.1)$$

where FDI_{ijt} is the bilateral FDI stock from source country i to host country j at time t, $GDP_{i\&j}$ represents market size variables denoting the gross domestic product in source and host country respectively. The larger the GDP in the source country the greater inward FDI emerges from this country. In addition, the bigger the host country's GDP, one would expect a higher bilateral flow of FDI into this country, since larger economies become more attractive for foreign capital. Thus, for both variables we expect positively signed coefficients. We use the absolute difference of GDP per capita variable between source country and host country at time t $\left(GDPC_{it} - GDPC_{jt}\right)$ as measures of factor endowment differentials between countries. The absolute difference of GDP per capita between the source and host country captures the market size differentials between countries, as well as factor endowments differentials between countries and thus, there is a positive impact of the absolute difference of GDP per capita variable on bilateral FDI stock. The time invariant factors are captured by a_{ij} , which represents the gravity factor. This is the bilateral costs between source and host country, which is proxied by distance between the countries. Greater distance presents weaker trade ties between the FDI source country and the host country, thus providing for lower FDI stock levels. Moreover, in line with the existing literature, common language is added to reflect the historical links between the host and source countries and this is expected to exert positive effects on FDI.

The variable X_{ij} represents the vector of host country explanatory variables such as (trade openness, macroeconomic stability, role of institution and infrastructural development). Trade openness variable is measured by the sum of exports and imports over GDP. This captures the liberalization of trade and openness in the host country economy. Thus, it is expected to have a positive impact on bilateral flows of FDI. Exchange rate is used as a proxy for the role of macroeconomic stability. Another important determinant of bilateral FDI inflows is the quality of domestic institution (Wei, 2000; Globerman and Shapiro, 2002; Benassy-Quere et al., 2007). Polity2 is the proxy measure for the role of institution and it gives information on the level of democracy for all independent states. It captures the regime authority spectrum ranging from -10 to 10. Higher value of this measure indicates better level of democracy signifying quality domestic institution, which positively influence bilateral flows of FDI. The measure of the quality infrastructural development within the host country is proxied by the number of fixed telephone subscription per 100 people. However, I acknowledge that the number of mobile phone subscribers would have been a better measure of infrastructural development, the problem is the availability of data in this part of the world. A better and developed infrastructure is believed to increase the productivity of investments and therefore, stimulate FDI flows (Wheeler and Mody, 1992; Morisset, 2000; Asiedu, 2002).

The source-host pair fixed effects δ_{ij}, controls for all time-invariant characteristics of each country pair, time fixed effects φ_t, controls for common shocks during our period of observation that affect all pairs in essentially the same way and ε_{ijt} is the standard error term.

The variable FIN is the proxy that measures the impact of FMD in the source and host countries on bilateral FDI stock. This study employs a unique banking data on financial market fragility indicators as proxy to capture the development of financial markets. Existing financial sector datasets according to (Beck et al., 2000; Cihak et al., 2013) focus on the commercial banking sector, but the recent financial crises have highlighted the significant role played by investment banks and real estate and mortgage banks. Moreover, this new datasets have a wider range than the existing datasets. It incorporates all deposit-taking institutions and investment banks, since the activities of investment banks are not always separate from those of commercial banks in all countries, and investment banking activities are known to have played a major role in the most recent financial crisis. These indicators measure financial fragility and each focuses on the different aspects of vulnerability in the financial system and they reflect the key areas of the CAMELS bank rating system

(capitalisation, asset quality, managerial efficiency, earnings, liquidity, and sensitivity to risk). The development of the financial market to some extent depends on the market fragility. High fragility in the financial market negatively affect bilateral flows of FDI and vice versa. There are five core measures of financial fragility according to the authors. These include:

Bank capitalisation: $\frac{Equity}{Total\ Asset}$, this ratio measures the extent of market capitalisation in the financial markets. An increase in this ratio leads to less fragility and this improves the development of financial markets thus, creating a conducive atmosphere that positively influence inward FDI.

Asset quality: $\frac{Impaired\ loans}{Gross\ loans}$, measures the extent of asset quality of the financial system. This measure is positively related with financial fragility as result affect the development of the financial markets thereby reducing bilateral FDI.

Managerial efficiency: $\frac{Cost}{Income}$, this is cost to income ratio that measures the level of managerial efficiency. A management that deploys its resources efficiently will look to maximise its income and reduces its operating costs, so an increase in this ratio implies a lower level of efficiency. This leads to a more fragile market and therefore, does not create a good environment for attracting bilateral FDI.

Earnings: $\frac{Net\ Income}{Total\ Asset}$, this ratio is also the return on assets and it measures an institution's earnings capacity. The larger the ratio, the less fragile the market becomes and this improves the development of the market, thus attracts bilateral flow of FDI.

Liquidity: $\frac{Net\ loans}{Total\ Asset}$, this ratio measures the extent of liquidity in the financial market. As pointed out by the authors, an increase in this ratio makes the market less liquid and thus leads to more fragility in market. This affects the development of the financial market and negatively affects bilateral FDI.

Besides the above-mentioned core measures of financial fragility, a final indicator of financial fragility is the bank Z-score. This measures the general financial stability of the country, the higher the Z-score, the more financially sound a country is and therefore positively affects bilateral flows of FDI. Out of the five core measures of financial fragility, the present study uses bank capitalisation and liquidity measures as proxy to capture the effect of development of financial markets in both host and source country on bilateral FDI. The choice of these

measures are because of paucity of data and the measures reflect as well as better describe the case of transitional economies.

3.3.2. Empirical strategy and methodological issues

According to (Santos Silva and Tenreyro, 2006), there is ongoing debates about the consistent estimation of the gravity models. However, for basis of comparison, this study uses different estimation techniques and therefore considers both linear and non-linear methods. The linear method such as the panel framework (fixed effect and random effect) are used. The panel framework method recognises how the relevant variables evolve through time and therefore identifies the specific time or country effects. Over the last years, researchers such as (Egger, 2000; Rose and van Wincoop, 2001; Egger and Pfaffermayr, 2003; 2004a and Melitz, 2007) have used the panel framework method. There are two main techniques of the panel framework used to fit the data depending on the a priori assumptions. The fixed effect estimator assumes the existence of an unobserved heterogeneity that is constant over time and this affects each individual (pair of countries) of the panel in a different way. On the other hand, the random effect estimator imposes no correlation between the individual effects and the regressors. However, these methods reduce efficiency due to the loss of information and may lead to biased estimates.

From the above, a much-discussed issue is how to deal with zero trade flows, in this case zero bilateral flows of FDI in a given year between two given countries. It is important to note that, globalisation or world trade and in our case, bilateral flows of FDI evolves along two margins (Felbermayr and Kohler, 2006). At the intensive margin is where a bilateral trading relationship already exists, while at the extensive margin new trading relationships are established. The challenge arises from the fact that the usual approach is to restrict attention to those pairs of countries for which strictly positive trade (FDI) flows are observed. This is because the standard technique of estimating a gravity model is to take logarithms and estimate its log-linear version. Thus, zero trade (FDI) flows will be eliminated from the estimation, as the log of zero is not defined. However, this seems to be inadequate given the coexistence of the two margins of globalisation, the exact interpretation of the regression estimates obtained with the log-linear method is questionable, as are their statistical properties.

As Westerlund and Wilhelmsson (2011) point out, the elimination of trade flows, in our case FDI flows when zeros are not randomly distributed leads to sample selection bias. Log-linear models are not suitable if the dependent variable exhibits zero values, which are not assigned randomly. A well-known problem in the log-linear specification of a gravity model is the difficulty in dealing with zeros in the dependent variable, as dropping them could lead to bias estimate. This seems to be the case for bilateral flows of FDI data. One can address this problem by means of non-linear least squares (NLS). For the non-linear method, this study employs the Poisson Pseudo-Maximum Likelihood estimator (PPML). As pointed out by Santos Silva and Tenreyro (2006), the log- linearization of the gravity model changes the property of the error term, thus leading to inefficient estimations in the presence of heteroscedasticity. As this is usually the case of bilateral flows of FDI data, the expected value of the error term is a function of the regressors. The conditional distribution of the dependent variable is then altered and ordinary least squares estimation (OLS) is inconsistent. The non-linear models deal with the issue of handling zero bilateral FDI flows and thus recent literature concerning estimation techniques have opted to use non-linear methods for estimating gravity models. Although Poisson is more commonly used as an estimator for count data models, it is appropriate to apply to non-linear models such as gravity. This estimator has a number of desirable properties for applied policy researchers using gravity models. First, it is consistent in the presence of fixed effects, which can be entered as dummy variables as in simple OLS. Second, it includes observations for which the observed bilateral FDI stock value is zero. Dropping zero observations as in log-linear models do potentially lead to sample selection bias.

3.4. Data Description

This study investigates the impact of FMD on bilateral flows of FDI in Africa within the gravity model framework with a panel data set of 20 source countries and 33 host countries (see Appendix A1 and A2) from 2001-2012. The dependent variable is bilateral FDI stocks, which is publicly available from UNCTAD. FDI stocks are preferred to FDI flows as the former are less volatile and which is especially important when dealing with yearly data. Secondly, stocks account for foreign direct investment being financed through the local capital markets, thus are better measure of capital ownership (Devereux and Griffith, 2002). GDP and GDP per capita are all sourced from World development indicators database (WDI). The time-invariant bilateral characteristics (distance and common language) are obtained from the Centre d´Etudes Prospectives et d'Informations Internationals (CEPII).

CEPII provides different measures of bilateral distances for most countries across the world. Trade openness and macroeconomic stability variable (exchange rate) are obtained from WDI. Polity2 (the proxy measure for the role of institution) is obtained from Centre for Systemic Peace (Polity IV Project). The measure of the quality infrastructural development within the host country is proxied by the number of fixed telephone subscription per 100 people and this comes from WDI. Finally, for the measures of FMD (FIN), the study uses two financial fragility indicators; equity to assets ratio and net loans to total assets ratio as proxy to measure the development of the financial markets. These are new datasets on financial market fragility by Andrianova et al. (2015).

Table 3.1 presents the summary statistics of the variables used in this study. The descriptive statistics show large variations in all the variables. Bilateral flow of foreign direct investment has a mean value of about USD 189.15. In addition, GDPS has a mean value of about USD 2.06 trillion, while GDPH is about USD 3.63 billion. On the average, GDP per capita for source countries (GDPPS) is about USD 34253.09, whereas that of the host countries is about USD 2010.24. In relation to sharing a common official language (comlang_off), an average of 21percent of countries share an official common language. Average distance between host and source countries is around 7371.81km. Trade openness in the host countries is high with an average trade volume of about 74.2 percent of GDP. The infrastructural development within the host countries on the average is about 4.1 percent which indicates less infrastructural development in the destination countries. The average quality of the institutional arrangements in the host countries is little above 1 which indicates low institutional arrangements for the host countries. The average exchange rate (official exchange rate)[3] which is defined as local currency units to the US dollar (USD) is about USD 172 million. For the measures of financial market development, the mean value for market capitalisation in the source countries (equitys) is about 5.2 percent, while in the host countries, it averaged 6.2 percent. Liquidity in source countries (netloans) and host countries (netloansh) averaged 51.7 percent and 47.2 percent respectively.

[3] The high average is due to the Zimbabwe's exchange rate over the years

Table 3.1: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
FDI (USD)	7,896	189.15	1109.26	-1527.28	23646.85
GDPS (USD)	7,908	2.06e+12	3.01e+12	1.22e+11	1.62e+13
GDPH (USD)	7,908	3.63e+10	6.91e+10	1.08e+09	4.61e+11
GDPPS (USD)	7,908	34253.09	20649.39	460.83	101563.7
GDPPH (USD)	7,908	2010.24	2458.49	149.37	14231.6
Language	7,908	0.21	0.41	0.00	1.00
Distance (Km)	7,908	7371.81	3417.72	561.64	18008.29
Openness (% of GDP)	7,906	74.21	28.85	0.00	202.85
Infrastructure (%)	7,906	4.09	6.07	0.00	31.50
Polity2h (%)	7,894	1.49	5.27	-9.00	10.00
Exchange rate (USD)	7,814	1.72e+07	3.40e+08	0.06	6.72e+09
Equity S (%)	7,908	6.67	5.21	0.59	43.47
Equity H (%)	7,788	11.49	6.20	-11.74	69.28
Net loans S (%)	7,908	51.69	15.62	11.38	5.016
Net loans H (%)	7,788	47.22	14.63	9.24	92.4

Note: GDPS is GDP in the source country, GDPH is GDP in the host country, GDPPS is GDP per capita in the source country, GDPPH is GDP per capita in the host country, Equity S and Equity H is the market capitalisation in the source and host countries respectively, Net loan S and Net loan H is the extent of liquidity in the financial markets for source and host countries respectively. Language is a dummy variable indicating whether source and host countries share common official language.

With reference to the correlation matrix (Appendix A3), we have evidence of no high correlation between the pair of variables in our model. We acknowledge that the correlation between GDPPH and infrastructure development reports the highest correlation coefficient of 0.62 and the lowest correlation coefficient of -0.003 GDPS and Net loans H. Intuitively, one would expect some degree of correlation between GDP and GDP per capita. From the correlation matrix, GDPS and GDPPS has a low correlation coefficient of about -0.15. On the other hand, the correlation between GDPH and GDPPH is about 0.55. Although, this evidence is observed albeit not severe to alter the validity of our estimates.

The issue of stationarity is essential in panel data analysis however, the relative size of the panel (i.e., the size of T relative to N) has important influence on the performance of the tests. The test of panel unit root requires the dimension of time series (T) should be large enough to conduct this test. This is because large value of time series in panel make it interesting to observe the time series property of the series. If T>N (observations), we go for dynamic panel data analysis (non-stationary panel data analysis) and test for the existence of unit root. However, if N>T, it does not require stationarity test. (See Baltagi and Kao, 2000; Breitung and Pesaran, 2008). In this study, N=53 and T=12, thus stationarity testing is not an essential pre-requisite in this case.

3.5. Discussion of Results

This section is organised into three subsections. It presents the results from both the linear and non-linear estimation techniques. For the linear method, this study uses both the fixed effect and random effect estimators. On the other hand, for the non- linear estimation techniques the study employs the PPML estimator.

3.5.1. Fixed Effect Estimation

We begin with the fixed effect estimation and this is when the interest of the study does not focus on estimating the impact of bilateral time-invariant variables such as distance and common language. Therefore, there is the possibility of perfect collinearity and thus, these variables are dropped when the fixed effect estimator is applied because there is lack of within-group variation. Table 3.2 presents the fixed effect estimation results. Also included in the results are year dummies. The year dummies are added to the regression to account for the changing nature of the relationship over time. In order to account for the multilateral resistance terms (MRTs), this study follows Rose and van Wincop (2001); Feenstra (2004); Baldwin and Taglioni (2007), and uses country fixed effects for host countries and source countries and time fixed effects as proxies for MRTs. The country fixed effects capture all the country-specific characteristics and therefore control for a country's overall volume of FDI. The use of these dummies in panel data (over time bilateral FDI data) are necessary in order to control for country-pair heterogeneity. This table shows the regression results for fixed effect, model 1 (without any dummy) and model 2 after controlling for year dummies.

Regarding the gravity factors as found by Bevan and Estrin (2004), the results reveal that GDP of both source and host countries in all the models are positively associated with bilateral FDI stocks. For instance in model 1, the effects of market size as reflected in source and host country's GDP have positive and significant influence on bilateral FDI stocks with an elasticity of 0.79 and 0.57 respectively. Thus, a 1 per cent increase in source or host country GDP tends to increase bilateral FDI stocks by about 0.79 and 0.57 percent respectively. However, after controlling for year dummies (model 2), the coefficients of market size for both source and host countries have increased.

More surprisingly perhaps, the estimated coefficient of GDP in source country is greater than that of the host country. This implies that the economies of source countries are more important than that of host countries. However, the estimated coefficient of absolute difference of GDP per capita between the source and host country as a measure of factor endowment differentials as well as market size differentials had the expected positive sign but statistically insignificant in both models.

As pointed out by previous researchers, bilateral FDI is explained by host country characteristics (pull factors). In line with this, the present study considers factors such as trade openness, the level of infrastructural development, the role of institutions and macroeconomic stability. These country specific factors can affect the profitability of FDI projects. From Table 3.2, out of the host country characteristics, trade openness had the expected significant sign. The estimated coefficient of trade openness is positive in all the models but statistically significant in model 2. The study finds that bilateral FDI stocks increase by 0.66 percent with a 1 per cent increase in host country's level of trade openness. This suggests that openness of an economy is an important driver for bilateral FDI as it provides a good platform for global business. As a result, firms benefit from low production cost in the host country.

Turning to FMD as the variable of principal interest, the study reveals that bilateral FDI stocks increase with better developed financial markets in both host and source country. We can infer from the regression results in Table 3.2 that, the estimated coefficient of bank capitalisation in both source and host country is positive and statistically significant in all the models. This implies that an increase in bank capitalisation ratio makes the financial markets less fragile in both source and host country, which improve the development of financial, markets thereby attracting inward FDI. Hence, FMD is seen in the empirical literature as not only a pull factor but also a push factor (see Desbordes and Wei, 2017). In addition, for host country, this finding is line with empirical research that describe the role of FMD as one of the conditions that also determine the absorptive capacity of FDI receiving country (Hermes and Lensink, 2003; Alfaro et al., 2004; Levine, 2005). The effect of liquidity on financial market development in the source country from the regression results is insignificant in all the models. Nevertheless, in the host country the estimated coefficient is negative as expected and significant at 10 per cent in all the models. The results suggest that liquidity ratio tends to reduce bilateral FDI stock. This is because an increase in this ratio makes the

financial market more fragile. Thus, affecting the development of the financial market and thereby reducing bilateral FDI. This finding supports the augment that the development of financial markets is crucial in attracting inward FDI (Hermes and Lensink, 2003; Alfaro et al., 2004; Levine, 2005).

Table 3.2: Fixed Effect Estimation

VARIABLES	Model 1	Model 2
lngdpsource	0.792***	1.042***
	(0.269)	(0.273)
lngdphost	0.573***	0.789***
	(0.136)	(0.229)
lndiffgdpper	0.148	0.102
	(0.130)	(0.136)
lnopenhost	0.194	0.663**
	(0.222)	(0.260)
lninfrahost	0.139	0.113
	(0.0943)	(0.0952)
polity2h	-0.00548	0.00290
	(0.0131)	(0.0145)
lnexchrateh	-0.0425	-0.0292
	(0.0631)	(0.0515)
lnnetloans	0.211	-0.168
	(0.280)	(0.293)
lnnetloansh	-0.309*	-0.340*
	(0.176)	(0.176)
lnequitys	0.365***	0.287***
	(0.0715)	(0.0727)
lnequityh	0.316***	0.255**
	(0.109)	(0.107)
Constant	-34.86***	-46.90***
	(5.079)	(8.919)
Year dummies		
Observations	1,840	1,840
R-squared	0.399	0.432
Number of pair	286	286

Dep Variable:lnfdi
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

3.5.2. Random Effect Estimation

The random effect approach allows for the estimation bilateral time-invariant variables, which are hitherto dropped in the fixed effect approach. It is worthy to note that if the interest of the study focuses on estimating the impact of bilateral time-invariant variables, then random effect estimation is the viable option. However, the main objective of this study is not on determinants of bilateral time –invariant variables. Nonetheless, for the current study to evaluate the effects of these variables (such as distance and common language) on bilateral flow of FDI in Africa, we present the random effect estimation. In addition, the Hausman specification test is conducted (see Table 3.3). It tests the null hypothesis that random effect model is appropriate for a particular sample compared to the fixed effect model and allows us to decide which model gives the best estimation (Wooldridge, 2002). The Hausman test result shows that the null hypothesis cannot be rejected, suggesting that the random effect model is appropriate.

Table 3.3 provides the regression results for random effect, also controlling for country dummies (model 1) and year dummies (model 2). From Table 3.3, the estimated coefficient of the core gravity factors such as GDP in both source and host country is positive and significant as expected in all the models. The coefficient of absolute difference of GDP per capita between the source and host country is positive as expected in all the models but statistically significant at 10 percent in model 1. This implies that an increase in factor endowment as well as market size differentials between the source and host country will positively influence bilateral FDI stocks. On the impact of bilateral time-invariant variables, the regression results indicate that the coefficient of common language is positive as expected and statistically significant at 1 percent in all the models. The results suggest that having a common official language between source and host countries is a driver of bilateral flow of FDI. The coefficient of distance on the other hand is negative in all the models and statistically significant at 10 percent. The estimated elasticity is -0.6 and -0.7 in models 1 and 2 respectively. This implies that it is not just geographical distance but also cultural differences are expected to affect the flow of FDI between countries adversely. This result affirms the market-seeking hypothesis of FDI. For the host country's specific determinants of bilateral FDI flows, the coefficient of trade openness is positive and statistically highly significant at 1 percent in model 2. The estimated elasticity is around 0.7, indicating that trade openness facilitates the flow of bilateral FDI. As expected, the level of infrastructural

development in the host country increases bilateral FDI inflows in model 1 and the estimated elasticity is 0.1.

The effect of FMD in both source and host country on bilateral FDI flow, using the bank capitalisation measure is statistically significant in all the models. This result is similar to that of the fixed effect estimation. On the other hand, as previously discussed in the fixed effect estimation, the impact of liquidity measure, as a proxy for FMD in the source country from the random effect regression results is insignificant in all the models. However, in host country, the study finds that the impact of FMD measure using the liquidity ratio is statistically significant at 10 percent in all the models with an estimated elasticity of about -0.3. This result provides evidence to support the idea that the development of financial market in the host country is one of the main drivers of bilateral flow of FDI.

Table 3.3: Random Effect Estimation

VARIABLES	Model 1	Model 2
lngdpsource	0.713***	0.940***
	(0.248)	(0.252)
lngdphost	0.581***	0.792***
	(0.134)	(0.227)
lndiffgdpper	0.209*	0.177
	(0.111)	(0.109)
comlang_off	0.882***	0.895***
	(0.301)	(0.303)
lndist	-0.642*	-0.661*
	(0.384)	(0.390)
lnopenhost	0.215	0.676***
	(0.224)	(0.261)
lninfrahost	0.1370**	0.109
	(0.064)	(0.0959)
polity2h	-0.00833	-0.000245
	(0.0132)	(0.0146)
lnexchrateh	-0.0447	-0.0299
	(0.0595)	(0.0492)
lnnetloans	0.252	-0.129
	(0.279)	(0.292)
lnnetloansh	-0.291*	-0.320*
	(0.176)	(0.177)
lnequitys	0.361***	0.283***
	(0.0720)	(0.0735)
lnequityh	0.306***	0.245**
	(0.110)	(0.108)
Constant	-30.07***	-41.42***
	(6.370)	(9.805)
Country dummies		
Country and year dummies		
Hausman test	24.47	
Prob>chi2	0.323	
Observations	1,840	1,840
Number of pair	286	286

Dep Variable:lnfdi
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

3.5.3. Poisson Pseudo Maximum Likelihood (PPML) Estimation

This approach deals appropriately with heteroscedasticity, model misspecification and excess zeros. The above estimators (linear methods) do not account for zero bilateral flow of FDI in a given year between two given countries. (Not all countries receive direct investment from all source countries). The problem is the fact that the normal way of estimating a gravity model is to take logarithms and estimate the log-linear form. In line with this, zero bilateral flow of FDI will be dropped out of the estimation. This affects the number of observations, as the logarithm of zero is undefined. To address the issue of handling zero bilateral flow of FDI in order to ensure the coexistence of the two margins of trade, this study follows the recommendations of several authors such as Desbordes and Vicard (2009). Therefore, the present study applies the PPML estimator. This estimator can be applied to the levels of the dependent variable and in this case bilateral FDI stocks. This helps in estimating directly the non-linear form of the gravity model and avoiding dropping zero bilateral flows of FDI. An influential paper by Santos Silva and Tenreyro (2006) point out that, in the presence of heteroscedasticity (as often in bilateral FDI flow data), the PPML is a robust approach. In view of this, a number of researchers have used this approach in the estimation of gravity equations (Westerlund and Wilhelmsson, 2011).

Table 3.4 depicts PPML regression results and the coefficients in Poisson models can be interpreted as semi-elasticities. From Table 3.4, the regression results indicate that the core gravity variables such as GDP in the host country and common language have the expected positively signed coefficient and are statistically significant at 1 per cent level. For instance, using the estimated coefficient of common language, a one standard deviation increase in common language tends to increase bilateral FDI stocks by about 1.4 percent. This implies that, for countries that share common official language, bilateral FDI stock increases. With the host country characteristics, the study finds infrastructural development as a key determinant of bilateral FDI stock with an estimated elasticity of 0.2. Surprisingly, the estimated coefficient of liquidity measure as a proxy for FMD in the source country now is positive and significant. This suggests that increase in liquidity ratio makes the market more fragile and rather influence bilateral FDI stock positively. This could be attributed to the fact that FDI firms can borrow from their home country to invest abroad because of low interest rates in the source country and thus, encouraging inward FDI. On the other hand, the effect of liquidity measure in the host country is negative as expected and highly significant with an estimated elasticity of -0.6. A possible explanation is that, there could be high savings in the

host country leading to low interest rates on domestic loans, thus discouraging the influx of FDI. Finally, the coefficient of bank capitalisation ratio as measure of FMD in source country is positive and significant, suggesting that a one standard deviation improvement in FMD in the source is predicted to increase bilateral FDI stock by 0.74 percent. However, for the host country, the coefficient is negative and statistically insignificant.

Table 3.4: Poisson Pseudo-Maximum Likelihood estimation

	(1)
VARIABLES	PPML
lngdpsource	-0.3000
	(1.186)
lngdphost	0.8249***
	(0.198)
lndiffgdpper	1.1407
	(1.044)
comlang_off	1.3771***
	(0.406)
lndist	1.0930
	(0.895)
lnopenhost	0.1165
	(0.386)
lninfrahost	0.2005*
	(0.112)
Polity2(H)	0.0017
	(0.025)
lnexchrateh	0.0774
	(0.126)
lnnetloans	0.6289*
	(0.380)
lnnetloansh	-0.5912***
	(0.220)
lnequitys	0.7408**
	(0.304)
lnequityh	-0.0016
	(0.136)
	(4.905)
Constant	-31.3853*
	(16.784)
Observations	7,155
R-squared	0.59
Pseudo log-likelihood:	-956946.27

Dep Variable:fdi
Robust standard errors in parentheses
*** p<0.01, ** p<0.05 * p<0.1

3.6. Conclusion

In this chapter, an attempt is made to forward the understanding and knowledge on the main causes of bilateral flow of FDI from individual source to host economies between the period 2001-2012. This chapter empirically analysed the determinants of inward FDI to African countries by focusing on the development of financial markets. The simple gravity equation, which contains the GDP and the geographical distance variables only, is augmented by incorporating FMD in both host and source as well as specific host country characteristics. In terms of the main feature of this study to the empirical evidence, the study has augmented the gravity model to account for FMD in both host and source country using financial fragility indicators as proxy to measure the development of the financial markets.

From the log-linear specification, with the fixed estimation, the results confirm that GDP in both host and source countries remain to be an important determinant of bilateral flow of FDI. This confirms that foreign investors' motives towards Africa are driven by market-seeking considerations. On the host country characteristics, the findings of the study indicate that pull factors such as trade openness and infrastructural development are the key drivers of bilateral flows of FDI to Africa. The results suggest that liberalisation of trade and openness in host economies provide a good platform for global business operations and in addition, country's international orientation reflects its competitiveness (Habib and Zurawicki 2002). More so, the findings imply that good local infrastructure plays an important role in the location decisions made by MNCs. It is believed to increase the productivity of investments thereby stimulating bilateral flows of FDI (Wheeler and Mody, 1992; Morisset, 2002; Asiedu, 2002). In order to assess the impact of time –invariant variables the random estimation is carried out. The regression results depict that gravity factors like distance and common language are important determinants of bilateral FDI. It is important to note that, not just geographical distance but also cultural differences are expected to reduce the flow of FDI between countries. This finding supports the empirical results by Gao (2005) that speaking a common language increases inward FDI.

Regarding the variable of interest, the study reveals in almost the estimations that, FMD in the host country is a dominating force driving bilateral flow of FDI. It is well known that a better-developed financial market that is less fragile tends to be associated with higher bilateral flow of FDI. This because developed financial markets in the host economies make easy availability of intermediate inputs and this enhances FDI as foreign firms depend on

such local inputs (Alfaro et al., 2010). It also expands the local market size and therefore, promotes market-seeking FDI (Desbordes and Wei, 2017).

Moreover, log-linear models are not suitable if the dependent variable exhibits zero values that are not assigned randomly. This seems to be the case for bilateral flows of FDI data and therefore, to deal with the problem of zero observations in the dependent variable, this study adopts the PPML estimator as suggested by Silva and Tenreyro (2006). It is reassuring that the results from this estimation are not different from the log-linear models. For instance, gravity factors like GDP in host economy and common language significantly influence bilateral FDI stocks. Interestingly in the non-linear model, financial market development is seen as not only a pull but also push factor. This implies that a better developed financial market in both source and host economies complement each other to influence inward FDI. This is in line with the empirical findings of Desbordes and Wei (2017) that FDI consists of fixed costs since an affiliate has to be established or acquired in the host country. Therefore, the availability of fund makes it easier and thus access to financing depends on how developed the financial market is in the source country.

The conclusion that can be drawn from this study is that, FMD especially in the host economies seem to be an important determinant of bilateral flows of FDI to Africa. The significance of this finding is on providing an analytical basis for the evaluation of the development of financial markets aimed at making African countries more attractive to foreign investors. In line with this finding, the study supports the empirical evidence of the relevance of financial market development as a determinant of inward FDI. Therefore, there is the need for a well-functioning financial system that requires strong institutions and a sound legal framework. Although, the financial sector in most of the African countries have gone through the first set of reforms under the Financial Sector Adjustment Programmes (FINSAPs), there is the need for further reforms by policy makers by putting in place well-functioning infrastructure in the financial sector to fully play its intermediary role to ensure the saving-investment-growth link. In addition, policy makers should focus on infrastructural development as well as liberalised trade since it provides a good platform for global business. It is recommended that future researchers can rely on this new dataset on financial fragility indicators as measures for the development of financial markets since it yields the same results as the previous measures.

APPENDIX A

Appendix A1: List of Source countries for the study (20)

France	Japan
Germany	Norway
United Kingdom	Portugal
Netherlands	Spain
U.S.A	Switzerland
Australia	Sweden
Belgium	Turkey
Canada	Brazil
Denmark	China
Italy	India

Appendix A2: List of Host countries for the study (33)

Algeria	Mauritania
Egypt	Mauritius
Libya	Mozambique
Morocco	Namibia
Tunisia	Niger
Angola	Nigeria
Botswana	Rwanda
Burkina Faso	Senegal
Cameroon	Sierra Leone
Cote d'lvoire	South Africa
Gabon	Swaziland
Ghana	Togo
Guinea	Uganda
Kenya	Tanzania
Madagascar	Zambia
Malawi	Zimbabwe
Mali	

Appendix A3: Correlation Matrix

Variables	FDI	GDPS	GDPH	GDPPS	GDPPH	language	Distance
FDI	1						
GDPS	0.203***	1					
GDPH	0.534***	-0.123***	1				
GDPPS	0.227***	-0.148***	0.153***	1			
GDPPH	0.395***	-0.009	0.551***	0.0787***	1		
Language	0.181***	0.180***	-0.113***	0.130***	-0.032	1	
Distance	-0.067**	0.429***	-0.262***	-0.300***	-0.104***	0.106***	1
Openness	0.048*	0.016	-0.199***	-0.021	0.395***	0.023	-0.008
Infrastructure	0.292***	-0.066**	0.408***	0.064**	0.616***	-0.057*	-0.187***
Polity2h	-0.008	0.037	-0.039	0.005	0.019	0.081***	0.447***
Exchange	-0.148***	0.063**	-0.240***	-0.040	-0.505***	-0.025	0.050*
EquityS	0.006	0.146***	0.067**	0.162***	0.101***	0.130***	0.040
EquityH	-0.204***	0.042	-0.388***	-0.060**	-0.060**	0.051*	0.121***
Net loanS	-0.228***	-0.194***	-0.079***	-0.009	-0.072**	-0.396***	-0.041
Net loansH	-0.030	-0.003	0.032	0.026	0.125***	0.060**	0.104***

variables	Openness	Infra.	Polity2h	Exchange	EquityS	EquityH	Net loanS	Net loansH
FDI								
GDPS								
GDPH								
GDPPS								
GDPPH								
Language								
Distance								
Openness	1							
Infrastructure	0.311***	1						
Polity2h	-0.012	-0.059**	1					
Exchange rate	-0.424***	-0.497***	-0.082***	1				
EquityS	0.066**	0.058**	-0.004	-0.016	1			
EquityH	0.305***	-0.116***	0.166***	-0.101***	-0.011	1		
Net loanS	-0.015	-0.116***	-0.026	0.051*	-0.134***	0.039	1	
Net loansH	-0.022	0.188***	0.288***	-0.048*	-0.041	0.038	-0.053*	1

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ denotes significance level at 10%, 5% and 1% respectively.

Chapter 4

FDI-Growth Nexus in Africa: Evidence from the new financial fragility measure.

Abstract

This chapter investigates whether the effect of foreign direct investment (FDI) on economic growth is contingent on a financial system that accounts for fragility, herein after referred to as a developed financial market. Several papers have looked at FDI-Growth nexus conditioned on financial market systems without accounting for possible market fragility. An important point of departure for this present study is the adoption of new financial market fragility indicators to examine the role of financial fragility in financial market development (FMD) on the FDI-growth nexus for African countries. Using two measures of fragility indicators and instrumental variable estimation technique, the study finds that accounting for financial fragility, managerial efficiency (cost to income ratio) reduces the positive effects of the development of financial markets in the FDI-growth link. On the other hand, the results for financial fragility, liquidity (net loans to total assets ratio) shows the opposing sign. Thus, increase in fragility enhances the growth promoting effect of FDI. This could be that multinational corporations (MNCs) are less responsive to the liquidity ratio of the host country. In spite of this revelation, the study shows that FDI have a marginally significant positive impact on economic growth. The findings suggest that fragility in FMD can weaken the growth enhancing effects of inward FDI.

4.1. Introduction

The classical and neoclassical economic theories argue that economic growth depends on the supply of capital as well as the supply of labour and technology. Developing countries and for that matter, African countries in their attempt to develop are hindered by shortage of capital that puts a limit on investment and economic growth prospects. This resource gap can be augmented with an inflow of funds from foreign private or public sector. In the 1980s, the drying up of commercial bank lending to developing economies prompted most countries to ease restrictions on foreign direct investment (FDI). Hence, many economies aggressively offered tax incentives and subsidies that created conducive business environment to attract foreign capital (Aitken and Harrison, 1999; World Bank, 1997). Therefore, along with the above policy changes (Carkovic and Levine, 2005), an outpouring of non-commercial bank private capital flows to developing economies in the 1990s occurred. Thus, FDI is seen as an important source of capital needed for economic growth. De Mello (1997) argues that FDI is a composite of bundle of capital stock and technology that can augment the existing stock of knowledge in the host economy through labour training, skill acquisition and diffusion, the introduction of new managerial practices and organizational arrangements.

Since the beginning of the 1990s, FDI has become one of the most important sources of foreign capital for emerging market economies (EMEs) as well as a catalyst for economic growth and wealth creation. For instance, according to Carkovic and Levine (2005) private capital flows to EMEs exceeded USD 320 billion in 1996 and reached almost USD 200 billion in 2000. Thus, FDI now accounts for over 60 percent of private capital flows to developing economies. In view of this, several countries in the African region as well as policymakers have adopted new policies to improve their investment climate, liberalise investment regulation and offer incentives for foreign investors in order to create the enabling environment to attract FDI.

The rationale for increased efforts to attract more FDI stems from the belief that FDI has several positive effects that include adaption of new technology, job creation (employment) and capital accumulation. These benefits, in addition to the direct capital financing it brings about, suggest that FDI is an essential ingredient in modernizing the national economy and promoting growth.

Theoretically, in the neoclassical growth model, FDI promotes economic growth by increasing either the volume of investment or its efficiency. However, in the endogenous growth model, the positive effect of FDI on economic growth arises from the generation of technological diffusion from the developed world to the host developing country (Borensztein et. al., 1998). While the increase in FDI flows is unmistakable, there is a widespread view in the empirical literature that the impact of FDI on growth remain inconclusive (Gorg and Greenaway, 2004). One possible explanation for this mixed result is because of conflicting opinions not only on the impact of FDI on economic growth but also on the transmission mechanisms through which FDI affect economic growth. In other words, most studies fail to model the contingency effects in the relationship between FDI and economic growth. Most economic models suggest that the link between FDI and economic growth may be contingent on other intervening factors.

A prominent view that has emerged in this discourse is that the absorptive capacity of the FDI-receiving country matters. This absorptive capacity has been looked at under different prisms. Some recent studies have argued that the positive effect of FDI on growth is strongly dependent on the circumstances (absorptive capacities) in the host countries. Absorptive capacity is the ability for the host country to absorb and internalize new technology from a foreign country. Thus, FDI can only contribute to economic growth through spillovers when there is a sufficient absorptive capacity in the recipient country. Recently, empirical studies have acknowledged that certain factors may condition the FDI-led growth hypothesis, especially in developing countries. In line with this, some researchers have argued that the contribution FDI can make is strongly dependent on the circumstances (absorptive capacities) in the host countries. Thus, there should be conditions necessary for identifying FDI's growth promoting effects. For instance, Balasubramanyam et al. (1996) and Borensztein et al. (1998) see the domestic economy's trade as well as human capital policies as the prerequisite for FDI's growth-promoting effects, while De Mello (1997) focused on the importance of physical capital accumulation. In addition, Blomstrom et al. (1994) demonstrate that FDI has a growth promoting-effect when a country is adequately rich in terms of per capita income. However, there are equally a number of other somewhat complimentary opinions along the lines of market size, natural resource endowment and a host of other factors.

Many researchers such as (Goldsmith, 1969; McKinnon and Shaw, 1973; Demetriades and Hussein, 1996) have identified the importance of well-developed financial markets in enhancing technological innovation, capital accumulation and economic growth. They argue that a well- functioning financial markets lowers the cost of transaction and ensures that capital is allocated to productive projects, thereby enhancing growth rates. In addition to the above, relatively more recent studies (Hermes and Lensink, 2003; Alfaro et al., 2004; Azman-Saini et al., 2010) have provided empirical evidence to support the important role of the financial sector in the FDI-Growth nexus. They conclude that the impact of FDI on economic growth is contingent on the development of financial markets of the host country. Therefore, these authors opine that, a well-functioning financial market is better positioned to attract FDI, lowers the transaction cost and reduces risks arising from information asymmetries.

The orthodox wisdom advocates that the development of financial market is a fundamental determinant as well as a key contributor of economic growth for the following reasons. Primarily, the financial sector may contribute to economic growth by mobilising savings and thus, increases the volume of resources available to finance investment projects. Additionally, it also screens and monitors investment projects thereby lowering the cost of acquiring information. Moreover, it determines the extent to which MNCs will be able to borrow to extend their innovative activities in the destination economy, which will further expand the scope of technological spillovers to domestic firms. Therefore, for a well-developed financial market in the host country, the diffusion process may be more efficient. Demetriades and Andrianova (2004) point out that the presence of a sound financial sector is a prerequisite for the host country to materialise innovations and exploit its resources efficiently. Hence, finance is seen as a facilitator for economic growth. Finally, a developed financial market tends to be more efficient and this matters for economic growth. As revealed by Blejer (2006), countries with more efficient financial markets are less prone to banking crisis and these countries suffer much less when crisis occurs.

The preceding discussions illustrate the significant role of financial markets in ensuring the positive externalities of FDI to materialize. This is not different for developing countries and for that matter Africa. Various studies on Africa have highlighted the significant role of the development of financial markets in ensuring the growth promoting effects of FDI (Alfaro et al., 2004 and Adams, 2009). Specifically, Adams (2009) observes that in the Sub-Saharan

Africa (SSA), the lack of positive effect of FDI may be due to the low level of the development of financial markets. Furthermore, the empirical results from the preceding chapter of this thesis affirms the significant role of the development of financial markets as a driver of inward FDI for African countries.

Despite this rather obvious role of the financial market, there seems to be a missing link in the role of FMD in the FDI- growth nexus. Previous studies have ignored the effect of financial fragility in the financial market and this militates against the development of the market in particular, thereby affecting its role in the FDI-growth link. A financial system can be described as fragile when the banks are unsound or the financial markets are unstable or both. These elements of financial market fragility such as banking crisis, cycles of boom and bust; and financial volatility can affect the process of FMD thereby hurting economic growth. Demetriades et al., 2017, argue that the mechanism through which the positive effect of FMD on growth can be weakened is by financial fragility. In Africa and particularly for SSA, Demetriades and James (2011) highlights the dysfunctional nature of financial markets to economic growth. They demonstrate that "the relationship between finance and growth in the region is a rather lose one" (p.263). Therefore, there is the need to fix this missing link, which is essential to the economic growth and development of the region.

Considering the key role that FMD play in an economy's growth processes, the objective of this study is to provide insights into the role of financial fragility in the financial market in the FDI-growth nexus for Africa. This chapter contributes to the existing literature by using a unique data on financial fragility developed by Andrianova et al., 2015 to provide for the missing link in the role of the FMD in the FDI-growth nexus. Moreover, this is the first paper to attempt a comprehensive study on the impact of FDI on economic growth contingent on financial fragility in financial market for Africa. The study uses a unique data, which has a wider coverage than the existing ones as it includes all deposit –taking institutions such as commercial banks, investment banks, real estate and mortgage banks. It is worthy to note that, the crucial role played by investment banks, real estate and mortgage banks in the latest global financial crisis cannot be overlooked (Bordo, 2008). Therefore, the omission of these banks may lead to under-estimation of financial fragility, which in turn may affect the development of the financial market.

To achieve the above objective, this study adopts the standard two-stage least squares instrumental variable estimation technique (2SLS-IV). The use of standard 2SLS-IV estimator, which relies on external instruments, is an attempt to address econometric concerns of ensuring that all biases linked to measurement error, simultaneity and omitted variable problem are effectively dealt with. In addition, for robustness checks, study relies on static panel estimator and thus uses the pooled ordinary least squares (OLS). The results of the study provide evidence that FDI has a marginally significant positive impact on economic growth after accounting for financial fragility in the development of financial markets. This suggests that fragility in the financial market is a key absorptive capacity and cannot be overemphasized in explaining FDI-Growth nexus in Africa.

The rest of the chapter is organised as follows. A discussion and summary of selected empirical literature on the FDI-growth link via FMD is presented in section 4.2. Section 4.3 highlights the empirical framework and methodological issues. Section 4.4 presents dataset used. Section 4.5 discusses the empirical results. The final section 4.6 succinctly concludes with a discussion of appropriate policy implications from the results.

4.2. Empirical Review on the role of FMD in FDI-growth nexus.

One of the earlier authors on the role of FDI in achieving economic growth, Hirschman (1958), has observed that in the absence of the right background linkages, the impact of foreign investment on the various sectors of an economy will be limited. Subsequently, Findlay (1978) in a theoretical paper substantiated Hirschman's work and indicated that although foreign investment is good, not all sectors are equally ready for its impact. Thus, the effects of FDI on economic growth may not always be positive, as one would have expected.

Since then, several other studies have sought to establish this relationship and there exists vast literature on this subject. The motivation for the surge to find out more about this relationship especially for developing countries may be attributed to benefits such as "productivity gains, technology transfers, the introduction of new processes, managerial skills, and know-how in the domestic market, employee training, international production networks, and access to markets" (see Alfaro et al., 2004, p.90). Some of the FDI-growth related studies are either firm level or country-specific (national) time series analysis, while others are panel studies. Interestingly, De Mello (1999) combined both time series and panel

data analysis in one study. In his time series analysis, he concluded that, in the long run, the effect of FDI on economic growth is not homogenous across countries. For the short-run estimates in his panel analysis, he found a negative FDI-growth relationship while he found no evidence for long-run causation of FDI to growth.

A priori, one would expect a positive relationship between FDI and economic growth. For example, in a panel study, Li and Liu (2005) investigated whether FDI affects economic growth using data for 84 countries over the period 1970-99. Applying both single equation and simultaneous equation system techniques, they demonstrated that FDI does not only promote economic growth by itself directly, but also it indirectly does so via its interaction terms. The interaction of FDI with human capital exerts a strong positive effect on economic growth in developing countries. In another study, Zhang (1999a) carries a causality test between FDI and economic growth in ten East Asian economies and finds that FDI appears to enhance economic growth in the long run for mainland China, Hong Kong, Indonesia, Japan, and Taiwan and in the short run for Singapore.

Contrary to the positive a priori expectation, we found that results from FDI-growth empirical studies have been ambiguous. For example, using data on 80 countries for the period 1979-98, Durham (2004) did not find a positive relationship between FDI and economic growth; instead, he argues that the effects of FDI are contingent on the "absorptive capability" of host countries.

Indeed, we have observed from the literature that, FDI can at best be described as a channel, which is contingent on absorptive capacities or conditional effects to achieve its growth objective. The World Bank's (2001) edition of global development finance highlighted the role of 'absorptive capacities' in FDI success. Absorptive capacities here include macroeconomic management (as captured by inflation and trade openness), infrastructure (telephone lines and paved roads), and human capital (share of labor force with secondary education and percentage of population with access to sanitation). An addition to the absorptive capacities which is currently considered as "prime" among the other absorptive capacities is financial market development (see Oman and Bolbol, 2003)

Several authors including Lensink and Morrissey (2006) have provided considerable evidence to support the role of FDI as a channel for economic growth. In the traditional literature,

FDI is believed to promote economic growth by increasing capital stock, whereas some literature (e.g. Markusen, 1995) recognises the role of FDI as a channel of technological transfer. Thus, technological change plays an important role in economic growth and therefore, FDI by multinational corporations as a means through which developing countries have access to advanced technologies that can enhance growth. These positive externalities (knowledge spillovers) takes place through imitation, competition, linkages and training. Domestic firms may become more productive by imitating the more advanced technologies and therefore, in the absence of FDI, acquiring the necessary as well as the right information for the adoption of new technologies will be too expensive for the local firms. In effect, FDI reduces the cost of technology adoption as well as expand the set of technologies available to domestic firms. The competition channel emphasizes that the arrival of foreign firms in the domestic economy may increase competition and this may be a source of encouragement to local firms in order to become more efficient in upgrading their technological base. Foreign firms may also transfer new ideas and technologies to local firms through linkages channel due to transactions with the domestic firms. The training channel is because of introduction of new technologies, which promotes an upgrading of human capital.

In recent debates in the development literature, attention has been drawn to the role a developed financial market plays in the FDI-growth nexus. In a much broader sense, Hermes and Lensink (2003) investigated the role developed financial systems play in enhancing the positive relationship between FDI and economic growth. They estimated an ordinary least squares (OLS) model using a balanced panel (cross-sectional) dataset spanning from 1975-1990 with sixty-seven developing countries. In their dataset, the sufficiently developed financial and the undeveloped financial systems were thirty-seven and thirty respectively. They provided evidence that, for host countries, FMD is a key pre-conditioned driver that determines the direction of the FDI-growth nexus. Indeed, they strongly argued that FDI would affect growth "only if financial markets are well-developed" (p.157). Thus, a host country with a well-developed financial market is most likely to have a positive FDI-growth relationship.

Unlike the study by Hermes and Lensink (2003) which focused on LDCs, Alfaro et al. (2004) has a much broader scope. First, they combined OECD & non-OECD countries. Their main objective was to examine the various links among FDI, financial markets and economic growth. Key amongst their objectives, which is similar to the objective of Hermes and

Lensink (2003), was to investigate whether countries with better financial systems can exploit FDI more efficiently. Secondly, they estimated both OLS and instrumental variable (IV) models to address possible endogeneity (reverse causality) issues that may be associated with OLS. Thirdly, they used different measures of financial market development, a means to test the robustness of the measures used to explain financial market systems. The authors provided interesting results, which show that FDI alone explains economic growth. However, countries with well-developed financial markets gain significantly from FDI. Their evidence was further authenticated when they introduced different measures of FMD yet found consistent results as earlier indicated. Thus, they provided robust evidence to support the finding of Hermes and Lensink (2003), that the impact of FDI on economic growth is contingent on a well-developed financial system. These findings are similar to Choong et al (2004), where they argue that the role of the financial sector cannot be overemphasised as it provides the needed absorptive capacity for the expected impact of FDI on economic growth.

Buttressing the role of financial market systems and economic growth, a recent study by Demetriades et al. (2017) is much more comprehensive. The novel use of the new financial fragility indicators for 124 countries over the period 2000-2011 established a relationship between finance, economic growth and fragility. The authors used an IV strategy in order to help identify the estimates and reduce possible simultaneity bias commonly associated with panel time-series studies. As part of their results, they provided evidence that both financial fragility and private credit have a negative and significant effect on GDP growth. This evidence was still robust after they have even controlled for systemic financial crisis. In addition, the authors interacted impaired loans with private credit, and found a further negative effect of the interaction on GDP growth. The study used z- score methodology to explain the degree of financial stability. Thus, a lower score represented a higher fragility and a higher score represented a greater financial stability. They found that greater financial stability eradicates the adverse effect of private credit on GDP growth.

In contrast, there have been empirical studies that provide evidence (e.g. Carkovic and Levine, 2005) that the effect of FDI on economic growth can be negative. Authors such as (Easterly, 1993; Borensztein et al., 1998) have provided the channels through which FDI can serve as a cost to economic growth. Easterly (1993) argues that one of the channels could be through the distortions in the domestic economy. He notes that policies such as preferential

tax treatments and other concessions can distort domestic incentives. If foreign firms obtain significant benefits from host governments, the distortions caused could have large negative effects on growth. In addition, FDI might crowd out domestic investment by diverting scarce resources away from other productive sectors. More so, the size of government could be another channel for adverse growth effects. Governments might need to invest in infrastructure to attract FDI and this might increase foreign debt as well as the distortionary tax burden, serving as another example of crowding out.

In conclusion, the above literature review suggests that the effect of FDI on economic growth remains extremely controversial. This is partly due to the use of different samples by different authors and partly due to various methodological problems. While the current study is similar in spirit to the above strand of empirical evidences, this study treads a distinct path on a number of fronts. First, most of the previous empirical attempts have been typically conducted either purely for advanced countries or with samples of countries that include a few from developing countries. Hence, the present study examines the FDI-growth nexus via financial market development with specific reference to a group of African countries. To the best of my knowledge, empirical works on the effect of FDI on economic growth conditioned on financial market development are scarcely available to this region. Secondly, previous studies on the above relationship have failed to account for the role of financial market fragility and therefore, the positive effect of financial market development on economic growth may have been weakened. To fill this gap, this study uses unique dataset on financial fragility indicators to examine its role in the development of financial market in the FDI-growth nexus, which is quite novel.

4.3. Empirical framework

4.3.1. Model specification

The purpose of this study is to examine the FDI-growth link via FMD accounting for the role of financial market fragility. The empirical model for this study is a modification of the specification by Barro and Sala-i-Martin (1995 and 2004) and follows Borensztein et al. (1998). In general, growth models are constructed by considering the effects of domestic capital, foreign capital, human capital, institutional factors, policy related factors and conditional convergence. The approach adopted in this study is to estimate the effect of FDI on economic growth conditioned on the development of financial market that accounts for financial fragility. Therefore, I extend the model by incorporating financial fragility in the set

of conditioning variables. This study as the starting point examines the direct impact of FDI, controlling for financial market fragility as well as with some set of conditioning variables on economic growth and the basic specification of the estimated model will be as follows:

$$G_{it} = \alpha + \beta Y_{i,0} + \gamma FDI_{it} + \delta FF_{it} + \rho X_{it} + \varepsilon_{it} \quad (4.1)$$

Equation (4.1) is a variant of Barro growth regression, where G represent economic growth, Y initial income (the natural logarithm of initial GDP per capita to measure the 'catching up effect'), FDI is foreign direct investment, FF measures financial market fragility indices and X represents a set of conditioning variables in line with the growth literature. The subscript i indexes individual countries, whereas t indexes time. The error term is denoted by ε. The coefficients of interest are both γ and δ. The former measures the effect of FDI on economic growth and the latter measures the responsiveness of economic growth to financial market fragility.

In the baseline model (equation 4.1), we are interested in estimating the effect of FDI on economic growth without any conditionality as well as the effect of financial fragility. However, in the empirical literature, the effect of FDI on economic growth remains ambiguous. This ambiguity is as a result of conflicting opinions not only on the impact of FDI on growth but also on the transmission mechanisms through which FDI affects economic growth. Thus, the effect of FDI on economic growth is contingent on certain factors (absorptive capacities) in the host country. Therefore, equation 4.2 models the effects of FDI on economic growth conditioned on financial market development that accounts for financial fragility. According to Demetriades et al. (2017), the mechanism through which the positive effects of financial market development on economic growth can be weakened is that of financial fragility.

In this equation, (FDI) is interacted with a measure of financial market development and financial market fragility. In addition with the same covariates as the specification in equation (4.1). Then use this interaction term as a regressor to test for the significance of the role of financial fragility in financial market development in enhancing the positive externalities associated with FDI. In other words, the interaction term denotes the complementarity of FDI and the role of fragility in financial market development in facilitating economic growth. Therefore, equation (4.2) is specified as follows:

$$G_{it} = \alpha + \beta Y_{i,0} + \gamma FDI_{it} + \rho X_{it} + \varphi FDI * FFMD + \varepsilon_{it}$$

(4.2)

The coefficient of the interaction term φ measures the conditional effect of FDI on economic growth. Thus, the impact of the role of financial fragility in financial market development (FFMD) as an absorptive capacity in enhancing the positive externalities of FDI inflows.

4.3.2. Econometric technique

Estimating the parameters in the model in equations (4.1 and 4.2) are not without a challenge. Particularly, in modelling the effect of FDI on economic growth, an important methodological issue is endogeneity bias. This could deter efficient identification of the true causal impact of FDI on economic growth. Theoretically, it is plausible and very likely that both the magnitude of FDI and the efficiency of FMD may increase with higher growth rates. Thus, this would lead to an overstatement of the impacts of each of the two variables and their interaction on economic growth. Hence, the findings are likely to be biased due to the common problems of simultaneity and reverse causality, which may arise because economic growth may be affected by FDI and FMD respectively as well as FDI and FMD may be driven by economic growth. This is a potential threat to identification of the causal impact of FDI and FMD on economic growth. To overcome the above challenge to identification, it is important to adopt an econometric technique that provides the possibility of reducing endogeneity in the empirical model. Various authors who consider this endogeneity problem often use either the 2SLS-IV or the System Generalized Method of Moments (GMM) estimation technique developed by Blundel and Bond, 1998). The former relies on external instruments while the latter on internal instruments. The OLS fails to account for the possible endogeneity of the right –hand-side variables. Specifically, it cannot account for potential country-specific variations that are not modelled and unobserved. It is believed that any significant correlation between unobserved country- specific factors and FDI or any of the right hand side variables make both the OLS and fixed effect estimators inconsistent.

4.3.2.1. Instrumental Variable Strategy

The IV-2SLS strategy involves replacing the endogenous variable (which is correlated with the error term) by a proxy variable, known as an instrumental variable that is independent of the error term. Therefore, in this study the standard 2SLS-IV estimation technique is used as

the preferred estimator to minimise, in a more direct way the potential endogeneity of FDI and FMD due to measurement error, omitted variables, and reserve causality. However, for robustness checks, this study considers the pooled OLS estimation. Although, in principle, the endogeneity problem can be avoided by applying instrumental variable techniques, the fundamental problem is that there are no ideal instruments available. A good instrument would be a variable that is highly correlated with the endogenous regressors but not with the error term that is, it should be relevant and valid. According to Delgado et al. (2014), several studies have proposed a number of different instrumental variables that have shown to reduce, at least part of the endogeneity of FDI. In addition, it is important to note that, due to lack of ideal instrumental variable for FDI, most studies have either refused to address the issue of potential endogeneity of FDI or used lagged values of FDI. Similarly, Lensink and Morrissey (2006), posit that it is often difficult to identify ideal instruments, which are good at predicting the variable of concern and yet are not determinants of the dependent variable. Therefore, they recommend the use of lagged values of the variables concerned as instruments. Studies such as Borensztein et al. (1998) have used lagged values of FDI and log of area as IV for FDI. Other studies that also use lagged values of FDI, as IV for FDI are Delgado et al. (2014), Carkovic and Levine (2005). In recent FDI- growth literature, there is the proponents of a so-called 'legal-based view' (La Porta et al., 1997; Levine, 1997), which demonstrate the importance of establishing a legal environment in which financial markets thrive on effectively as well as an important factor in explaining FDI inflows.

In line with the above discussion, the present study proposes to use three variables as instruments for FDI. These are lagged FDI, log of area and origins of a country's legal system. Lagged FDI (previous FDI inflows) are likely to influence the flow of current FDI to a particular country but may not affect current economic growth directly as it gives signal to current investors that there are business opportunities in the host country. The log of area appears to be a good instrument because it can be a proxy for the size of the market and most scholars see the size of the market as very important in the traditional explanations of FDI inflows. Finally, this study uses the origins of a country's legal system as an instrument for FDI. A dummy variable is created (English common-law or the French civil law) since all African countries were colonised by either the British or the French. This serves as a secured property rights and therefore, creates the enabling environment and investor confidence, thus positively correlates with FDI. For financial fragility, this study follows

Demetriades et al. (2017) and instruments financial fragility indices by their predetermined values at the start of each period.

4.4. Data and variable description

This section describes the data used in the empirical analysis, which is based on an annual panel data set of 40 African countries for the period 1998-2012. The panel data set helps to explore the cross sectional as well as time series data simultaneously. There are 54 countries in Africa; some countries are omitted due to paucity of data. In addition, the choice of the time period covered is due to availability of data. All the variables used in this study are all sourced from World Bank's World Development Indicators Database (WDI, 2015) except the measures of financial market fragility, the role of institution and initial average years of schooling.

The dependent variable is economic growth, measured as growth in GDP per capita and the main variables of interest are FDI and financial market fragility indicators. FDI refers to net inflows to GDP ratio; it is expected that increase in FDI will bring additional capital needed for growth, thus a positive relationship between FDI and economic growth. The financial market fragility variables are from the New International Database of Financial Fragility developed by Andrianova et al., 2015 to measure FMD. Two measures are used in this present study and these include cost to income ratio (measures managerial efficiency) and net loans to total assets ratio (measures the extent of liquidity). Managerial efficiency: $\frac{Cost}{Income}$, this measures the level of managerial efficiency. A management that deploys its resources efficiently will look to maximise its income and reduce its operating costs therefore, an increase in this ratio implies a lower level of efficiency. This leads to a more fragile market and thus, reduces the flow of FDI. Liquidity: $\frac{Net\ loans}{Total\ Asset}$, this ratio measures the extent of liquidity in the financial market. As pointed out by the authors of these indicators, an increase in this ratio makes the market less liquid and thus makes the financial market more fragile. This affects the development of the financial market and therefore not a good driver of FDI. The choice of these indicators reflect and better describe the case of developing economies such as African countries and due to the availability of data for the countries.

It is believed that a fragile financial market that is susceptible to shocks make financial market development extremely vulnerable. From the empirical literature, it has been found that better developed local financial market which is resilient determine the absorptive capacity

of FDI receiving country (Hermes and Lensink, 2003; Alfaro et al., 2004). These new financial sector measures, according to the authors have wider coverage than the existing ones. For instance, whereas the existing measures focused exclusively on commercial banks, these new indicators incorporate all deposit-taking institutions including investment banks, real estates and mortgage banks. These banks played a significant role in the latest global financial crisis and therefore, their omission may lead to under measurement of financial fragility and thus, affect the development of the financial markets.

In line with the growth literature and as part of the explanatory variables, the study includes initial average years of schooling as a measure of human capital, initial income defined as GDP per capita in the previous year (initial GDP per capita), government final consumption expenditure as a percentage of GDP, a measure of trade openness and institution. Initial average years of schooling is expected to be positively correlated with economic growth (Barro and Lee, 1993, 1996) and therefore, it is used to proxy human capital in the host economy. The initial GDP per capita measures the 'catching up effect' and this captures the growth rate convergence process. It is generally expected to be negatively related to economic growth rates, indicating the existence of conditional convergence among countries. The growth literature suggests that government consumption expenditure may be detrimental to economic growth (Barro, 1996; Garrison and Lee, 1995; Durlauf et al., 2005). These authors demonstrate that increase in government final consumption expenditure reduces economic growth through distortions due to either taxation or government spending programmes that do not contribute to private sector productivity. Trade openness is defined as the ratio of exports plus import as a percentage of GDP. A positive coefficient is expected as openness to international trade is beneficial to economic growth. (Barro, 1996; Chang and Mendy, 2012). The institutional index is composed of six (6) measures and it comes from International Country Risk Guide (ICRG). The role of institution is another important source of growth highlighted in the literature (Acemoglu et al., 2002; Mijiyawa, 2008; Anyanwu, 2014). Good institutions create the enabling environment for the private sector to thrive on and therefore a positive coefficient is expected. These control variables are included in order to reduce omitted variable bias.

In addition, the following variables are constructed: Fin, fdidcc and fdidcn. Fin is a measure of financial market development, which is proxied by domestic/private credit (dc). It is measured as a percentage of domestic credit to the private sector divided by GDP. It is a

commonly-used variable to measure financial deepening in the academic literature as it measures the intermediation ability of the financial sector. fdidcc and fdidcn are interaction terms. It is fdi* dc * c/n, where fdi represents FDI, dc is a proxy for financial market development (FIN) and fragility measure is either c (cost to income ratio) or n (net loans to total assets ratio). These terms measures the effect of FDI on economic growth conditioned on the development of financial market that accounts for fragility.

Table 4.1 presents descriptive statistics of the variables used for this study. The data reveals large variations in initial income (GDP per capita) with a mean value of USD 988.46 for the period 1998 to 2012. GDP per capita growth for the African countries under the period of study averaged 2.17 percent. FDI inflows as a percentage of GDP has an average of 3.97. Initial average years of schooling (a measure of human capital) has a mean value of 2.86. Trade openness, measured as the share of total trade (sum of exports and import of goods and services) to GDP, averaged 77.01 percent in the region. Government expenditure averaged 14.81 percent for the period of study. Domestic credit to the private sector as a percentage of GDP averaged 22.21 percent. Regarding the financial fragility measures, cost to income ratio (Cost) averaged 58.24 percent and net loans to total assets ratio (Netloans) averaged 46.50 percent.

Table 4.1: Summary Statistics

Variable	Obs	Mean	St.dev	Min.	Max
GDP per Capita growth (%)	597	2.17	5.84	-62.21	57.99
Initial GDP per Capita (USD)	600	988.46	1209.05	136.17	5287.36
Initial Av. yrs. Of sch.	600	2.86	1.24	0.82	5.96
FDI (% of GDP)	600	3.97	6.85	-5.98	74.12
Trade openness (% of GDP)	600	77.01	46.45	20.96	531.74
Government Ex. (% of GDP)	598	14.81	6.28	2.05	42.51
Domestic credit (% of GDP)	600	22.21	26.11	0.20	160.12
Area (Km^2)	600	633042.1	638814.6	2040	2381740
LegUK	600	0.35	0.48	0	1
LegFR	600	0.65	0.48	0	1
Institution (%)	600	30.98	18.34	0.89	76.85
Cost (fragility index 1) (%)	600	58.24	18.93	2.00	230.61
Netloans (fragility index 2) (%)	600	46.50	15.66	6.37	92.4

Notes: This table shows the descriptive statistics for the data of 40 African countries over the period 1998 to 2012. The statistics are based on the raw data.

The pairwise correlation matrix for the variables used in the econometric estimation is presented in Table 4.2. The test depicts the correlation coefficient with the associated level of significance. Using a p-value of 5%, we have evidence of no high correlation between the

pair of variables in our model. Although, we acknowledge that the correlation between initial GDP per capital (a proxy for initial income) and initial average years of schooling (a proxy for human capital) reports the highest correlation coefficient of 0.58, followed by the correlation between FDI and trade openness with correlation coefficient of about 0.52, yet this is not high enough to inflate our estimates. FDI and government final consumption expenditure has the lowest correlation coefficient. Hence, the evidence given by the pairwise correlation matrix in Table 4.2 indicates that there is no severe multicollinearity in the data which can affect the precision of our estimation.

Table 4.2: Pairwise correlation matrix

	GDPPC growth	InitialGDPPC	InitialAvysh	FDIGDP	TradeOp	GovfCon	Domesticcr	Area	LegUK	LegFR	all	cost	Netloans
GDPPCgrowth	1.0000												
InitialGDPPC	-0.0918*	1.0000											
InitialAvysh	-0.0456	0.5782*	1.0000										
FDIGDP	0.2877*	-0.1233*	-0.1354*	1.0000									
TradeOp	0.2955*	0.1411*	0.2068*	0.5212*	1.0000								
GovfinalCon	-0.0236	0.1455*	0.2766*	-0.0002	0.1960*	1.0000							
Domesticcr	-0.0501	0.4619*	0.4852*	-0.1153*	0.0065	0.1902*	1.0000						
Area	-0.0356	0.1366*	-0.0124	-0.0304	-0.2081*	-0.0897*	0.0332	1.0000					
LegUK	0.0084	-0.0090	0.5100*	-0.0250	0.0395	-0.1721*	-0.1721*	-0.1441*	1.0000				
LegFR	-0.0084	0.0090	0.5100*	-0.0250	-0.0250	-0.1721*	-0.1721*	-0.1441*	-1.0000	1.0000			
all	0.0448	0.4148*	0.3512*	-0.0725	0.0841*	0.3896*	0.4847*	-0.2859*	0.1972*	-0.1972*	1.0000		
cost	-0.1290*	-0.2452*	-0.2179*	-0.0631	-0.2424*	-0.0386	-0.0565	0.1561*	0.0045	-0.0045	-0.2052*	1.0000	
Netloans	-0.0227	0.1709*	0.1064*	-0.1814*	-0.1757*	0.1205*	0.3323*	-0.0889*	-0.1108*	0.1108*	0.3371*	-0.0412	1.0000

Note: * denotes the probability value at 5% significance level.

4.5. Discussion of results

This section presents the empirical results. As a baseline regression, we examine the direct effect of FDI on economic growth. Next, we assess the impact of FDI on economic growth controlling for financial fragility. Finally, we investigate the role of financial fragility in financial markets in the FDI-growth nexus.

4.5.1. Direct impact of FDI on economic growth

Table 4.3 presents both the pooled OLS and 2SLS estimation results on the direct impact of FDI on economic growth. Given the strengths of the 2SLS-IV estimator as already discussed in section 4.3.2.1, we use the 2SLS-IV estimation as our preferred model whiles the OLS estimation is used for robustness checks. We can infer from Table 4.3 that FDI relates positively with economic growth in both pooled OLS and 2SLS-IV estimations. The results clearly indicate that the estimated coefficient on growth is statistically significant in both models, which suggests that FDI plays a significant and positive role in boosting the growth of African countries economies. This result is consistent with some studies in the FDI-growth literature. (see Baldwin et al., 2005; Chong et al., 2010; Gui-Diby, 2014; Zghidi et al., 2016). The finding assumes that the effect of FDI on economic growth is not contingent on absorptive capacities.

However, in terms of the level of significance, there is a 1 percent level of significance for the pooled OLS estimation as compared to a 5 percent level of significance for the 2SLS-IV estimation. In addition, the magnitude of the FDI coefficient is larger in 2SLS-IV estimation than in pooled OLS estimation model. Moreover, the explanatory power of the 2SLS-IV model is not different from that of pooled OLS model. In particular, after instrumenting FDI with lagged FDI, log of Area and origins of a country's legal system as detailed in section 4.3.2.1, the results posit that a 1 per cent increase in FDI as a share of GDP will raise economic growth by 0.62 per cent on the average as opposed to 0.47 percent in the pooled OLS estimation. This indicates that there is a 0.15 percentage points downward bias in the pooled OLS estimates of FDI, which is most likely caused by endogeneity; the instruments used (lagged FDI, log of Area, origins of a country's legal system) are able to correct for (at least part of) the downward bias on the FDI coefficient.

Table 4.3: Regression Results

VARIABLES	(1) Pooled OLS	(3) IV-2SLS
Initial Income	-1.1845**	-1.3393**
	(0.565)	(0.631)
Initial Av yrs of sch	0.0281	0.1697
	(0.208)	(0.227)
Government Expenditure	-0.5328	-0.6281
	(0.954)	(1.088)
Trade openness	2.0737*	1.9185
	(1.123)	(1.465)
Institution	0.0457*	0.0497*
	(0.024)	(0.026)
FDI	0.4699***	0.6241**
	(0.153)	(0.263)
Year Dummies	Yes	Yes
Observations	566	512
F-stat. of excluded instruments		28.23
P-value (KP rk LM stat.)		0.00
Hansen J-test (p-value)		0.5566
R-squared	0.13	0.13

Dep Variable: GDP PER CAPITA GROWTH
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias 16.85

Initial GDP per capita (a proxy for initial income) which measures the 'catching up effect' is introduced as an explanatory variable according to the conditional convergence hypothesis. The estimated coefficient of initial income shows the expected negative sign and is statistically significant at 5 percent in both models. This implies a convergence of per capita income across countries as outlined in growth theories. This result is in line with the work of (Barro and Sala-i-Martin, 1997; Degado et al., 2014; Zghidi et al., 2016). There is also an evidence of positive and significant effect of the role of institutions, proxy with a composite institutional index (an average of voice and accountability, political stability and absence of violence, government effectiveness, rule of law and control of corruption) on economic growth in Africa. For example, the results suggest that a 1 per cent increase in institutional index would increase economic growth by 0.046 percent and 0.050 percent in both pooled OLS and 2SLS-IV models respectively. Therefore, we conclude that better institutional quality of a country promotes economic growth. This result is consistent with the findings of (Acemoglu et al., 2002; Mijiyawa, 2008; Anyanwu, 2014). The impact of trade openness on growth is positive and significant in the pooled OLS model but not 2SLS-IV model. The effect of the other variables in the regression such as government consumption and human capital had their expected signs; however, they were not significant in all the models.

4.5.2. Direct impact of FDI on growth controlling for financial fragility

Table 4.4, reports the regression results on the direct effect of FDI on economic growth controlling for financial fragility indices that have been missing in previous studies. The impact of FDI on growth is still positive and significant at 1 percent and 5 percent in the pooled OLS and 2SLS-IV estimation models respectively. The result is consistent with the previous result discussed in Table 4.3. The conditioning sets (initial GDP per capita and institution index) are significant and have the expected signs in all estimated models. For instance, a 1 per cent increase in institution index will lead to a 0.03 percent and 0.05 percent increase in growth respectively in both pooled OLS and 2SLS-IV models. The coefficient of trade openness is again positive and significant at 10 per cent in the pooled OLS model but not the 2SLS-IV model.

Table 4.4: Regression Results

	(1)	(2)
VARIABLES	Pooled OLS	IV-2SLS
Initial income	-1.4509**	-1.4855**
	(0.651)	(0.685)
Initial Av yrs of sch	0.0712	0.1057
	(0.214)	(0.261)
Government expenditure	-0.3673	0.0237
	(0.927)	(1.149)
Trade openness	2.0376*	0.9567
	(1.086)	(1.490)
Institution	0.0343*	0.0531**
	(0.020)	(0.023)
FDI	0.5322***	0.7166**
	(0.152)	(0.302)
Financial fragility index 1	-2.0069*	-3.7770*
	(1.154)	(2.242)
Financial fragility index 2	1.5471*	-0.9472
	(0.878)	(1.298)
Year Dummies	Yes	Yes
Observations	566	512
F-stat. of excluded instruments		18.91
P-value (KP rk LM stat.)		0.00
Hansen J-test (p-value)		0.4209
R-squared	0.15	0.10

Dep Variable: GDP PER CAPITA GROWTH
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias 12.20

The financial fragility 1, which measures managerial efficiency (cost to income ratio), had its expected significant sign in both models. From our preferred 2SLS-IV model, a 1 percent increase in the cost to income ratio will lead to a 3.8 percent decline in economic growth. The estimation results demonstrate that financial fragility index (cost to income ratio) reduces economic growth after instrumenting this index with it predetermined value at the start of each period (initial value). The result implies that an increase in this ratio reduces the level of managerial efficiency, which tends to make the financial market more fragile affecting the development of financial market and this does not create the enabling environment to spur economic growth in the economy. In other words, the positive impact of financial development on growth can be weakened by financial fragility. This is because the financial system can be described as fragile when the banks are unsound or the financial markets are unstable or both. Hence, these elements of financial market fragility such as banking crisis, cycles of boom and bust, and financial volatility can affect the process of FMD thereby hurting economic growth. This result is similar to the findings of Demetriades et al. (2017) and confirms that financial fragility has negative effect on economic growth. However, for financial fragility 2 that measures the extent of liquidity in the market (net loans to total assets ratio), the coefficient estimate is positive and significant sign in the pooled OLS result but in the 2SLS-IV estimation, it is negative and not significant. The positive and significant result in the pooled OLS implies that increase in fragility index 2 (net loans to total assets ratio), this makes the financial market less liquid and rather affect growth positively.

4.5.3. The role of financial fragility in financial market in the FDI-growth nexus

In Table 4.4 above, specifically focuses on the effects of FDI and financial fragility on economic growth, while Table 4.5 examines the impact of FDI on economic growth contingent on the development of financial market that accounts for financial fragility. In other words, the aim in Table 4.5 is to gauge whether as earlier hypothesised, the impact of FDI on economic growth depends on a financial market that accounts for the role of financial fragility. Before commenting on the role of financial fragility in financial market in the FDI-growth nexus, it is worth mentioning that, the result for the conditioning sets is similar to previous results discussed above. The coefficient of initial income and the role of institution have their expected signs and statistically significant in both models. For instance, from Table 4.5, the regression result suggests that there is weak evidence of the 'catching-up effect', in the 2SLS-IV model as compared to the pooled OLS model, as the coefficient on the initial GDP per capita is negative and significant at 10 percent level.

However, the significance level of the institution variable is the same for both models. Interestingly, the impact of FDI on economic growth is positive and significant in the pooled OLS model with some bias. For the true effect, which accounts for possible endogeneity, FDI enters the 2SLS-IV model with the expected positive sign, but it is only marginally significant. One can argue based on the evidence that without accounting for financial fragility especially in developing countries, the impact of FDI on growth can be somewhat misleading. The coefficient of trade openness is positive as expected in all the models but statistically significant in the pooled OLS model. Again, the effect of government consumption expenditure and human capital on economic growth have their expected signs, but are statistically not significant.

Table 4.5: Regression Results

	(1)	(2)
VARIABLES	Pooled OLS	IV-2SLS
Initial income	-1.3366**	-1.5877**
	(0.644)	(0.775)
Initial Av yrs of sch	0.1246	0.2772
	(0.212)	(0.214)
Government expenditure	-0.2010	-0.3626
	(0.949)	(1.061)
Trade openness	2.0299*	1.8971
	(1.106)	(1.411)
Institution	0.0415*	0.0391*
	(0.022)	(0.021)
FDI	0.9879***	0.9755*
	(0.336)	(0.542)
FDI×Fin×Fragility 1	-2.1851**	-2.0720**
	(0.956)	(1.013)
FDI×Fin×Fragility 2	1.6870**	1.8411**
	(0.855)	(0.924)
Year Dummies	Yes	Yes
Observations	566	512
F-stat. of excluded instruments		45.85
P-value (KP rk LM stat.)		0.00
Hansen J-test (p-value)		0.4315
R-squared	0.15	0.15

Dep Variable: GDP PER CAPITA GROWTH
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias 16.85

In order to examine the role of financial fragility in financial market in the FDI-growth nexus, the selected financial fragility indices; cost to income ratio (fragility index 1) and net loans to total assets ratio (fragility index 2) are interacted with private credit. This variable (private credit) measures financial market development. Private credit is measured as a percentage of domestic credit to the private sector divided by GDP. This is commonly used as a proxy to measure the deepening of financial sector in the finance-growth literature as it indicates the intermediation ability of the financial sector. The interaction of private credit and financial fragility indices (fragility index 1 and 2) measures the role of financial fragility in financial market. To show whether the effect of FDI on economic growth is contingent on the role of financial fragility in financial market, FDI is interacted with financial fragility (index 1and 2) in financial market and this gives the variables (*fdidcc* and *fdidcn*). The regression result in Table 4.5 shows that the estimated coefficient on *fdidcc* (interaction of FDI, private credit and fragility index 1) is negative and statistically significant at 5 percent in both models. This result implies that the more unsound and unstable the financial system is the less absorptive capacity the country has for FDI and thus, economic growth is affected negatively. The result provides an extension to the role of FMD in the FDI-growth literature (see Hermes and Lensink, 2003; Alfaro et al., 2004; Azman-Saini et al., 2010).

Surprisingly, the estimated coefficient on *fdidcn* is positive and significant in all the models. This suggests that an increase in net loans to total assets ratio, which makes the financial system unsound and unstable rather increases the absorptive capacity for FDI, thereby increasing economic growth. This can be possible if the FDI firm is already well established and has securities to access funds (loans) in the host country. Thus, financial market development attracts FDI firms by providing short-term finance to meet the FDI firm's liquidity needs. Therefore, support expansion without necessarily turning to the financial market of the source country.

4.5.4. The Specification tests under Instrumental Varaiable-2SLS estimation

In this sub-section, the specification tests under 2SLS-IV are discussed. For 2SLS-IV estimation, a weak identification test is performed on the instruments. This arises when the excluded instruments are correlated with the endogenous regressors, but only weakly. The Kleibergen-Paap (KP) rk Wald F-statistic is used and as a rule of thumb, KP Wald rk F statistic (F-statistics of excluded instruments) of at least 10 is required to reject the null hypothesis that the instruments are weakly identified (Baum, 2006). In other words, the

instruments are correlated with the endogenous regressors. As shown in Tables (4.4 and 4.5), the F statistics are greater than 10. Therefore, we reject the null hypothesis and conclude that the instruments used are not weakly correlated with FDI and financial fragility. In addition, the underidentification test is conducted. This is a Lagrange multiplier (LM) test of whether the equation is identified, i.e., that the excluded instruments are relevant. The test is essentially the test of the rank of a matrix and under the null hypothesis that the equation is underidentified. The computed p-value of KP rk LM statistics is used and as shown in the tables, they are highly significant. Thus, we reject the null hypothesis that the equation is underidentified, indicating that the matrix is full column rank. Hence, the model is identified and the instruments are relevant.

Finally, we conduct the Sargan-Hansen test, which is a test of overidentifying restrictions. Testing the instruments validity help to assess the extent to which the instruments meet the orthogonality condition. The joint null hypothesis is that the overidentifying restrictions are valid, thus the instruments are valid instruments. This implies that the instruments are uncorrelated with the error term, and that the excluded instruments are correctly excluded from the estimated equation. A rejection of the null hypothesis casts doubt on the validity of the instruments and therefore, they are not satisfying the orthogonality conditions required for their usage. From the Tables (4.4 and 4.5), the p-values of the Hansen J-statistics of the estimated models are above 0.1. This implies that we fail to reject the null hypothesis that the instruments are valid.

4.6. Conclusion and policy implications

FDI has been recognised as one of the additional sources of capital needed for economic growth in developing countries. However, the positive effects of FDI on economic growth may strongly depend on the conditions (absorptive capacities) in the recipient countries. Akinlo (2004) demonstrates that FDI contributes to economic growth only when a sufficient absorptive capability is available in the host economy to absorb the advanced technologies. Several empirical studies have examined the FDI-growth nexus and the role played by the circumstances FDI is confronted with whenever it enters the host economy. These studies have focused on the role of human capital policies, open trade and investment regimes, the importance of physical capital accumulation and host of other factors.

Recent studies have recognised that a well-developed financial system is a prerequisite for FDI's growth-promoting effects. They argue that a strong financial system enhances the efficient allocation of resources and in this regard, it improves the absorptive capacity of a recipient country in relation to FDI inflows. However, these studies have failed to account for the role of financial fragility. The original contribution of this study is to shed more light on the role of fragility in financial market in the FDI-growth framework. This paper argues that for African countries, failure to account for financial fragility in the financial market in the FDI-growth nexus may lead to misleading estimates. This is due to fact that most markets are fragile and that the development of the financial system largely depend on the extent of fragility in the market.

This study empirically investigates the potential growth-promoting effects of foreign direct investment contingent on a well-developed financial market that accounts for financial fragility for 40 African countries for the period 1998-2012. The empirical investigation presented in this study suggests that the growth-promoting effect of FDI can be misleading in the absence of accounting for the role of financial fragility in the development of the financial system. The paper also finds evidence that, fragility in financial market has a potential negative effect in the FDI-growth nexus. Thus, the results from the current study affirms the empirical evidence by Hermes and Lensink (2003) and Alfaro et al. (2004) that positive effect of FDI on economic growth is dependent on a strong financial system.

The results of the empirical investigation in this chapter have some clear and policy-relevant implications. FDI has growth-promoting effects and these effects may be augmented by a stable and sound financial system. Most developing countries and for that matter African countries have weak financial systems. As noticed by (Honohan and Beck, 2007; Andrianova et al., 2010), the financial markets in Africa are dysfunctional. Therefore, there is the need for African governments and policy makers to design sound macroeconomic and development policies encompassing the entire economy with a strong emphasis on reforming and liberalising the financial sector to make it deep stable and sound to maximise the positive effect of FDI on economic growth. Hence, there is the need to strengthen the creditor protection laws as well as related informational infrastructure including credit information bureaus system in order to reduce the possibility of bad debts. The above-mentioned policies are essential in making the financial market sound. In addition, the

provision of enabling environment and investment policies such as tax incentives as well as subsidies aimed at attracting FDI inflows must be a top priority.

Chapter 5

Foreign Direct Investment and Environmental Pollution: Evidence from Africa.

Abstract

Shortage of capital for economic growth has been the bane of most developing countries and for that matter Africa. Foreign direct investment (FDI) is seen as one of the resources for growth and development, therefore countries all over the world are liberalising to promote trade and encourage FDI to promote growth and development. However, the influx of FDI has a deep implication for the process of economic growth because by contrast they are regarded as one of the main agents for environmental degradation. Using both static and dynamic panel estimation techniques, this study examines the effect of FDI on environmental pollution in terms of carbon dioxide (CO_2) emission levels on African countries for the period 1996-2013. The findings of the study reveal a positive relationship between FDI and CO_2 emissions. Moreover, the group-wise estimation results reveal that there are differences in terms of the impact of FDI on the level of CO_2 emissions on the African continent.

5.1. Introduction

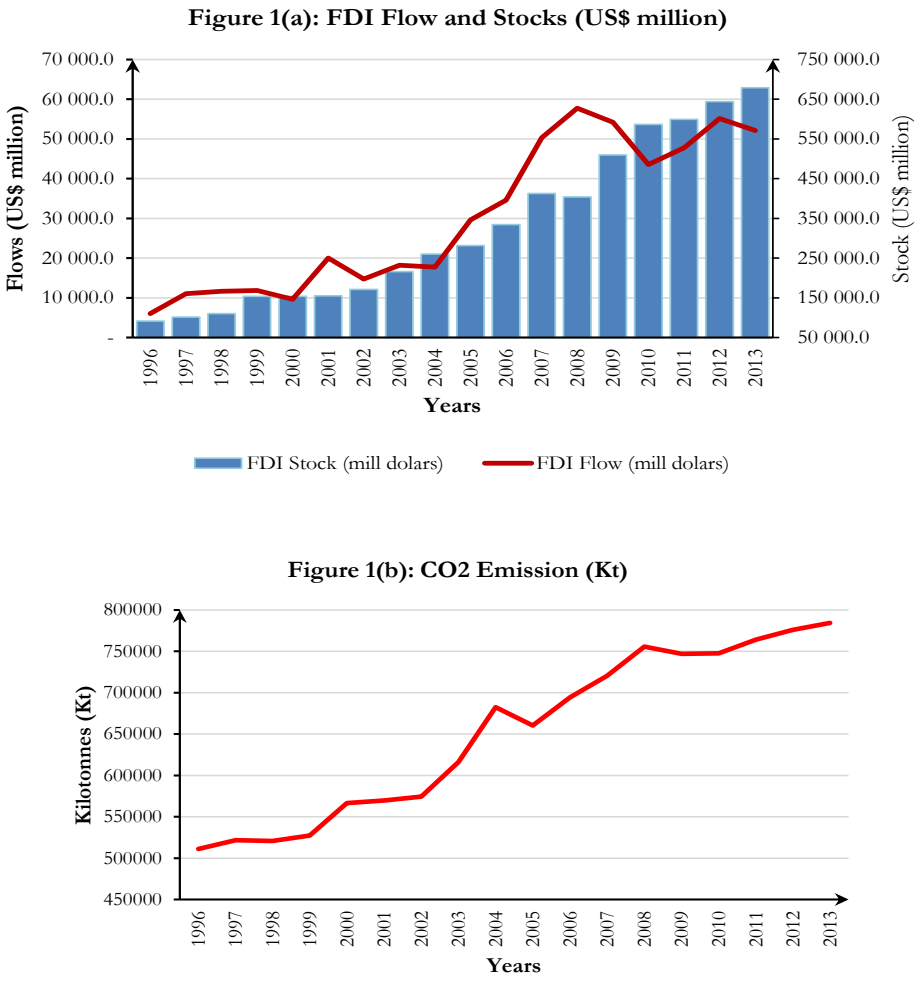
One major challenge African countries have been facing is the shortage of capital which hampers their rate of growth and development. They do not have adequate national savings to finance their investments. Therefore, they are in need of foreign capital in the form of both direct and indirect investments. FDI seems to be one of the easiest ways to get foreign capital without undertaking any risks as compared to banks loans. Thus, many African countries have attempted to reform and liberalise their investment policies to attract more stable forms of foreign capital.

Although there have been numerous concerns about its social as well as environmental impact, FDI has been recognized as a stable source of financial resources to bridge this gap. Therefore, a report by the United Nations Conference on Trade and Development (UNCTAD, 2009) indicates that most of the developing countries are now highly dependent on FDI as an engine of growth. Furthermore, developing countries are receiving more FDI and this accounted for about 52 per cent of the global FDI inflows in 2012 (UNCTAD, 2013). A report by the World Bank 2014 indicates that FDI flows into Sub-Saharan Africa (SSA) have grown nearly six-fold over the past decade. In African countries, FDI not only serves as a critical source of long-term capital for investment in infrastructure and other developmental initiatives, but also as a catalyst for economic diversification (Anyanwu and Yameogo, 2015). As shown in Figure 1a below, both FDI, flows and stocks have continued to increase over the period of study to the continent of Africa. Hence, FDI have been encouraged and welcomed by developing countries because of the major role they play in the domestic economies as a source of growth and job creation (Borensztein et al., 1998). Notwithstanding the benefits and growth promoting effects of FDI, it is very crucial for various policy makers and governments on the African continent to ensure that developmental goals today do not affect future generations.

However, the absence of regulations governing natural resource extraction that is weak or poorly enforced, can increase the openness to foreign investment that will accelerate unsustainable resource use patterns. The ability of developing countries to attract FDI, maximise the associated benefits and minimise the risks depend on the effectiveness of their policy or institutional frameworks and institutions (Wilhelms, 1998; Pigato, 2001). Increasing FDI inflows may have worrying impacts for the destination country's ecosystem and social development. It is worth noting that, the influx of FDI has a deep implication for the process

of economic growth, because by contrast they are seen as one of the main factors that could lead to environmental degradation.

Figure 5.1: Trends in FDI Flows, Stocks and CO2 Emission



Source: World Bank (2012), World Development Indicators (WDI).

The environmental consequences of globalization have been subjected to a heated debate. In the last 20 years, the literature have shown that developing countries have more than doubled their carbon dioxide emissions (Carbon Dioxide Information Analysis Centre)[4]. From Figure 1b, reveals that carbon dioxide emission (CO_2) within the sub-region has also witnessed an increasing trend, which raises some cause of concern for policy makers.

Much of the debate on the impact of the influx of FDI on the environment now centres on the pollution havens hypothesis (PHH) and race to the bottom hypothesis, which is a subset

[4]The Carbon Dioxide Information Analysis Centre (CDIAC) is the primary climate-change data and information analysis centre of the U.S. Department of Energy (DOE)

of the pollution haven effect. Taylor (2004) argues from the pollution haven effect that pollution intensive industries migrate from developed countries to the developing countries where there is laxity in environmental regulation. The high cost of production for high pollution emission industries in advanced countries due to environmental tax makes such industries find developing countries attractive destination for their manufacturing activities. Therefore, developing countries provide pollution havens for pollution intensive industries. A strategy referred to as the comparative advantage motive for FDI. International flow of goods and services thus, enter into this debate. Most countries argue that they are still on the climbing side of the environmental Kuznets curve (EKC) and may individually employ the race to the bottom regulatory practice by setting lax environmental standards in order to gain strategic trade advantages. According to Dong et al. (2012), increasing FDI flows due to globalisation have raised the concern of a race to the bottom phenomenon in environmental protection. This is because footloose investors of dirty industries tend to move to pollution havens of the developing countries.

Despite the current significance of FDI in Africa's economy, its relationship with the environment has not been extensively studied. Therefore, the empirical literature on FDI-environmental pollution link is scarce in Africa, a region that has become a major recipient of FDI. Therefore this chapter contributes to the ongoing debate regarding the environmental impacts of FDI by examining whether FDI to developing countries are associated with higher levels of pollution, and in particular analyse the relationship between CO_2 emissions and FDI in the region for the period 1996-2013. To the best of my knowledge, this study is the first to conduct a comprehensive analysis of the effects of the influx of FDI (either stock or net inflow) on the environment of Africa countries. More so, it conducts a group-wise estimation based on income groupings, natural resource endowment and environmental performance to examine the different magnitude of environmental pollution of the countries in the study.

In order to achieve the above objective, this chapter principally adopts the static panel data estimator (fixed effect estimator) to control for the unobserved heterogeneity. However, in order to address and minimize the potential effect of endogeneity, this study uses the dynamic panel data estimator developed by Arellano and Bover (1995) as well as Blundell and Bond (1998) and present empirical evidence using system Generalised Methods of Moments (GMM). The empirical evidence from this study shows that there is a direct

relationship between FDI and environmental pollution. However, there are differences in terms of impact of FDI on the environment (proxy by the level of CO_2 emissions) for African countries according to different classifications.

The rest of the chapter is structured as follows: Section 5.2 provides a review of the literature on economic growth-environmental pollution-FDI link. In addition, this section details the review on environment pollution and FDI nexus. Section 5.3 presents the empirical framework and methodological issues. Section 5.4 describes the data set used, summary statistics and correlation matrix. Section 5.5 is allocated to the analysis of empirical results of the nexus between FDI and the environment. Finally, section 5.6 concludes and formulates policy implications.

5.2. Review on Economic growth-environmental pollution-FDI link

The relationship between economic growth, environmental pollution and FDI inflows have been analysed by a number of studies. The empirical studies on the economic growth-environmental pollution-FDI link can be put into three research strands namely: the causality between economic growth and FDI inflows, the relationship between trade and the environment, and the nexus between FDI and environment. Many researchers have extensively looked into the first strand of the literature. The empirical question addressed is whether a higher level of FDI inflows increases economic growth and likewise whether higher economic growth attracts further FDI inflows (see Anwar and Nguyen, 2010; Batten and Vo, 2009; Tsang and Yip, 2007; Hermes and Lensink, 2003).

The second and the third strands of the literature are closely related in that; they both looked at the relationship between economic activity (trade and FDI) and environmental pollution. These strands of literature are in line with the EKC, which focuses on the environmental consequences of liberalisation of trade and investment. This hypothesis states that the relationship between economic growth and environmental pollution because of expansion in economic activity conforms to an inverted –U curve. That is, as per capita GDP increases; the amount of pollution after certain point decreases. Therefore, economic growth is the solution to environmental problems in the future with no policy intervention. Empirical studies that provide evidence to support this hypothesis include Selden and Song (1994), Grossman and Krueger (1995), and Dean (2002). The second and third strands also follow from the pollution haven effect and race to the bottom hypothesis. The former attests that

investors will relocate their industries to developing countries where there is lax environmental regulation. Thus where it will be cheaper and more efficient in the light of regulatory requirements. The latter a subset of the pollution haven effect, consists of positive action by governments to lower environmental regulations and standards in order to attract FDI inflows.

More specifically, the third research strand looks at the relationship between FDI and environmental pollution. This examines the impact of FDI inflows on the environment that might follow from pollution haven and the race to the bottom hypotheses where nations are motivated to respond to the relocation of multinational corporations (MNCs) of dirty industries seeking to cut down their cost of production and gain competitive edges in international markets. Studies such as Smarzynska and Wei (2001), Xing and Kolstad (2002), Eskeland and Harrison (2003) can be cited in support of this strand of literature. However, the empirical results on this research strand are inconclusive and mixed (Saboori et al., 2012).

We have observed from the literature on the third strand that, the FDI -environmental pollution link has been tested empirically from two angles: first, FDI as a function of pollution and other control variables; and second, pollution as a function of FDI and some control variables. The present study focuses on the latter that is the nexus between environmental pollution and FDI. We now turn our attention to empirical studies that relate to the latter.

5.2.1. Empirical Review on Environmental Pollution and FDI nexus

Now, we review studies that have addressed the question of the impact of FDI on the environmental pollution. To measure environmental pollution, these studies have mostly used carbon dioxide (CO_2) emissions as a proxy. Studies of this nature have mainly been focused on developing countries such as Asia, Latin America and Africa. In line with this, our review focuses mainly on developing country studies. Findings from these studies have been inconclusive, in that, while some studies have found a positive relationship, others have been negative.

Kivyiro and Arminen (2014) conduct a study on selected African countries to investigate the causal links between CO_2 emissions, energy consumption, economic development and FDI in six SSA countries. They employ the autoregressive distributed lag (ARDL) models and provide evidence that FDI appears to increase CO_2 emissions in some of the countries, while the opposite impact can be observed in others making it impossible to give any universal policy recommendations.

Linh and Lin (2015) investigate the dynamic causal relationships among environmental degradation, economic growth, FDI and energy consumption in Asia. Using panel data technique, they provide evidence that supports the EKC. From their Granger causality test, they establish both short and long run causality relationships among economic growth, FDI, energy consumption and CO_2 emissions. In addition, they find support for the pollution haven hypothesis, which indicates that less stringent environmental regulations of the host countries attract FDI inflows.

Li and Lin (2015) examine the effects of urbanization and industrialization on energy consumption and CO_2 emissions from a dynamic panel threshold regression model of 73 countries over the period of 1971–2010. The countries are grouped according to their annual income levels and the results reveal that the effects of urbanization and industrialization on energy consumption and CO_2 emissions depend on the income groupings. Therefore, different development strategies of urbanization and industrialization should be pursued depending on the levels of income in a bid to conserve energy and reduce emissions. Talukdar and Meisner (2001) in a similar study, use panel data analysis in examining the effects of FDI and income on CO_2 emissions for forty-four developing countries. They estimate a reduced-form and random-effects model using data from these countries over nine years (1987–95) to establish systematic empirical relationship between the relative level of private sector involvement in an economy and the environmental performance of the economy in terms of its emission of industrial carbon dioxide. Their findings conclude that an increase in FDI deteriorates the environment.

In line with the above studies, Baek (2016) estimates the effects of FDI inflows, income and energy consumption on CO_2 emissions using panel data of five countries from Association of Southeast Asian Nations (ASEAN) over 1981–2010. The results based on the pooled mean group (PMG) estimator of dynamic panels show that FDI tends to increase CO_2

emissions, supporting evidence of the pollution haven effect. He also finds that income and energy consumption have a detrimental impact on the level of CO_2 emissions.

Cole et al., (2006) in a study of 13 countries from Organization for Economic Cooperation and Development (OECD) and 20 developing countries, with a panel fixed effect model find that FDI affects the environment negatively. FDI leads to less stringent environmental policy in countries if the degree of corruptibility of local government is high and vice versa, thus FDI contributes to the creation of pollution haven. Jorgenson (2009), using a random effect in a panel study of less developed countries also finds that industrial water pollution is positively associated with FDI in the manufacturing sector. Lee (2009) also investigates FDI, pollution and economic growth in Malaysia using ARDL cointegration and Granger causality. The study concludes that FDI positively affect emission in the long run. Blanco et al., (2013) use a sample of 18 Latin American countries to examine the relationship between sector-specific foreign direct investment and CO_2 emissions. They use the panel Granger causality test and their results indicate that there is no robust evidence that FDI caused CO_2 emissions. Al-mulali and Tang (2013), testing the validity of PHH in the Gulf Co-operation Council (GCC) Countries with the use of panel cointegration and fully modified ordinary least squares (OLS) reveal that the source of pollution in the GCC countries is not FDI inflows but rather other factors such as energy consumption and GDP growth rate. In contrast to the above findings, a more recent work by Saboori et al. (2012) present mixed findings when examining the causal relationship between CO_2 emissions and income. A possible explanation for the latter can be attributed to the Porter's hypothesis, it claims that as income increases with trade openness, developing countries tend to adopt stringent environmental regulations to force the adoption of environmentally friendly production patterns, thereby reducing pollution and improving competitiveness (Porter and van der Linde 1995, Mani and Wheeler 1998). As countries open up to trade, this can ease the transfer of technological and managerial innovations from the advanced countries to developing countries, thus leading to environmental quality (Vogel, 1995).

Atici (2012) using panel data from the period 1970–2006, examines the interaction between trade and the environment in terms of carbon emissions for the group of ASEAN countries. He provides evidence that CO_2 emissions display an inverted-S shape in the region. In general, exports as a percentage of the gross domestic product (GDP) are the main contributors to carbon emissions in the developed, developing and late-developing ASEAN

countries. The study finds no evidence for the FDI's deteriorating impact on environmental quality. Moreover, Japan's imports from the region do not cause pollution while China's imports stimulate pollution per capita. He (2006) constructs a simultaneous model to study the FDI–emission nexus in China and with a panel data of China's 29 provinces' industrial sulphur dioxide (SO_2) emission. His results show that, exerting through different channels, the total impact of FDI on industrial SO_2 emission is very small. With a 1 per cent increase in FDI capital stock, industrial SO_2 emission will increase by 0.098 per cent, and that the emission increase caused by the impact of FDI on economic growth and composition transformation cancel out the emission reduction. This result is due to FDI's impact in reinforcing environmental regulation.

In addition, studies by (Bao et al., 2011; Kim and Baek, 2011) find no support or little evidence on the negative effect of FDI on the environment. Bao et al. (2011) investigate the effects of FDI on emissions of five pollutants in China using a panel data set of 29 provinces over the period 1992–2004. The study applies a simultaneous equations estimation technique to estimate the scale, technique and composition effects of FDI on China's overall and regional pollution emissions. They provide evidence to indicate that FDI in general helps reduce pollution emissions in China, contributing largely to its technique effect and environmental impacts of FDI vary significantly among different regions and for different pollutants in China. On the other hand, Kim and Baek (2011) examine the environmental consequences of economic growth for developed and developing countries in a dynamic cointegration framework by incorporating energy consumption and FDI. Their results show that economic growth improves environmental quality for developed countries in the long run, but worsen the environment in developing economies. Energy consumption has a detrimental long-run effect on environmental quality for both developed and developing countries. However, FDI is found to have little long-run effect on the environment in both developed and developing countries.

From the preceding review, we observe that there is paucity of literature on this relationship in Africa where the influx of FDI has been raising. Regarding our contribution, this study investigates the relationship based on a much wider scope, thus not on few selected countries. In addition, the current study also presents various measures of FDI and examines the FDI-pollution relationship. Also, a detailed disaggregation of the continent vis a vis income-groupings, resource-rich-groupings, environmental performance-groupings are

explored to aid policy formulation on the continent. Furthermore, some of the studies have addressed the issue of endogeneity as a key empirical strategy challenge using ARDL and other dynamic models. In our case, we address this problem using GMM. Therefore, this chapter hopes to conduct a holistic study that examines the effects of FDI inflows on the environment (using CO_2 emissions as a proxy).

5.3. Empirical framework

5.3.1. Methodological framework

Following the theoretical model by Chang (2012), the nexus between economic growth, openness and FDI can be expressed with the national income identity as:

$$Y = C + I + G + F + X - M \tag{5.1}$$

Where Y is Gross Domestic Product, C denotes Consumption, I is Domestic Investment, G is government expenditure, F is Inward Foreign Direct Investment, X and M are Exports and Imports respectively. Based on this identity we are able to derive the indirect effect on the environment as a result of trade openness and FDI through economic activities. Indeed, economic activities are a dominant causal factor of environmental pollution. Thus from the perspective of production, this is given as:

$$TEP = f(Y, \boldsymbol{\delta}) \tag{5.2}$$

Total environmental pollution (TEP) is explained by Y and $\boldsymbol{\delta}$, which are economic activities and a vector of other controls respectively. This concept according to Grossman and Krueger (1993) has been grouped into three main effects namely: scale, composition and technique. In a broader sense, their pioneering study point out that the theoretical underpinning of the indirect impact of the environment as a result of trade and FDI can be well explained by decomposing pollution into aspects of scale, composition and technique. The scale effect is due to the expansion of economic output (GDP) emanating from foreign trade or FDI and vice versa. It is clear that, under the ceteris paribus condition, total amount of pollution will increase with the presence of scale effect. In addition, the composition effect talks about the share of output in GDP and thus all other things being equal pollution will change due to the structural changes arising from trade openness or FDI. In other words, this effect relates the comparative advantage to trade practices. That is a move towards pollution intensive production would generate high pollution and vice versa. Lastly, the technique effect which deals with pollution intensity; this implies that the pollution per unit

product may decrease with increasing trade or FDI. The reason is that modern technology transfer from developed countries to developing countries is more efficient and cleaner. In addition, multinational firms also try to abide by stricter environmental regulations and hence follow the same technology in other countries. Competition from globalisation forces firms to adopt more technologies that are efficient in attempt to reduce pollution. The above analysis shows that the effects of trade and FDI on the environment suggest a two-sided effect, thus providing both threats and opportunities for a country. Therefore, this study seeks to conduct an empirical investigation to contribute to this debate.

In this study, we use CO_2 as a measure of TEP and re-formulate the structural economic function given by equation 5.2 as equation 5.3. All other definitions remain the same.

$$CO_2 = f(Y, \boldsymbol{\delta}) \tag{5.3}$$

5.3.2. Empirical model

In line with equation 5.3, we use CO_2 as a measure of TEP and re-formulate the structural economic function given by equation 5.3 into a simplified econometric function (equation 5.4) below. The model specification employed in this study follows the panel structure by Frankel and Rose (2005). However I modify their model by replacing their variable of interest (trade) with FDI and incorporate other control variables which solely depend on the interest of the researcher. The empirical model can be expressed as:

$$lnCO_{2i,t} = \beta_0 + \beta_1 lnFDI_{i,t} + \beta_2 lnEC_{i,t} + \beta_3 lnGDP_{i,t} + \beta_4 lnECONS_{i,t} + \beta_5 lnT_{i,t} + \beta_6 PR_{i,t} + U_{i,t} \tag{5.4}$$

where $lnCO_2$ is the natural log of carbon dioxide emissions measured in kilo tonnes (kt) as a proxy for environmental pollution, $lnFDI$ is the natural log of FDI (stock or net inflow), $lnEC$ is the natural log of energy use, $lnGDP$ is the natural log of per capita real GDP, $lnECONS$ is the natural log of the economic structure, lnT is the natural log of trade openness, PR is an index to measure the role of institution and U is the error term. The parameter β_0 is the intercept, while $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ and β_6 are the slope coefficients of the respective variables, i represents the individual country and t is the time period.

It is important to note that $U_{i,t}$ can be decomposed into $a_i + \varepsilon_{it}$, where a_i is the fixed effect which captures any unobserved factors leading to individual heterogeneity in the intercept of the equation as a result of country specific effects. The ε_{it} is the idiosyncratic error, which

reflects any unobserved factors that change over time. It is assumed that the expectation of the idiosyncratic error given the explanatory variables is equal to zero, thus uncorrelated.

The dependent variable, carbon dioxide emission (CO2, kilo tonnes), measures environmental pollution and it is a pollutant generally used in the literature due to its importance to global warming (Acharyya, 2009 and Atici, 2012). It is also the commonly used indicator related to the environment in the developing countries. FDI inflow implies expansion of economic activities and by the scale effect this may have some consequences on the host country's ecosystem. The effect of FDI is uncertain; if FDI inflow brings cleaner technologies, we can expect a negative sign for this variable, but if FDI inflow increases pollution, it may have a pollution haven effect. Thus, β1 could be positive or negative. Energy use (EC) is a determinant of total emissions. A positive coefficient (β2) is expected, given the level of technology at a point in time, there is a positive relationship between consumption and CO2 emissions (Pereira and Pereira, 2010). Real GDP per capita and its square capture the environmental Kuznets curve (EKC). Since GDP per capita reveals a country's income and level of development, it is expected that the initial level of income induces pollution; however, as income increases, environmental degradation declines because of the level of environmental consciousness and cleaner technologies. Hence, the coefficient of per capita real GDP (β3) is expected to be positive. Economic structure (ECONS) captures the effects of the structural changes on the various economies on carbon dioxide emissions. It is the share of industrial value added to the service value added. Given the fact that the industrial sector is a contributing factor to the production of total emissions, we expect a priori that a rise in the ratio will exert positive impact on the environment. Thus, $\beta 4 > 0$.Trade openness (T) is one of the determinants of environmental pollution and also by the scale effect, international flow of goods and services indicate expansion of economic activities; all other things being equal, it is expected that the amount of emission levels increase. Therefore, the coefficient of trade openness (β5) is expected to be positive. Good institutions proxied by PR, in a country will ensure proper standards of environmental rules and regulations leading to environmental quality. It is expected that good institution will enhance environmental quality, thus, a negative coefficient (β6) is expected.

5.3.3. Estimation Technique

This study is interested in examining the effects of FDI on environmental pollution (proxy by CO2 emissions). Therefore, the empirical model above is specified to address the key objective of this study. The study adopts the static panel data estimator however, two models Pooled OLS and Fixed effect (FE) using both stock of FDI and net inflow of FDI are estimated. The Pooled OLS is the baseline model, which is more suitable for cross sectional data analysis and it, fails to account for the unobserved country specific (fixed) effects, thereby puts all observations together into a pool and assumes that all the entities are the same. In other words, it ignores the heterogeneity or the individuality that may exist among the countries and if not dealt with will make our estimate bias and inefficient. Hence, there is the need to control for all unobservable (time-varying) determinants of environmental pollution due to country specific characteristics. This study proposes to use the fixed effect estimator; this assumes to remove the effect of those time-invariant characteristics so that we can assess the net effect of the explanatory variables on the dependent variable.

5.3.3.1. Endogeneity Problem

One would expect a reverse causality between FDI and environmental pollution (proxied by Co2 emissions level). Total environmental pollution is explained by economic activities, of which FDI is a component. Hence, FDI can cause environmental pollution. Therefore, causality could run in both directions. The observed correlation might be a result of the pollution haven hypothesis, which claims that laxity in environmental regulations in developing countries stimulates FDI inflows. This reverse causality leads to endogeneity bias and could be a potential threat to identification of the causal impact of FDI on environmental pollution. Thus, the findings that do not allow for endogeneity are likely to be biased. To avoid this plausible endogeneity challenge, it is essential to use an econometric approach that provides the possibility of alleviating endogeneity in the empirical model.

In order to manage the potential endogeneity, internal instruments are used with the dynamic panel data estimator system GMM developed by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998).The basic method to address the possible endogeneity bias is that developed by Arellano and Bond (1991), which proposed that the lagged levels of the regressors are used as instruments.

It is valid under the assumption that the original error term is not serially correlated and that the explanatory variables are weakly exogenous. This strategy is known as Difference GMM estimation and the following moment conditions apply:

$$E\left(Y_{i,t-s} \quad \Delta\varepsilon_{it}\right) = 0, \ for\ s \geq 2; \ \ t = 3, \ldots., T$$

$$E\left(X_{i,t-s} \ \ \Delta\varepsilon_{it}\right) = 0, \ \ for\ s \geq 2; \quad t = 3, \ldots., T$$

where $Y_{i,t-s}$ represents the lagged dependent variable (CO_2 emissions) and $X_{i,t-s}$ is the lag of all the covariates. The letter s denotes the lag structure, and therefore, lagged levels from lag two and above can be used as valid instruments.

However, Blundell and Bond (1998) show that lagged levels of independent variables can perform poorly as instruments for their differenced series. For instance, if the variables are persistent, then their past values may convey little information about their future changes, making their lagged value a weak instrument. They therefore contributed to the improvement of this method by suggesting the addition of the equation in levels to their differenced equation to get a system of equations. In addition, the variables in levels are instrumented with lagged first difference of the corresponding variable. Hence, they propose additional instruments as well as conditions of utilisation based on the results of Arellano and Bond (1991) and Arellano and Bover (1995). This approach (system GMM) is able to increase efficiency as compared to the difference GMM. Thus, for the system GMM, the following orthogonality restrictions are further imposed:

$$E\left(\Delta Y_{i,t-s} \quad \varepsilon_{it}\right) = 0, \quad for\ s = 1$$

$$E\left(\Delta X_{i,t-s} \ \ \varepsilon_{it}\right) = 0\ , \ for\ s = 1$$

The system GMM estimation technique is more suitable for the panel data models with a large number of individuals and a small number of time- periods (small T, large N panels), with explanatory variables that are not strictly exogenous (Roodman, 2009). The study relies on this technique to accommodate for the persistence of the dependent variable and to allow country level variables to be time-variant.

The consistency of the system GMM estimator largely depends on the validity of the assumption that the error term does not exhibit serial correlation and the instruments validity. By construction, the test for the null hypothesis of no first order serial correlation should be rejected under the assumption that the error term is not serially correlated. This

by design is expected in the first- differenced equations. Hence, a test of second-order serial correlation in the differenced equation is performed (Roodman, 2009) in order to rule out first-order serial correlation in levels. The condition for no second-order serial correlation is:

$$E(\Delta\varepsilon_{it} \quad \Delta\varepsilon_{i,t-1}) = 0, \ \ for\ t = 2$$

The absence of second-order serial correlation is not rejected (see Table 5.7). For the instruments validity, the Sargan/Hansen test of overidentifying restrictions is performed. The null hypothesis is that the overidentifying restrictions are valid. Failure to reject the null hypothesis implies the instruments are valid and that they satisfy the orthogonality conditions required for their usage.

5.4. Data Description

This chapter models the relationship between the environment and FDI. As the pollution haven and race to the bottom hypotheses indicate, trade, FDI and environmental pollution are closely related to the process of globalisation and therefore differences in environmental regulations may lead to a comparative advantage in pollution intensive production among countries (Cole, 2004). The current study focuses on African countries to determine the relationship between the environment and the influx of FDI due to globalisation. This will enable various governments and policy makers of African countries to know the impact of FDI on the environment in order to put in the right measures to achieve sustainable development, an aspect of the Sustainable Development Growth (SDG) targets.

The model is estimated using a panel data set of 31 African countries for the period 1996-2013 and this helps us to explore the cross sectional as well as the time series data simultaneously. In addition, panel data allow for increasing the sample size, which offers much better estimates by providing more degrees of freedom and more efficiency (Asteriou and Hall 2007; Harris and Sollis 2003). Panel data also offer more variability that leads to less collinearity among variables (Harris and Sollis 2003). There are 54 countries in the African continent; some countries are omitted due to paucity of data. The choice of the time period covered is due to the availability of data. CO_2 emission measures environmental pollution and the variable of interest is FDI (stock or net inflow).

The other controlled variables are: energy use, GDP per capita, trade openness and economic structure (the share of industrial value added to service value added to capture the effects of the structural changes on the various economies on carbon dioxide emissions). Given the fact that the industrial sector is a contributing factor to the production of total emissions, we expect a priori that a rise in the ratio will exert positive impact on the environment. The role of institution is also controlled for and this index (PR) is composed of voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law and control of corruption. It is expected that good institution will enhance environmental quality. These institutional variables are from the International Country Risk Guide (ICRG). The FDI stock variable is from UNCTAD and all the other variables are sourced from the World Development Indicators Database (WDI, 2015). The detailed data as well as the variable descriptions can be seen in (Appendix B1).

In addition to the control variables, the following variables are constructed: Pr-index, FDI stock_index and FDI flow_index. Pr-index measures the role of institution. It comes from International Country Risk Guide (ICRG) and is composed of six (6) major components measuring various dimensions of political and business environment. It is the average of the six components; voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law and control of corruption. FDI stock_index and FDI flow_index are interaction terms that denote whether the effect of the role of institutions on environmental pollution is contingent on the type of FDI (flow or stock), thus the conditional effect. FDI stock _index = FDI stock * Pr-index and FDI flow _index = FDI flow * Pr-index.

Moreover, in order to perform a group-wise estimation, the full sample of countries for this study is sub-divided into various groupings such as income status, natural resource endowment and environmental performance. The income grouping follows the new country classification by the World Bank. Countries with gross national income (GNI) per capita of USD 1,035 or less are classified as low income. Those with GNI per capita of USD 1,036 to USD 4,085 are regarded as lower middle income, countries with GNI per capita of USD 4,086 to USD 12,615 are grouped as upper middle income and nations with per capita GNI of at least USD 12,616 are put into high income (World Bank July, 2015 classification). This study classifies the countries into low and middle income, by merging the lower and upper

middle countries into middle income. The region is divided into oil and non-oil countries as well as environmental performance. The countries are grouped into low or high environmental performance by using environmental performance index (EPI) constructed by Yale University. This index ranks countries on a scale of 0-100 percent, with 0 percent being worst and 100 percent the highest. The study constructs an average of this index using 2006, 2008 and 2010 scores and countries with an average score of at least 50 percent are classified as high performance and those with a score of less than 50 percent are grouped as low performance. We construct dummy variables in order to examine the effect of FDI on the environment based on these groupings to ascertain whether there are differences in terms of the impact.

Table 5.1 presents the descriptive statistics for the variables. The data reveals large variations in real GDP per capita (gdppc) with a mean value of USD 1418.04 for the period 1996 to 2013. Stock of FDI and net inflow of FDI as a share of GDP for the countries under this study averaged 37.96 percent and 4.37 percent respectively. Regarding CO_2 emissions, it averaged 29053.96 kilotonnes (kt) during that period. Trade openness, measured as the share of total trade (sum of exports and import of goods and services) to GDP, averaged 68.8 4 percent in the region. Energy use averaged 66.02 kg and the economic structure averaged 0.65 percent.

Table 5.2 depicts the correlation matrix for the variables used in the econometric estimations. It can be seen that there is no high correlation between the pair of variables in Table 5.2, indicating that the presence of multicollinearity in the econometric estimations is not severe which can affect the precision of our estimation. However, we admit that the correlation between stock of FDI and net inflow of FDI showed the highest correlation coefficient of about 0.55, followed by the correlation between carbon dioxide and energy use with correlation coefficient of about -0.46, nonetheless this is not high enough to affect our estimates. Trade openness and energy use has the lowest correlation coefficient of about -0.043.

Table 5.1: Descriptive Statistics

Variables	Obs	Mean	St.dev	Min	Max
Carbon Dioxide emission (kt)	496	29053.96	77688.02	146.68	477806.40
Stock of FDI (% of GDP)	543	37.96	77.02	0.20	710.60
Net inflow of FDI (% of GDP)	553	4.37	9.55	-82.89	91.01
Economic Structure (% of GDP)	546	0.65	0.51	0.04	2.75
GDP per capita (USD)	558	1418.04	1773.89	53.10	8327.34
Trade openness (% of GDP)	539	68.84	28.24	17.86	179.12
Energy use (kg of oil)	518	66.02	29.90	0.18	98.34
Institution variable (%)	558	0.49	0.12	0.11	0.80

Notes: This table shows the descriptive statistics for the data of 31 African countries over the period 1996 to 2013. See appendix for the detailed description of the variables.

Table 5.2: Correlation matrix

	Carbon dioxide	Stock of FDI	Net inflow of FDI	Economic Structure	GDP per capita	Trade openness	Energy use	Institution variable
Carbon dioxide	1.0000							
Stock of FDI	-0.0459	1.0000						
Net inflow of FDI	-0.1006	0.5540	1.0000					
Economic Structure	0.1182	-0.1172	-0.0620	1.0000				
GDP per capita	0.4606	-0.0690	-0.0732	0.2891	1.0000			
Trade openness	-0.1133	0.3463	0.4197	0.1916	0.3240	1.0000		
Energy use	-0.4611	0.0794	0.1150	-0.3225	-0.4410	-0.0428	1.0000	
Institution variable	0.1821	-0.0791	-0.1107	-0.1502	0.4598	0.0528	-0.2821	1.0000

5.5. Discussion of Results

This section presents the empirical results on the relationship between FDI and environment. The section is structured into three subsections. As the starting point, we show the environmental pollution-FDI link panel regression for the overall African countries under study. This is followed by the group-wise estimation results and finally, the dynamic panel data estimation results.

5.5.1. Panel regression results for the overall African countries

Table 5.3 shows the Pooled OLS and FE estimations regression results for both stock of FDI and net inflow of FDI. However, our discussions will be based on the fixed effect model due to some of the reasons mentioned above (see section 5.3.3). In addition, from Table 5.3, the R-squared for the fixed effect model as compared to the Pooled OLS model is greater thus; the former has more explanatory power. According to the regression results, from model 4, the coefficient of FDI is positive and significant at 10 percent, indicating that net inflow of FDI leads to higher emission levels on the African continent. This implies that, by the scale effect FDI coming to African countries increase economic activities and all other things being equal, it influences negatively on the environment (in terms of emission levels). This finding is consistent with Cole et al., (2006) and Elliot & Shimamoto (2008). However, from model 3, the results show the expected sign but is not significant. This can be attributed to the time lag effect of stock variables. We find that econs, which measures the structure of the African economy in both regression results, have the expected positive sign with the stock model being highly significant. This indicates that industrial sector contributes significantly to the deterioration of the environment.

In line with empirical literature real GDP per capita and its square was used as control variables. The results reveal that real GDP per capita and its square have the expected signs. This finding is consistent with the EKC, which states that the quality of the environment worsens as the economy grows and after a certain threshold, it starts improving resulting in an inverse U-shaped pollution-GDP per capita pattern. More specifically, this U-shaped pollution-GDP per capita pattern is the evident in model 3 (using the FDI stock variable). The breadth of our findings show that in both models pollution worsens during the initial growth process. For instance, from both FDI stock and flow models, a 1 percent increase in GDP per capita leads to 1.438 percent kt and 1.838 percent kt increase in CO_2 emission respectively. Nonetheless, after this worsens state of the environment, further increase in

economic growth (GDP per capita squared) leads to improvement in environmental quality. Thus, the negative and significant sign of GDP per capita squared is evident in the FDI flow model. In both models trade openness has the expected sign, that is a highly significant positive impact on the environment and this finding supports previous study by Atici (2006). The result implies that African economies are fragile and vulnerable, leading to negative effect on the environment. Surprisingly, energy use one of the determinants of total emission had a different expected significant sign. Our finding contrasts with study by Pereira & Pereira (2010), which shows that there exist a positive relationship between energy use and the level of emission. This could be attributed to the fact that, the type of energy used in Africa has no impact on the environment. To evaluate the role of institutions in promoting environmental quality, we created an index (pr_index) and this measures good institutional arrangements.

Table 5.3: OLS and Fixed Effect Regression Results

	(1)	(2)	(3)	(4)
Dependent Variable: lnco2kt	Pooled Stock	Pooled Flow	FE Stock	FE Flow
lnstockfdi	0.3002		0.0268	
	(0.223)		(0.049)	
econs	0.7174***	0.5266***	0.1838***	0.1068*
	(0.129)	(0.134)	(0.063)	(0.064)
lngdppc	2.7817***	3.2731***	1.4380***	1.8379***
	(0.761)	(0.761)	(0.394)	(0.401)
lngdppc2	-0.1473***	-0.1874***	-0.0164	-0.0535*
	(0.055)	(0.055)	(0.030)	(0.031)
lntrade	-1.4425***	-1.1272***	0.2179***	0.2549***
	(0.181)	(0.174)	(0.052)	(0.054)
lnenergyuse	-0.5651***	-0.5839***	-0.3489***	-0.4263***
	(0.062)	(0.063)	(0.102)	(0.104)
pr_index	-0.9521	-0.3959	0.0246	-0.0492
	(1.425)	(0.598)	(0.343)	(0.202)
FDIstock_index	-0.1883		0.0694	
	(0.460)		(0.103)	
lnflowfdi		0.4583***		0.0461*
		(0.153)		(0.026)
FDIflow _index		-1.0120***		-0.0573
		(0.301)		(0.051)
Constant	4.2310	2.0674	-0.1653	-0.7123
	(2.805)	(2.715)	(1.286)	(1.268)
Observations	465	454	465	454
R-squared	0.55	0.55	0.64	0.62
Number of id			30	30

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

We construct the average of the six components; voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law and control of corruption. The results from this study indicate different signs; thus, a positive sign for the stock model and a negative sign for the net inflow model but all had no significant impact on the environment. The study further went ahead to examine whether there exist a conditional effect. That is the role of institutions and it impact on the environment depend on the type of FDI (flow or stock) by creating an interaction index: FDI stock_index and FDI flow _index. The result is similar to the previous one without the interaction. The results imply that institutions in Africa are yet to grow to have the desired benefits. Hence, it is important for policy makers on the continent to put in the right structures and allow its institutions to work.

5.5.2. Discussion of Group-wise estimation regression results

The group-wise estimations (disaggregated our overall sample into various groupings), help in conducting a comprehensive analysis of the effect of FDI on the environment to ascertain whether there are differences across the various groupings in order to avoid generalisation about the impact of FDI on the environment for African countries. It is worth noting that, estimations of previous models together with these models also help to provide robustness checks. Thus, study further examines the different magnitude of emission levels by the various income groupings in a group-wise estimation using dummy variables. In other words, this study further investigates whether there are differences among African countries based on their income status (see section 5.4 and Appendix 3). Table 5.4 presents the group-wise estimation for the income groupings. In addition, the analysis and discussion will be focused on stock variable rather than the net inflow variable since from the large sample estimation (Table 5.3) it performs better in terms of the R-squared. The continent is classified into low and middle-income status using a dummy variable to examine whether the impacts of FDI on emission levels is uniform across the regions. As shown in table 5.4, the study finds evidence that a 1 percent increase in stock of FDI will increase emission levels in middle-income countries by 0.10 percent kt. Though the magnitude is not too big, it is highly significant. On the other hand, for low-income countries, the coefficient of stock of FDI is positive but not significant. This is expected because middle-income countries are likely to attract more FDI than low-income countries because of their market size. Furthermore, most of the middle-income countries are generally oil producing and thus all other things being equal, emission levels (pollution) will be higher in these countries. The structure of middle-

income countries' economies (econs) has a positive relationship with emission levels. This implies that the share of the industrial sector to the service sector has a polluting effect. The result for low-income countries was negative and insignificant. This can be attributed to the fact that in these countries the industrial sector might not be large enough to a have significant impact on emission levels. Unlike the middle-income countries that exhibited the Kuznets curve (inverted U-shape), the low-income countries showed a mirror effect (normal U-shaped). Interestingly, this finding indicates that for low-income countries in the short-run, their economic activities are low, thus no polluting effect.

In the long run, when there is an increase in economic activity, it affects positively on emission levels. Surprisingly, the findings from the group-wise estimation based on income groupings indicate that trade openness has no significant effect on emission levels in middle income countries but rather has a polluting effect in low income countries. This could be that low income countries' economies are more open to polluting activities or emissions from the rest of the world. In other words, their economies are fragile and vulnerable. The result according to the group-wise estimation in Table 5.4 for energy use and the institution variable (pr-index) for both groupings follow the previous result for the full sample.

Table 5.4: Fixed Effect Regression Results for Income Status

Dependent Variable: lnco2kt	(1) Middle Income (Stock)	(2) Low Income (Stock)	(3) Middle Income (Flow)	(4) Low Income (Flow)
lnstockfdi	0.1009***	0.0285		
	(0.029)	(0.023)		
econs	0.2845***	-0.0800	0.1923**	-0.0790
	(0.073)	(0.148)	(0.079)	(0.151)
lngdppc	3.9408***	-3.7815***	4.3425***	-1.7356
	(0.820)	(1.188)	(0.864)	(1.137)
lngdppc2	-0.1769***	0.4239***	-0.2163***	0.2398**
	(0.056)	(0.104)	(0.059)	(0.099)
lntrade	-0.0380	0.3787***	0.1689*	0.3488***
	(0.096)	(0.055)	(0.096)	(0.059)
lnenergyuse	-0.2836**	-1.4605***	-0.3833***	-1.4712***
	(0.111)	(0.306)	(0.116)	(0.333)
pr_index	0.3491	-0.0190	0.1577	-0.4524*
	(0.314)	(0.251)	(0.333)	(0.232)
lnflowfdi			0.0007	0.0272**
			(0.012)	(0.011)
Constant	-9.4623***	19.9115***	-10.3017***	14.7560***
	(3.010)	(3.419)	(3.178)	(3.236)
Observations	250	215	242	212
R-squared	0.65	0.73	0.58	0.73
Number of id	16	14	16	14

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

To further explore the differences across African countries in terms of the magnitude of the impact of FDI on the level of emission, the study groups the sample into oil and non-oil producing countries (Appendix 4). Interaction terms (lnstockfdi_oil and lnflowfdi_oil), are created by multiplying the stock and flow of FDI by its dummy variable and this give the FDI for the oil producing countries. From Table 5.5, it can be seen that the coefficient of FDI in oil producing countries (lnstockfdi_oil) is positive and significant at the 10% level. An indication that FDI in oil producing countries relative to non-oil producing countries has a polluting effect because of the usage of the natural resource. In terms of the EKC, there was no evidence. However, there is a positive relationship between real GDP per capita and emission levels. The co-efficient of trade openness in oil producing countries as compared to non-oil producing countries is positive and highly significant indicating a polluting effect. The co-efficient of energy use is still negative and significant as in the previous models and the institution variable as usual insignificant.

Table 5.5: Fixed Effect Regression Results for Oil and Non-oil Producing Countries

Dependent Variable: lnco2kt	(1) Stock	(2) Flow
lnstockfdi_oil	0.0474*	
	(0.025)	
econs	0.1883***	0.1040
	(0.063)	(0.065)
lngdppc	1.5941***	1.7876***
	(0.390)	(0.403)
lngdppc2	-0.0261	-0.0506
	(0.029)	(0.031)
lntrade	0.2427***	0.3158***
	(0.052)	(0.052)
lnenergyuse	-0.3477***	-0.4467***
	(0.104)	(0.105)
pr_index	0.1469	0.0229
	(0.213)	(0.201)
lnflowfdi_oil		-0.0044
		(0.011)
Constant	-0.8255	-0.7020
	(1.255)	(1.278)
Observations	465	454
R-squared	0.63	0.62
Number of id	30	30

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Finally, the study examines whether there is differences in the impact of FDI on emission levels in high or low environmental performance countries (see section 5.4 and Appendix 5) with the help of dummy variable. This is to assess the effect of environmental regulations on FDI impact on emission levels. Table 5.6 depicts the finding of group-wise regression results. There is evidence that for both groupings, FDI is positively associated with the levels of emission. The Kuznets curve is evident in the high environmental performance countries as it exhibits the inverted U-shaped curve. For the low environmental performance countries, there is no evidence. Trade openness is positive and significant for both groups indicating whether a country has high or low environmental performance index, an increase in trade openness will positively affect emission levels. The coefficient of energy use is negative and significant as portrayed by the results from previous models discussed above. The institution variable is not significant in this group-wise estimation.

Table 5.6: Fixed Effect Regression Results for Environmental Performance

	(1) High EPI	(2) Low EPI	(3) High EPI	(4) Low EPI
Dependent Variable: lnco2kt	(Stock)	(Stock)	(Flow)	(Flow)
lnstockfdi	0.0791***	0.0522**		
	(0.027)	(0.024)		
econs	0.0605	0.0827	-0.1060	0.0044
	(0.120)	(0.073)	(0.109)	(0.083)
lngdppc	2.1569***	0.8613	2.8207***	0.7554
	(0.487)	(0.660)	(0.484)	(0.717)
lngdppc2	-0.0817**	0.0080	-0.1338***	0.0086
	(0.036)	(0.052)	(0.036)	(0.057)
lntrade	0.3248***	0.1285*	0.3325***	0.1888**
	(0.068)	(0.075)	(0.068)	(0.074)
lnenergyuse	-0.2457**	-2.4186***	-0.3017***	-2.7316***
	(0.104)	(0.343)	(0.104)	(0.375)
pr_index	-0.2253	0.3785	-0.3337	0.2557
	(0.272)	(0.299)	(0.238)	(0.315)
lnflowfdi			0.0225**	0.0114
			(0.011)	(0.012)
Constant	-2.8988*	12.5446***	-4.3354***	14.5646***
	(1.597)	(2.396)	(1.572)	(2.617)
Observations	322	143	318	136
R-squared	0.59	0.81	0.59	0.79
Number of id	21	9	21	9

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

From the foregone analysis and by way of comparison the results of this study suggests that the association between FDI and CO_2 emission have not been equally the same for all African countries. There is an evidence to argue that relatively middle-income countries, high environmental performance countries and oil-producing countries' FDI have a greater magnitude in terms of the relationship with CO_2 emission. In addition, there exist differences in the regression results (i.e. magnitude and fit) when one is using different measures of FDI (net inflow or stock) as variable.

5.5.3. Dynamic panel data estimation regression results

In order to address the issue of endogeneity, this study adopts the dynamic panel data estimator developed by Blundell and Bond (1998), the system GMM estimator to minimise potential endogeneity as well as serial correlation of the error term. Table 5.7 describes the system GMM estimation results, which are consistent in signs and significance with the other results obtained in the previous models discussed above regarding the impact of FDI on the

environment. Specifically, the influx of FDI have significantly positive effects on the environment. This implies that FDI (either stock or flow) increases emission levels and therefore affect the environment negatively. For instance, a 1 percent increase in FDI stock leads to about 0.103 percent kt increase in CO_2 emission level and a 1 percent increase in FDI flow leads to about 0.117 percent kt increase in emission level. In addition, from model 2, (using FDI flow) the regression results indicate that real GDP per capita and its square have the expected signs confirming the presence of EKC. This implies that emission levels tend to be high in the beginning of economic development and after a certain level of real per capita GDP is attained, further economic development results in decreasing emission levels. The turning point of per capita GDP at which CO_2 emission level is at its maximum and starts to decrease is USD 931.13[5]. Based on the per capita GDP for all countries in 2015 (IMF, World Economic Outlook, 2018), this finding reveals that the turning point has been reached by all the middle income African countries (see Appendix B3) as well as Tanzania and Zimbabwe. The rest of the countries (see Appendix B3) are yet to reach the turning point. Therefore, it is clear that CO_2 emission level will continue to rise for these countries until the highest per capita GDP is reached. Interestingly, the institution variable (pr_index) has the opposing sign (positive) and statistically significant in all the models. From the regression results using the FDI stock model, a 1 percent increase in the institutional variable (pr-index) leads to 0.602 percent kt increase in CO_2 emission level. This implies that institutions negatively affect the environment. However, its conditional effect that is when interacted with the different measures of FDI (net inflow or stock); the institution variable had the expected significant negative sign for all the models. This implies that the effect of institutions on the environment is contingent on FDI. Thus, with good institutions in African countries, the influx of FDI will not have adverse effect on the environment.

5.5.3.1. Dynamic panel system GMM estimation diagnoses

The estimates from the system GMM confirm the theoretically expected results. According to the results, the estimated coefficient of the lagged dependent variable is positive and significant, suggesting that there is significant persistence effects, which supports the use of this estimator. The p-value of 0.00 on the Wald test in all specifications suggests rejection of the null hypothesis that the independent variables parameters are jointly zero. The system GMM estimator assumes that there is no autocorrelation in the idiosyncratic errors, hence

[5] Taking the first derivative of $Y = \beta_0 + \beta_1 X + \beta_2 X^2$ and setting it to zero yields the turning point at $\frac{-\beta_1}{2\beta_2}$. Y is the dependent variable (CO_2 emission level), X and X^2 are GDP per capita and its square respectively.

Table 5.7: GMM Regression Results

Dependent Variable: lnco2kt	(1) GMM Stock	(2) GMM Flow
lnco2kt L1.	0.9970***	0.9890***
	(0.014)	(0.014)
lnstockfdi	0.1025**	
	(0.048)	
econs	0.0139	0.0189
	(0.022)	(0.020)
lngdppc	0.2065	0.3719**
	(0.190)	(0.189)
lngdppc2	-0.0143	-0.0272**
	(0.014)	(0.013)
lntrade	-0.0295	-0.0491
	(0.046)	(0.043)
lnenergyuse	0.0061	-0.0072
	(0.014)	(0.012)
pr_index	0.6019**	0.2247**
	(0.285)	(0.094)
FDIstock_index	-0.1862*	
	(0.098)	
Log_flowfdi		0.1170***
		(0.036)
FDIflow _index		-0.1855***
		(0.068)
Constant	-0.8962	-1.0204
	(0.656)	(0.648)
Observations	437	426
Number of id	30	30
Wald test p-value	0.000	0.000
Sargan Test overidentification	89.82	99.26
Prob > chi2 (125)	0.993	0.957
Resid. AR(2) test p-value	0.839	0.225

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

the need to test for autocorrelation. Besides, the system GMM may suffer the problem of too many instruments, so Sargan/Hansen test for over identifying restrictions is also needed. The p-values of the Sargan/Hansen test for the estimated models are above 0.1, thus they are not significant. Therefore, we fail to reject the null hypothesis that the instruments are valid. In addition, Arellano- Bond AR (1) and AR (2) are used to test for both first and second order autocorrelation respectively. From the estimated results in Table 5.7, the p-value of AR (2) indicates that the absence of second-order serial correlation is not rejected. The serial correlation test shows that all the results for the variant system GMM models fulfil

the no serial correlation assumption, as autocorrelation is significant at the first order but insignificant for the second order autocorrelation. These guarantee the consistency of the estimates and the validity of the instruments used.

5.6. Conclusion and Policy Implications

The main objective of this study is to evaluate whether there is a relationship between FDI and environmental pollution (proxy by CO_2 emission level) on the African continent. To achieve this, the study investigates the nexus between FDI and CO_2 emission by using panel data set from 31 countries over the period 1996 -2013 and estimate the relationship using the fixed estimator and the dynamic panel data technique (system GMM estimator) on FDI stocks and flows.

A formal analysis that establishes the link between FDI and CO_2 emission reveals that from the full sample there is a positive relationship for African countries in both models and whether using different measures of FDI. The study controlled for some explanatory variables and noticeable result is the impact of trade openness; this is positive and significant implying a deteriorating effect on the environment. Next is the interesting outcome of the insignificance of the institution variable (pr-index). However, when the institution variable is interacted with FDI inflows the estimated results especially in the dynamic panel data technique suggest the expected outcome (improvement in environmental quality). This evidence provides the credence to calls for strengthening the institutions and making them work in order to derive their full benefits. The study finds evidence for the inverted U-shape for middle-income countries but for low-income countries, there exist a mirror effect (normal U-shape). Concerning energy use, our findings indicate a negative and significant coefficient in all the estimations, meaning the type of energy use in Africa has no polluting effect. That is the mix of energy used on the continent is generally not having a serious deteriorating effect on the environment.

To provide more insights, we categorized African countries by income levels, oil and non-oil producing countries as well as high and low environmental performance countries. The findings confirm that there are differences in terms of the impact of FDI on CO_2 emission in African countries based on the groupings. Overall, evidence from the study reveals that FDI has a positive effect on the environment (in terms of pollution, proxy by CO_2 emission). Nevertheless, there are differences in terms of the magnitude of the impact of FDI on CO_2

emission levels among countries. For instance, countries with middle-income status, producing oil and having high environmental performance index have greater impact as compared to low-income status, non-oil producing and low environmental performance index countries.

To sum up, after controlling for some explanatory variable, the key finding is that inward FDI has a negative relationship with the environment. Africa's attempt to grow has been hampered by shortage of capital and the desire to bridge this gap through heavy reliance on inward FDI and the implications of this might have on the environment could potentially leave adverse footprints for future generations. The need to prevent this situation is more critical than ever. Hence, the call for development that is both sustainable and ecologically friendly for the African continent as a whole in order to reverse some of the negative impacts of FDI on the environment. Therefore, concrete environmental regulations and policies are to be put in place. A report by the United Nations Environment Programme (UNEP, 2013) African environment outlook 3, opines that there is high rates of environment-related disease in Africa especially the oil producing countries and this could seriously hinder the continent's sustainable growth. For instance, about 30 percent of environmental factors contribute to Africa's disease burden and this hinders the development of the continent. Therefore, it urges African leaders and policy makers to put environmental health policies first. Thus, for economies to succeed in the long term, workforces and families must be healthy because health and economies both are contingent on well-managed natural resources and healthy ecosystems.

From the above report and in line with this study, the policy recommendations are to promote regional environmental sustainability in order to alleviate poverty, an immense effort from national governments to draft an environmental sustainability plan for the continent will be essential. This document should include significant commitments by each of the respective governments to actively promote environmental sustainability strategy. In addition, each of the countries should ideally adopt it and could serve as a fundamental document for the region, outlining the prerequisite in terms of environmental standards for the influx of FDI. In line with this, the recommendation is that policy makers such as the African Ministerial Conference on the Environment to institute environmental management policies and programmes for the sustainable future of the continent. Future policy-led research may exclusively focus on the impact of FDI on CO_2 emissions by disaggregating

the entire economy into the manufacturing, mining and agricultural sectors. In addition, the choice between different measures of FDI variable is very crucial since there is differences in terms of magnitude of the impact of FDI on CO_2 emissions.

APPENDIX B

Appendix B1: Data and Variable Description

Variable	Description
CO2 emissions (kilo tonnes)	Carbon dioxide emissions are those stemming from the burning of fossil fuels and the manufacture of cement. They include carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring.
Foreign direct investment (stock or flow), as a % of GDP	Foreign direct investment are the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor.
Trade (% of GDP)	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.
GDP per capita (constant 2005 USD)	GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products.
Energy use/consumption (kg of oil equivalent per capita)	Energy use refers to use of primary energy before transformation to other end-use fuels, which is equal to indigenous production plus imports and stock changes, minus exports and fuels supplied to ships and aircraft engaged in international transport.
Industry, value added (constant 2005 USD)	It comprises value added in mining, manufacturing (also reported as a separate subgroup), construction, electricity, water, and gas. Value added is the net output of a

Variable	Description
	sector after adding up all outputs and subtracting intermediate inputs.
Services, etc., value added (constant 2005 USD)	They include value added in wholesale and retail trade (including hotels and restaurants), transport, and government, financial, professional, and personal services such as education, health care, and real estate services

Source: World Development Indicators (WDI database, 2015)

Appendix B2: List of African countries for the study

Algeria	Malawi
Angola	Morocco
Botswana	Mozambique
Burkina Faso	Namibia
Egypt	Nigeria
Ethiopia	Senegal
Cameroon	Sierra Leone
Congo, Rep of	South Africa
Congo, Dr Rep of	Sudan
Gabon	Tanzania
Gambia	Togo
Guinea	Tunisia
Guinea Bissau	Uganda
Kenya	Zambia
Liberia	Zimbabwe
Mali	

Appendix B3: Income Groupings

Middle Income	Low Income
Algeria	Congo, Dr Rep of
Morocco	Malawi
Egypt	Mozambique
Tunisia	Gambia
Namibia	Uganda
Gabon	Tanzania
Congo, Rep. of	Zimbabwe
Kenya	Burkina Faso
South Africa	Guinea
Sudan	Guinea Bissau
Zambia	Ethiopia
Cameroon	Mali
Senegal	Togo
Botswana	Sierra Leone
Nigeria	Liberia
Angola	

Source: New country classification by World Bank

Appendix B4: Oil and Non-oil Producing Countries

Oil producing	Non-oil producing
Nigeria	Namibia
Angola	Kenya
Algeria	Mozambique
Egypt	Gambia
Sudan	Uganda
Congo, Rep of	Tanzania
Gabon	Burkina Faso
South Africa	Guinea
Cameroon	Guinea Bissau
Congo, Dr Rep of	Senegal
Morocco	Botswana
Malawi	Mali
Ethiopia	Togo
Zambia	Liberia
Zimbabwe	Sierra Leone
Tunisia	

Source: Wilkipedia

Appendix B5: High and Low Environmental Performance Countries

High Performance	Low Performance
Algeria	Congo, Dr Rep of
Morocco	Burkina Faso
Egypt	Sudan
Tunisia	Guinea
Namibia	Guinea Bissau
Gabon	Ethiopia
Congo, Rep of	Nigeria
Malawi	Mali
Kenya	Angola
Mozambique	Sierra Leone
South Africa	
Gambia	
Uganda	
Tanzania	
Zimbabwe	
Cameroon	
Senegal	
Botswana	
Angola	
Liberia	
Gambia	

Source: Yale Centre for Environmental Law and Policy

Chapter 6

General Conclusion

6.1. Introduction

This final chapter provides a review and summary of the key findings, policy implications attainable from the empirical results, limitations of the empirical study, recommendations for further study and the concluding remarks of the three empirical studies.

6.2. Review and summary of the results

In this thesis, we admit that developing countries and for that matter, African countries lag behind in GDP growth due to varied factors which among other things include inadequate capital. This has created a resource gap and the need to bridge this gap to ensure higher economic growth in order to alleviate poverty, in fulfilment of Sustainable Development Growth (SDG) targets.

Ever since the upsurge of liberalisation in developing countries in the 1980s, much attention is placed on the role of foreign direct investment (FDI) to encourage good economic performance. This relates to a large body of research in economics to understand the pathways for economic development in developing economies; this thesis adds to that effort. In particular, the major aims of this thesis was to examine the growth promoting effects of FDI via a sound financial market as well as ensuring sustainable development. FDI has been recognised as a vital ingredient for growth. It brings about financial resources and technological advancement that can be harnessed to bridge this gap. Both the theoretical and the empirical literature have shown that FDI can contribute to a host country's economic growth.

Theoretically, FDI should enhance the host country's economy by increasing investible capital and by way of technological spillovers. In addition, FDI is supposed to be a more stable source of funding, since it is based on a longer-term view of the recipient country's growth potential, raw material accessibility, and its access to markets (UNCTAD, 1999). In this light, various governments and policy makers across Africa are implementing policies to create the enabling environment to attract FDI in order to promote economic growth. However, in the process of economic growth and development, policy makers should take into account the issue of sustainable development, such that development today does not affect future generation.

This thesis consists of three main empirical chapters, which focuses mainly on the effect of financial market development on bilateral FDI, the impact of financial fragility in the financial market development and its role in the FDI-growth nexus and the effect of FDI on environmental pollution. The main objective of this thesis is specifically to examine the role of FDI in pursuit of the developmental agenda of African countries as well as ensuring sustainable development.

Chapter 3, the first empirical chapter of the thesis suggests that financial market development is a key driver of bilateral FDI under the gravity model framework. The chapter uses a unique banking dataset as a proxy to measure financial market development (FMD) in both host and source country and its effects on bilateral FDI inflows. The results from the preferred model; Poisson Pseudo-Maximum Likelihood (PPML) estimation, show that financial market development (using net loans to total assets ratio as measure) in the source country on the contrary is positive and significant, thus a highly fragile market rather influences bilateral FDI. This can be attributed to the fact that, multinational corporations (MNCs) can borrow from their home economy to invest due to low rate of interest in the home country's financial institution and hence, increasing FDI to host economy. However, in the host country, the coefficient of this measure is negative and significant as expected. This can be attributed to the fact that higher savings in the host economy leads to a lower rate of interest on domestic loans and thus, not attracting bilateral FDI. For the second measure of financial market development (equity to total assets ratio), for the source country, the result indicates that financial market development is a push factor for bilateral FDI.

Chapter 4, the second empirical chapter accounts for the impact of financial fragility in financial market in the relationship between FDI and economic growth. This is motivated by the fact that, the mechanism by which the positive influence of financial market development on growth can be weakened by financial fragility. The results from this chapter demonstrate that the growth promoting effects of FDI can be misleading if we fail to account for fragility in the development of the financial market. However, one of the fragility measures (net loans to total assets ratio) has the opposing effect. This can only be possible if the FDI firms are well established and have enough securities to obtain funds in host country. This offers short-term finances to meet FDI firm's liquidity needs and this encourages FDI to the host economy.

The last empirical chapter of this thesis looks at the effect of FDI on the environment. Using a panel dataset of 31 African countries and under both static and dynamic panel estimations, the result in this chapter suggests that FDI to Africa have negative effects on the environment in terms of carbon dioxide (CO_2) emission levels. Specifically, the chapter further reveals from the group-wise estimation base on income grouping, natural resource endowment and environmental performance that there are differences in terms of the impact of FDI on the level of CO_2 emissions. For instance, on the income grouping, the study finds that, FDI in middle-income countries is positive and significantly affects the environment in terms of CO_2 emission levels. While, for the low-income countries, the effect of FDI on the environment is positive but not significant. This could be the fact that, the middle-income countries have a bigger market size than the low-income countries and thus, are more likely to attract FDI.

6.3. Policy recommendations

The lessons from empirical chapters 3 and 4 may require the need for a sound and stable financial system with strong institutions as well as sound legal framework. Thus, there is the need for further reforms to liberalise the financial sector together with a well-functioning infrastructure to make it play its intermediary role fully to enhance the saving-investment-growth link. In other words, there should be policies to enhance institutional infrastructure and identify the particular institution that would enable the development of the financial sector. Moreover, policy makers in Africa need a clear picture of where the constraints in attracting FDI lie: in order to identify different dimensions of sound macroeconomic and developmental policies that encompass the entire economy in view of creating the enabling environment in attracting FDI.

The findings in the last empirical chapter have profound policy implications for the African region at large and individual countries. African governments and policy makers must put in place a regional environmental sustainability plan, which details the environmental standards and the commitments by each country to actively promote environmental sustainability strategy. This will make the continent to attract cleaner investments that will not affect the development of future generation. In addition, policy makers such as the African Ministerial Conference on environment must introduce environmental management policies and programmes in order to tighten the environmental laws in the African continent.

Finally, it is worth mentioning that, the policies recommended above will at least expand the options available to African countries. However, the drawing from policies to improved economic performance is far from certain. Thus, we do not impress upon policy makers to completely implement these policies, as they may not guarantee safe route to development. As the Barcelona Development Agenda (2004) pointed out, no one set of policies are certain to ignite development.

6.4. Limitations of the empirical study

This thesis has made a conscious attempt to make the findings as reliable as possible in order to push policy makers in the developing countries to improve economic policies, but a number of weaknesses remain concerning the data itself and attempts to deal with the econometric problem of endogeneity. First, there is paucity of data as well as data quality on developing countries is poor, this includes missing data points and when interpolations have to be done, they may not accurately capture the counterfactual. It is believed that World Development Indicators (WDI) reduce this risk. Another limitation of this thesis is the issue of how to address the econometric problem of endogeneity. In the second empirical chapter, we address the issue of endogeneity with lagged values, which are not the most suitable approach to solve identification problems; however, we take this approach because of lack of good instruments.

6.5. Directions for further research

On the potential determinants of bilateral flow of FDI in the first empirical chapter as a plausible extension, further research should evaluate the level at which each of the measures of FMD will affect bilateral flow of FDI for African countries. This definitely requires threshold analysis and could offer deeper insights about development strategies for the region. Additionally, empirical chapters 3 and 4 rely on unique and new banking dataset by Andrianova et al. (2015). It is recommended that future researchers would use these new measures of financial fragility as proxy for financial market development, since both old and new measures yield similar results about the impact of financial market development on FDI. Finally, in terms of the period of the data, it is recommended that, further studies would consider extending the dataset since there is a gap in the period 2013-2017. This will ensure the analysis of the studies conducted to reflect the current trends.

In the last empirical chapter, future empirical research may look at the disaggregation of the economy into various sectors such as manufacturing, mining and agricultural sectors and examine FDI inflows into each sector and its effect on the environment.

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