Essays on Industry Linkages and Foreign Direct Investment: Evidence from Nigeria

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Declaration

While registered as acandidate for the Degree of Doctor of Philosophy, I have not been registered for any other research award. The results and conclusions embodied in this thesis are my work and have not been submitted for any other academic award.

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I express my sincere gratitude to my Research Supervisor Professor Ghulam Sorwar for the motivation, enthusiasm and technical advice he has given me throughout this study. I also express profound gratitude to the World Bank Enterprise department, for providing all the data needed for this research work. I also wish to express my gratitude to the Department of Trade, Investment and Innovation at the United Nation Industrial Development Organization for assisting with the practicality of this research. I also wish to thank God for the completion of this thesis.

I dedicate this thesis to my parents Olufunmbi and Omotayo for their unwavering support throughout this study.

Abstract

This thesis is based on an econometric investigation of the relationship between industry linkages and Foreign Direct Investment in Nigeria. Unique data obtained from a survey of Nigerian firms conducted by the World Bank Enterprise Survey Department was employed for the estimations based on manufacturing and service firms. This study also constructed an input-output table to measure both horizontal and vertical linkages. This study is divided into four parts.

Firstly, the study investigated spill-over effects from FDI to domestic firms through horizontal and vertical linkages using the augmented Cobb-Douglas models as well as the Ordinary Least Square and Fixed Effect techniques. The results of the estimation show evidence of the positive effects of foreign presence on domestic firms and the presence of large technology gaps. Also, the results indicate that there is a productivity spill-over in both horizontal and vertical linkages. Firms with technology level below its foreign competitors tend to benefit from the technology brought by FDI.

Secondly, the study investigates Nigerian innovative outcomes of domestic firms' performance by using the Crepon Duget Mairesse model coupled with augmented Cobb-Douglas function. The result showed that firm-level innovation activity in Nigeria appears to be high and even larger than in similar countries around the region, but the extent of innovativeness is low and incremental. This suggests that in contrast with OECD countries, some of the innovations implemented are so minor, or are based on imitation, to the extent that they do not have a significant impact on productivity (survival innovation).

Thirdly, the study theoretically and empirically investigates the impact of Export-platform FDI on backward linkages; by doing this, a three-country model is developed and tested. The results from the various hypotheses tested indicate that there is a significant relationship between FDI and backward linkages in Nigeria; and the role of the trade agreement, local content requirement and market size is very critical for spill-overs and productivity.

Lastly, the study also looks at how FDI loosens the financial constraints of domestic firms through the use of the Euler framework, and the consideration of the industry linkages. The results show that private domestic firms do have financing constraints and the flow of inward FDI alleviates the financing constraints by signalling. This study provides new evidence on the relationship between industry linkages and FDI in Nigeria.

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CHAPTER 1: Introduction

1.1 Background of the Study

The impact of Foreign Direct Investment (FDI) on host countries has been a contentious area of research in the fields of economics, international business and politics. In economics and international business research, the investigation of FDI effects on an economy is undertaken using either of two primary approaches. One is the macro approach which involves the empirical investigation of FDI effects on economic growth, trade, real wages or employment. Thesecondis the micro approach which relates measures of FDI or foreign presence on smaller economic units such as firms or plants. However, in both macro and micro investigations, there is a considerable level of debate and contrasting views. Starting from macro investigations, some studies argue that FDI can augment domestic capital accumulation and thus enhance economic growth (Slywester, 2005). Similarly, some show that FDI can fuel domestic investment by raising the investment ratio above the domestic savings ratio (Thirlwall, 2006). On the other hand, some studies contend that FDI can crowd out domestic investment and create distortions within the economy which deter GDP growth (Chase-Dunn, 1975). In the same line of thought, Cebula (1992) argues that FDI can raise the price of capital and thereby depress investment.

FDI has become an essentialmechanismfor the advancement of many developing countries based on the belief it will promote growth through job creation and technology transfer. The experience of some developing countries that enjoy the fruits of FDI, such as emerging developing economies, have induced many host countries to continue offering an attractive policy for FDI.

Technology is an essential element for the long-term growth of many countries because technology can push countries out of the diminishing return trap (Barro and Sala-i-Martin, 1995). Moreover, the literature on FDI frequently emphasises the multinational firms own some specific technology as their competitive advantages and that these assets enable them to compete when they invest in the host countries (Markusen & Venables, 1999; Rodriguez-Clare, 1996). Therefore, the arrival of the foreign firms could lead to the possibilities that some of the technology brought by multinational firms could be transferred or spill-over to the host countries.

The arrival of multinational firms enables cross-border technology. However, this does not guarantee that the host countries can ultimately benefit from such cross-border technology.

The reasons are, firstly, that the multinational firms could try to prevent the leakage of their technology to their competitors and, secondly, that the host countries, especially the domestic firms, may lack some skills and abilities to fully benefit from the technology brought by those multinational firms.

Consequently, the most critical role of the host government is to direct the technology brought by FDI in such a way that it is beneficial to the domestic firms. If domestic firms can learn and absorb that technology, there are possibilities that industrialisation could start in the host country and that long-term growth could be expected. One of the critical policies, carried out by many host countries, is to build linkages between FDI and domestic firms because as long as the FDI generates some demand for intermediate goods produced by domestic suppliers, there is hope that technology transfer or spill-over to domestic suppliers occurs. An alternative policy is to promote the domestic firms' abilities so that they can benefit from the new technology or learn to absorb the new technology.

As mentioned above, if foreign firms generate demand for intermediate goods, they will create linkages with domestic suppliers. These linkages could bring two benefits to host countries. First, the linkages between foreign firms and the domestic suppliers can generate technology spill-over to domestic suppliers. Second, the linkages will encourage many entries and employment in the supplying industries. However, not all the domestic suppliers can benefit from the technology spill-over. Domestic suppliers will benefit from the technology spill-over differently, depending on their characteristics and absorptive capacity (Gorg & Greenaway, 2004; Smeets, 2008).

1.2 Literature of Related Studies

Linkages between FDI and the host country have been the focus of many studies based on the belief that such linkages could benefit host countries. Rodriguez-Clare (1996) and Markusen & Venable (1999) explained that this linkage generated demand for intermediate goods produced by the domestic suppliers, which resulted in their entrance into the chain of the supplying industries and could lead to the growth of supplying industries. Furthermore, the linkages also generated employment in those supplying industries. Also, Javorcik (2004) pointed out that there wasevidence of technology spill-over from the foreign firm in the downstream industries to the domestic suppliers in the upstream industries. He explained that foreign firms could encourage domestic suppliers to improve their productivity or the foreign firms might transfer technology to improve the productivity of domestic suppliers.

Studies on productivity spill-over from FDI to domestic firms in the host country are abundant. Most of the empirical studies focused on horizontal spill-overs, which occurred when foreign and domestic firms were in the same industries because of competition, imitation and movement of labour from foreign to domestic firms (Blomstrom & Kokko, 1998). However, the results from empirical studies have been mixed with both positive and negative spill-overs being reported (Gorg & Greenaway, 2004; Smeets, 2008). Likewise, empirical evidence of the vertical spill-over is also mixed with positive and no spill-over effects (Smeets, 2008).

There are possible explanations for these mixed findings. However, two prominent factors are the technology gap and the absorptive capacity. Theoretical explanation on the role of the technology gap argues that the technology gap affects the productivity spill-over from foreign to domestic firms because the larger gap permits the potential that domestic firms can catch up quickly to foreign firms. That is, the larger the gap, the more opportunities for domestic firms to learn from the foreign firms (Findlay, 1978). On the other hand, there is also a theoretical explanation that the large gap encourages foreign firms to bring only old technology because, with the larger technology gap, foreign firms will be able to earn the profit by using only modest technology in competition with domestic firms. However, if the technology gap is smaller, the foreign firms need to bring in the high technology to compete with domestic firms (Glass & Saggi, 1998; Wang & Blomstrom, 1992).

Regarding the role of absorptive capacity, the theory has suggested that to learn to make use of new knowledge brought by foreign firms, domestic firms need a certain level of absorptive capacity. Cohen and Levinthal (1989, 1990) explained that organisation needed prior related knowledge to learn or to imitate the new knowledge. They inferred that basic knowledge was needed before the advanced knowledge could be easily learned or copied. For example, workers might need to know how to type before they could use Microsoft Word efficiently. Cohen and Levinthal (1989, 1990) also argued that there were costs associated with imitation and those costs would be lower if an organisation had a certain level of absorptive capacity. Despite the theoretical explanation of the roles of technology gap and absorptive capacity on productivity spill-over, the empirical evidence is mixed (Smeets, 2008).

Conversely, firms which are already technologically advanced are thought to have little room for further advancement. This is supported by the works of Chuang and Hsu (2004), Jordaan (2008, 2013), Lai, Wang, and Zhu (2009), Sjöholm (2007), Smeets (2008), Tian, Jiang, and Jiang (2010), Xu and Zhao (2012) and Yin and Zhou (2014). The other strand of the literature emphasises the importance of a small technology gap in aiding technology transfer from foreign firms, given that these firms have the basic skill level to follow and adopt the technology being used by foreign-owned firms (Cantwell, 2009). This is endorsed by the works of Dimelis (2005), Farole and Winkler (2015), Hamida and Gugler (2009), Jabbour and Mucchielli (2007), Marcin (2008), Takii (2005), Ubeda and Pérez-Hernández (2016) and Wang, Ning, Li and Prevezer (2016). Thus, the current literature either accepts or rejects the sweeping statement that absorptive capacity matters for FDI spill-overs, but is devoid of differentiating between intra- or inter-industrial linkages between local and foreign affiliates and whether they may respond differently to changes in absorptive capacity (Imbriani, Pittiglio, Reganati & Sica, 2014; Khalifah, Salleh & Adam, 2015).

In relation to the impact of innovation on productivity, Hall (2011) provides a comprehensive survey of the empirical work. The survey mainly focuses on 16 existing empirical studies using the workhorse empirical model, the Crepon-Douget-Mairesse (CDM) model (Crepon, Duguet & Mairessec, 1998), implemented using firm-level data in OECD countries and a few emerging markets. Hall's (2011) main finding is that, in general, most studies find a positive correlation between product innovation and productivity, but the impact of process innovation is ambiguous. According to Hall (2011), the problem with process innovation is that it cannot be measured in the surveys beyond the dichotomous variable of whether the firm implements process innovations or not. In general, these studies suggest that innovation has a positive impact on productivity.

The evidence for developing countries, however, is scarce. One relevant study is Goedhuys, Janz and Mohnen (2006), which examined the primary drivers of productivity in Tanzania. The authors did not find any link between Research and Development (R&D), product and process innovations, licensing of technology, or training of employees, and productivity. The results suggest that Tanzanian firms were struggling to convert knowledge inputs into productivity improvements due to the weak enabling environment for business, which was the primary constraint on productivity according to their empirical results.

Because of the benefits of FDI as mentioned above, host countries have used many incentives to attract FDI, but there is little discussion about the impact of Export-platform FDI on backward linkages. Therefore, this thesis incorporates and expands the model of Lin and Saggi (2007) into developing a three-country model, to look at impact relationship between Export-platform FDI and backward linkages as its one primary channel by which foreign firms affect the host country.

Financing constraint severely affects developing countries, particularly African countries and this problem can inhibit firm growth and exacerbate poverty. Using enterprise-level dataset from the World Bank's Enterprise Survey, Fowowe (2017) investigates the effects of financing constraints on the growth of firms in Africa using both objective and subjective measures of access to finance. Preliminary analysis shows that African financial systems are characterised by small banking systems. Banks in Africa are poor in channelling deposits to where they most efficiently used, signalling low intermediation efficiency. This constraint leads to situations where banks prefer to invest in government securities rather than lend to the private sector. Also, African banks have low outreach, with banks enjoying high-interest rate spreads and targeting short-term finance, to the detriment of long-term finance for investments.

These considerations have prompted the research questions for this study which are presented in the following section.

1.3 Research Questions

The research questions underlying this study are fourfold:

Question 1: Are there spill-over effects from FDI to domestic firms in Nigerian industrial sectors?

Given the extensive literature on FDI spill-overs in manufacturing & servicing firms and the lack of consensus on the actual direction and extent of spill-overs, unique data employed in this study will contribute to the debate by providing a comprehensive analysis on Nigerian manufacturing and service firms. This will contribute towards the attempts to arrive at a standpoint on FDI spill-over investigation. The approach towards our investigation is to provide estimates of foreign presence measures using augmented Cobb-Douglas production functions. Also, emphases are placed on vertical productivity spill-overs and technology gaps as well as the introduction of new proxies for absorptive capacity.

Question 2: Do innovation outcomes in Nigerian industrial sectors affect domestic firms' performance?

How do innovation investment outcomes affect domestic firms' performance? To examine the innovative behaviour of firms in Nigeria, the World Bank 2014 Enterprise Survey Innovation module was used as it had comprehensive survey findings on innovation information carried out in Nigeria. The approach involved using a logical framework, based on the CDM model, which holds that firms invest in knowledge inputs that can be transformed into innovation outcomes according to the efficiency of their innovation function. The aim is, therefore, to provide a rich description of firm-level innovation and investment in knowledge capital and also linking innovation activities with productivity.

Question 3: Does Export-platform FDI have an impact on backward linkages?

This is a methodological question, which involves two procedures. The first of these is to develop a three-country model and incorporate the model and assumption from the works of Lin and Saggi (2007). The second procedure is the application of the model to supporting industries in Nigeria in order to investigate the impacts of this kind of FDI on backward linkages. The reason is that it is one of the main channels through which foreign firms affect the host country.

Question 4: Does FDI loosen domestic firms' financing difficulties?

Empirically, this question answers some questions on the impact of FDI inflow into a host country. Therefore, in answering this question the author uses an improved Euler framework, and considers both horizontal and vertical linkages with FDI through the utilisation of the constructed I-O table.

1.4 Objectives of the Thesis

One of the objectives of this thesis is to focus on how to enable domestic firms (both domestic supplier and domestic firms in final goods industries) to benefit from the productivity spill-over from FDI. Along with this objective, the thesis attempts to construct a symmetrical input-output table based on recently available data that helps to explain industry linkages in Nigeria and also attempts to identify the role of absorptive capacity of domestic firms - their technology gap compared to their foreign competitors in affecting the productivity spill-over.

The second objective of this thesis centres on the role of innovation outcomes of domestic firm's performance. This thesis, accordingly, looks at providing a rich description of the nature of firm-level innovation and investment in capital. To boost productivity, there is a need for broad-based innovation and investment capital. According to Schumpeter (1942), innovation is the engine of the 'creative destruction' process that spurs economic dynamism and transformation and is at the centre of the development process.

The third objective of this thesis is to examine the impact of Export-platform FDI on backward linkages because it is one of the mainchannels through which foreign firms affect the host country. In doing so, this objective expands more on the works of Lin and Saggi (2007) and develops a three-country model to explain Export-platform FDI in Nigeria.

The fourth objective of this thesis is to consider the role of inward FDI on alleviating the financial constraints of domestic firms. Firms in developing countries typically cite financing constraints as one of their primary obstacles to investment. To achieve this objective, the author looked at the role of information asymmetry in the credit market by proposing a new hypothesis. This hypothesis stated that FDI could alleviate the financing constraints of domestic firms by reducing the information asymmetry in the credit market. Also, the Euler framework is improved to analyse the impact of FDI on domestic firm's constraints.

1.5 Contribution of thesis

There are two limitations of previous studies on productivity spill-over that are subject to discussion that this thesis attempts to extend. First, the empirical evidence on the role of the technology gap on productivity spill-over tends to focus only on the technology gap between domestic and foreign firms within the same industry (horizontal spill-over). There is little attention given to the technology gap between foreign and domestic firms in vertical linkages. This thesis attempts to verify whether the technology gap affects the vertical productivity spill-over. In particular, the study attempts to verify whether the domestic suppliers in the upstream industry can benefit from vertical productivity spill-over if they have the technology below their foreign competitors and similarly, whether domestic firms in the downstream industry can benefit from vertical productivity spill-over when they have the technology below that of their foreign competitors. The main reason for such empirical analysis is that it can point out the role of FDI in both upstream and downstream industries while taking account of the competition between domestic and foreign firms as well.

The second limitation in previous research is related to the use of proxies to measure absorptive capacity. Previous studies tended to use R&D as proxies for absorptive capacity, but such R&D is not appropriate, especially in developing countries such as Nigeria. Some reasons that R&D is not a good proxy for absorptive capacity are as follows. Firstly, in the developing countries such as Nigeria, most FDI is invested in labour-intensive industries and usually comes with less complicated technology. Therefore, R&D is less needed in an industry where labour is used intensively and simple technology is easily imitated. Secondly, in developing countries, the majority of domestic firms are small/medium firms, and they cannot afford R&D expenditure. Finally, R&D is not a good proxy for absorptive capacity because even though domestic firms may have R&D, they may still need trained workers to use R&D. In this study, two proxies for absorptive capacity are used: worker's education level and training offered by firms.

Besides the two limitations on technology gap and absorptive capacity in the previous studies, there is also limited evidence on the impact of innovation on productivity from developing countries. Therefore, this study sheds more light on the nature of firm-level innovation and investments in knowledge capital as well as on the link between innovation activities and productivity from the Nigerian perspective. Also, the study assesses the impact of Export-Platform FDI on backward linkages, as its impact on host countries has received scant attention in research especially in the case of developing countries.

In summary, this study contributes to the literature by filling some gaps found in the previous studies on the relationship between industry linkages and FDI. In the first direction, it investigates the role of the technology gap on productivity spill-over by extending the role of the technology gap to the case of vertical spill-over. Also, it investigates the role of absorptive capacity on productivity spill-over by introducing new proxies of absorptive capacities: the workers' education and training offered to workers. Also, it adds to the body of literature on the impact of innovation outcome on firm's productivity from a developing country standpoint. In the second direction, it contributes to the literature by constructing a theoretical model and providing empirical analysis to explain the impact of Export-platform FDI on backward linkages in the host country.

This study adds to the body of literature and empirical findings by investigating the impact of inward FDI on financial constraints of domestic firms. Few studies have looked at the rationale from the perspective of information asymmetry. Therefore, one of the major contributions is the connection of industry linkages with financial constraints, as well as developing an improved Euler framework to capture financial constraints of domestic firms with a developing country.

1.6 Structure of thesis

The general approach in each Chapter of the thesis is to provide a detailed study or analysis of industrial sectors including manufacturing and service firms in Nigeria. Most chapters have a distinctive methodology but use similar data sources and they end up highlighting distinctive findings that correspond to various studies and the context of the thesis. In summary:

Chapter 1 provides the basic research questions, objectives and an overview of the thesis, with a description of related literature across the subject area.

Chapter 2 explores the Nigerian economy and constructs an input-output table that shows various inter-relationships between different domestic industrial sectors. Also, the chapter explores FDI trends in Nigeria as well as various determinant factors that contribute to FDI inflow. Various FDI theories are discussed in this chapter, and Nigerian industry policies are mentioned.

Chapter 3 reviews theliterature related to foreign direct investment, industry linkages, theories as well as determinants of FDI from the country's perspective.

Chapter 4 provides an empirical approach to productivity spill-overs, FDI and industry linkages. The chapter analyses intra-sectoral spill-overs and inter-sectoral spill-overs which include forward and backward linkages. The chapter also introduces new proxies for absorptive capacity and defines technology gap through mathematical formulation. Cobb-Douglas and the Total Factor Productivity Model are used in this chapter for empirical investigation.

Chapter 5 explores the role of innovation inproductivity and defines firm-level innovation empirically. Also, the chapter analyses the link between innovation activities and productivity, including employment. FDI and innovation policies of Nigeria are discussed extensively within this chapter and the CDM model is well incorporated.

Chapter 6 provides both a theoretical and empirical approach towards spill-overs and industry linkages by examining the impact of Export-platform FDI on backward linkages in the host country. The chapter develops a three-country model and places emphasis on the works of Lin and Saggi (2007). The chapter also develops some testable hypothesis, which was tested using empirical data both from the Enterprise survey and the Nigerian Bureau of Statistics.

Chapter 7 provides an empirical approach toward FDI and financial constraints of domestic firms using a modified Euler framework. The chapter defines financial constraints and analyses firms based on upstream and downstream production settings. Also, the chapter looks at horizontal and vertical linkages with FDI.

Chapter 8 provides the overall conclusion of the thesis which points out how the research questions were answered and indicates certain issues where there is the need for further research.

CHAPTER 2: Input-Output Table Construction, Industry Linkages and FDI in Nigeria

2.1 Introduction

The fundamental issues of economic growth revolve around critical determinants, as well as supporting and retarding factors, which lie in the complex interactions among various forces within the economic environment. Kuznets (1971, p.60) defined the economic growth of a country as "a long-term rise in capacity to supply increasingly diverse economic goods to its population; this growing capacity is based on advancing technology and the institutional and ideological adjustments that it demands". The increase in the outputs of major sectors of an economy, such as manufacturing and natural resource due to increases in the use of inputs or improvement in technology, leads to economic growth. Key macroeconomic indicators such as the gross national product (GNP), gross domestic product (GDP) and net national product (NNP) are used, among other economic parameters, as measures of economic growth performance of an economy. Thus aprogressive increase in the outputs of major sectors of an economy is a manifestation of the attainment of economic growth.

Economic growth is driven by a process that is generated and sustained by the efficient utilisation of economic resources to meet effective demand and social needs. The challenge facing countries in attaining economic growth is that of creating an enabling atmosphere for harnessing of economic resources. This challenge has become even more intensified by an increasingly interdependent global economic dispensation that tends to undermine and marginalise sluggish economies which has given rise to disparities among countries of the world regarding their levels of attainment of economic growth. Some economies have witnessed sudden and remarkably very high growth rates above the world average. This achievement is being referred to as ‘growth miracles’. On the other hand, those economies that have performed abysmally below world average are referred to as ‘growth disasters’.

The neoclassical and endogenous growth models of economic growth, regarded as the two broad classifications of economic growth theory (McCallum, 1996), have dwelt extensively on the theoretical and empirical requisites of economic growth. Congruent with the classical argument of Malthus (1798), natural resource utilisation, pollution and other environmental considerations have become critical to the possibilities of long-run economic growth (Romer, 2001). The effect of natural resources on society is as old as human activities. The environment inserts itself at the intersection between nature and society in that, outputs of human economic activities (production, exchange and consumption) generate environmental problems while the depletion of scarce renewable and non-renewable natural resources raises concerns about the sustainability of economic rents from the exploitation of natural resources. Considering that economic growth entails the capacity to supply increasingly diverse economic goods, natural resources such as oil and gas have the potential for being catalysts for generating economic growth if properly harnessed. Even though natural resources have been part of economic growth analysis from a much earlier period, the publication of The Limits of Growth (Meadows, Meadows, Randers & Behrens, 1972) propelled an upsurge in research on the economics of natural resources. Besides the perception of being a basis for national prosperity, power and wealth, issues such as essentiality, intergenerational equity, sustainability and optimal utilisation of natural resources have crystallised the crucial role of natural resources in the attainment of economic growth. Natural resources, conceived as factor inputs, fit into the classical production function and have, thus, become a significant component of economic growth analysis, which stresses the constraints imposed by finite resources and the principle of diminishing returns.

Real productive activities engender economic growth by ensuring a continuous improvement in the methods of production, the discovery of new resources and thus creating the necessary conditions for efficient utilisation of resources. A multiple sector positive performanceis essential for the growth of the overall economy, but a sector of the economy that attracts a large spectrum of economic activities can stimulate the productive fibre of other sectors towards real production and provide the requisite impetus for the sustainable growth of the economy. A natural resource sector, such as oil and gas, tends to generate tremendous economic activities arising from their intrinsic versatile utility value. The temptation for rent-seeking behaviour could undermine the efficient use of the natural resource and other resources of the economy thereby crippling the chances of the growth of the economy. If rents, derived from natural resource extraction, are used to facilitate complacent consumption to the detriment of real production, there will be an expansion of non-tradable sector activities leading to the shrinking in tradable sector activities such as manufacturing. This phenomenon is referred as the ‘Dutch Disease’, and it is a chronic source of slow growth due to the absence of "backward and forward" linkages among sectors of the economy (Sachs and Warner, 1997). The manufacturing sector, with a thriving service sector for support, is a vital source for economic growth through learning-by-doing, as such should have a pivotal link with the oil and gas sector regarding resource use for real productive activities that propel the economy towards a sustainable growth path.

Inter-industry linkage analysis describes a multi-industry process of complex combinations of numerous and diverse resources that are transformed into usable goods and services. This process hinges on the method of input-output that illustrates the use of resources obtained from different sectors by other sectors of the economy. The absorptive capacity (the ability of capital investment or resource to yield healthy levels of return) of industries and that of the overall economy provides the impetus for inter-industry linkages. The productivity level of the economy reflects on the value-adding capabilities of factors of production which hinge on the level of inter-industry linkages that exists within the economy. There is a positive relationship between the extent of inter-industry linkages and the level of the output of the economy, which is an important measure of economic growth. Given that economic growth is engendered by the efficient use of resources and considering that inter-industry linkages are about multi-industry absorption of resources obtained from different sectors of the economy, a formidable inter-industry linkage process is crucial for attaining economic growth.

To understand the structure of an economy requires understanding how each sector of the economy is related one another. The role of industry linkages has long been an interest for economists since Hirschman (1958), who argued that interdependent structure was essential for economic development in a country. He postulated that industry linkages depended on demand and supply of inputs of intermediate goods to other economic activities. A rise or a fall in production of an economic sector would have an impact on the other sector of the economy. The magnitude of the impact depended on whether that sector had strong or weak linkages with the others.

The study of industry linkages among economic sectors requires the use of an input-output table, which is compiled from a comprehensive survey of demand and supply of intermediate goods among all sectors of an economy. The input-output table could show the degree of interdependence between one economic sector and another. Usually, the construction of an input-output table is costly and only the government can compile such a table.

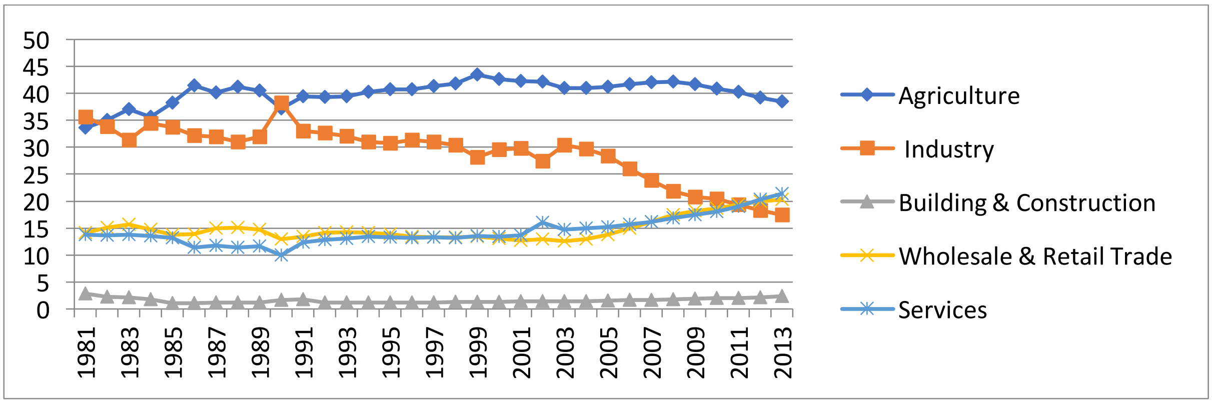
Having a good input-output table enables the author to predict the impact of growth in one economic sector on the other. Recently, the input-output table has provided a good tool for simulation of macroeconomic policies for many countries. For example, the impact of the growth of import or export of final demand on all sectors in the economy and the impact of an increase in wage rate, consumption tax or import duties need to be taken into account. In Nigeria, there isn't an updated symmetric input-output table, as the last one constructed was in 1999 by Patrick Osakwe from the Trade and Regional Integration Division, of the United Nations Economic for Africa (UNECA). For this reason, a more updated version based on the data from the Nigerian Bureau of Statistics (NBS) Database was used to construct the table.

2.2 Overview Structure of the Nigerian Economy

Nigeria is the most populous country in Africa with a population of over 140 million people. The country is endowed with vast expanses of land, forest resources and abundant natural resources, including rivers and lakes, oil and gas, and solid minerals. It is, therefore, a potentially large centre of production and consumption activities and has the potential for becoming a large economy. Nigeria's economic structure is largely oil-based.The economy has stumbled for years due to political unrest, corruption and poor fiscal policies. However, since the restoration of democracy and the introduction of economic reforms, the country is growing at a fast pace. According to the International Monetary Fund (IMF) projections, Nigeria is the second fastest growing economy in the world and will outperform other African economies shortly.

The GDP growth right from the 1980s up until recent time is shown in figure 2-1 and indicates that the agricultural sector contributes more to the economy than any other sector in total. However, the service sector has remarkably improved over the years. The agricultural sector contributed an average of 40% to the total GDP from the beginning of the 1980s up until 2013. The Industrial sector has contributed about 30% to the total GDP for the years in question. The trade sector which in some cases can be classifiedas part of the Service sector has also improved over time. Especially between the years 2007 to 2013, its growth has improved enormously.

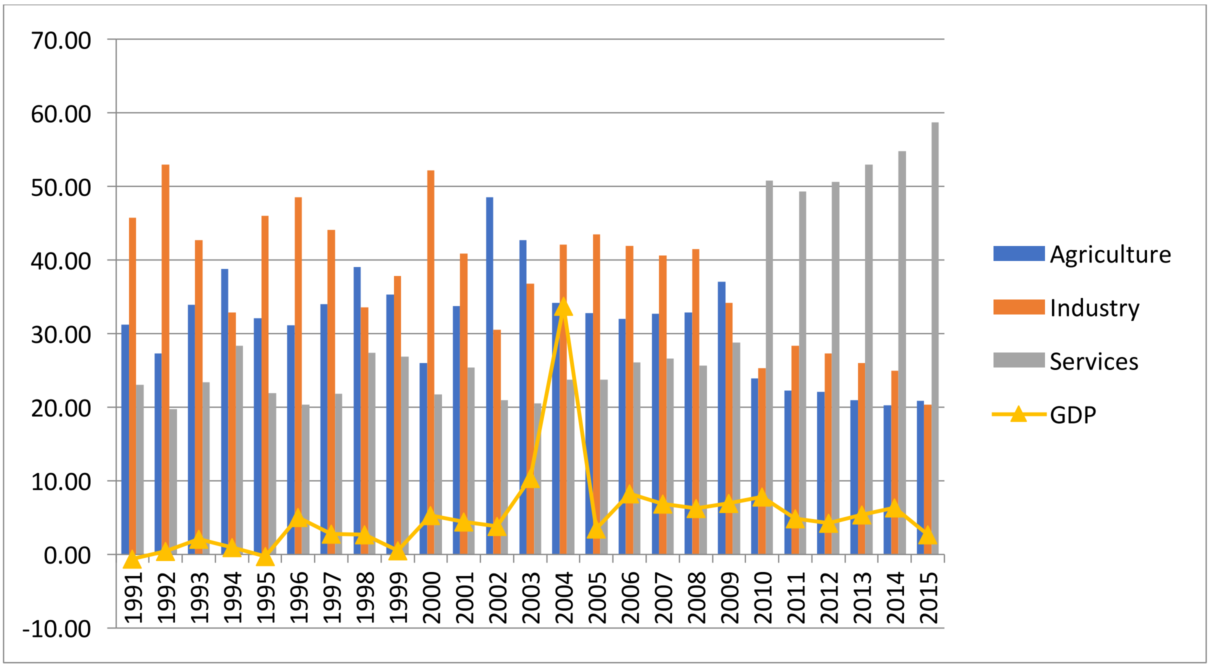
***Figure 2-1.* GDP Shares of Sectors in Percentages**



(Source: National Bureau of Statistics, 2015)

In the twenty-first century, the industrial sector has fallen in terms of its contribution to GDP as shown in figure 2-2; however, the service industry including trade has done remarkably well. The agricultural sector seems to be slowly declining.

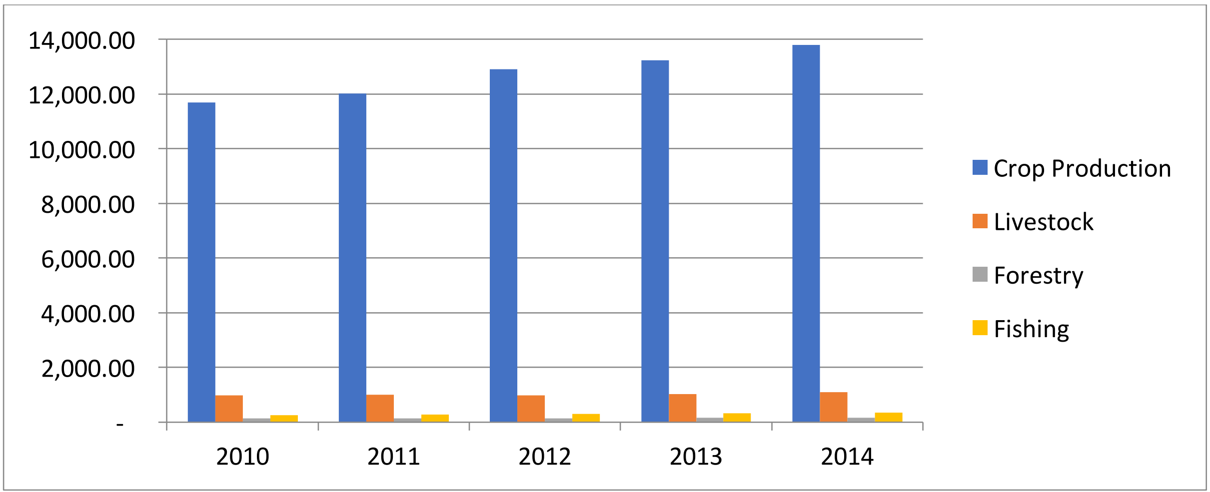
***Figure 2-2.* Growth of GDP by Sectors of Economy in Percentages**



(Source: National Bureau of Statistics 2015)

Production output of agricultural products is shown in figure 2-3 below. The leading agricultural sector is crop production which exceeded any other sector by a huge margin from 2010-2014. The crop production sector produces about 70% of the agricultural sector and it consists of crops such asbeans, rice, cassava, yam, maize, groundnut and Guinea corn. The livestock sector has had a gradual growth rate. Forestry and fishing sectors have had similar growth patterns, contributing less to the growth of the agricultural sector.

Figure 2-3. **Production of Agricultural Sector Output (Billions of Naira)**



(Source: National Bureau of Statistics 2015)

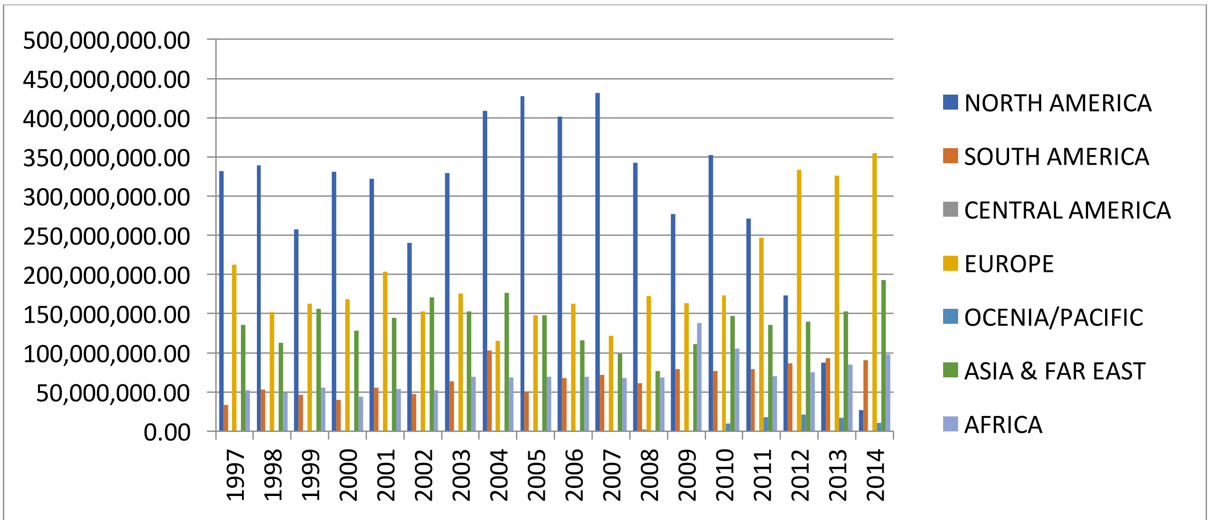
Table 2-1 below displays the structure of the industrial sector as a percentage share of GDP at a constant price. Industry has contributed about 22% to the GDP from 2010 to 2014. Within the industrial sector, crude oil accounted for about 61% of the sector's GDP; which is, therefore, the largest share of GDP when compared to other sectors within the industrial sector. This validates the point that the crude oil sector is vital to the economic growth of the country. It also shows that the country depends greatly on the oil industry. The manufacturing sector also contributed about 39% to the sector's GDP from 2010-2014. However, the food industry contributed a larger percentage.

Table 2-1 **GDP Shares of Industrial Sectors in Percentages** (Source: National Bureau of Statistics 2015)

Industrial Sector	**2010**	**2011**	**2012**	**2013**	**2014**
(a) Crude Petroleum & Natural Gas	**69.83**	**66.79**	**62.74**	**54.60**	**50.84**
(b) Solid Minerals	**0.43**	**0.46**	**0.55**	**0.64**	**0.69**
Coal Mining	6.20	6.52	6.43	6.63	6.92
Metal Ores	4.54	4.56	4.06	4.01	4.07
Quarrying & Other Mining	89.26	88.92	89.50	89.35	89.01
(c) Manufacturing	**29.74**	**32.75**	**36.72**	**44.77**	**48.47**
Oil Refining	7.13	6.43	4.67	5.92	4.66
Cement	6.18	5.65	5.65	6.46	7.30
Food, Beverage and Tobacco	64.23	58.50	54.94	50.44	46.44
Textile, Apparel and Footwear	9.85	13.56	17.04	18.82	21.52
Wood and Wood Products	3.45	3.09	3.29	2.94	2.89
Pulp, Paper and Paper Products	0.68	0.68	0.63	0.76	0.75
Chemical and Pharmaceutical Products	0.70	0.92	1.29	1.59	1.91
Non-Metallic Products	1.66	2.35	2.34	2.54	2.98
Plastic and Rubber products	0.95	1.81	2.22	2.38	2.70
Electrical and Electronics	0.07	0.11	0.09	0.08	0.08
Basic metal, Iron and Steel	1.24	2.44	2.60	2.42	2.44
Motor vehicles & assembly	0.61	0.62	0.74	0.76	0.83
Other Manufacturing	3.25	3.84	4.47	4.90	5.50

The main markets for the petroleum products are US, Canada, South American Countries such as Brazil and Argentina, EU countries such as Germany, Netherlands and the rest, Central American countries such as Barbados, Oceania/Pacific countries such as New Zealand and Australia, Asian/Far East countries such as Japan, China, Taiwan, India and African countries such as Ghana, Senegal Ivory-Coast and the rest. Figure 2-4 below also displays the volume of export by markets. There are some reasons that lead to high export of petroleum products such as tariff incentives given to some countries. Looking at the diagram form 1997 through to 2010, the North American region had imported more of the country's crude oil, and by far the largest amount of crude was by the US. By 2011, the import from the North American region started to decline due to production capabilities derived from their region. However, the EU region, between 2012 and 2014, has imported more Nigerian Crude oil than any other region and the growth of import by the region has been significantly increasing. The Asia/Far East region has maintained a considerate amount of crude oil importation while the African region in the last six years has had a stable importation volume.

Figure 2-4. **Export of Crude Petroleum & Gas (Quantity bbls)**



(Source: Nigerian National Petroleum Corporation Bulletin 2015)

Table 2-2 below displays the structure of the Service Sectors in Nigeria in percentages of the constant price of the year 2010. It shows that the trade sector remains the top sector in the service sector and accounts for the largest share of GDP compared to other service sectors.

From 2010 to 2014, the sector had an average of 17% of the sectors' GDP. The construction sector has shown a growing impact in the GDP share from 2010 to 2014 which could be as a result of infrastructure development within the economy. The information and communication sector also plays a vital role in the composition of the sectors' GDP. However, the growth of this sub-sector has been on the decline in the past five years. The education sector has shown rapid growth in the last five years, and this could be attributed to awareness campaigns on the importance of grassroots education.

Table 2-2 **GDP Shares of Service Sectors in Percentages** (Source: National Bureau of Statistics 2015)

	2010	**2011**	**2012**	**2013**	**2014**
Construction	**2.88**	**3.16**	**3.32**	**3.59**	**3.82**
Trade	**16.47**	**16.76**	**16.44**	**16.62**	**16.57**
Services	**34.73**	**34.34**	**34.59**	**35.87**	**36.17**
(a) Transport	3.66	3.73	3.43	3.26	3.17
(b) Information and Communication	31.40	30.80	30.24	29.92	29.88
(c) Utilities	1.17	1.49	1.61	1.74	1.57
(d) Accommodation and Food Services	1.30	1.36	1.50	2.38	2.63
(e) Finance & Insurance	10.06	7.06	8.14	8.09	8.16
(f) Real Estate	21.76	20.99	21.13	21.63	21.23
(g) Professional, Scientific & Technical Serv.	9.02	10.29	10.57	9.99	9.84
(h) Administrative and Support Services Business Services	0.07	0.07	0.06	0.06	0.06
(i) Public Administration	10.54	11.68	8.87	8.07	7.72
(j) Education	4.36	5.51	5.34	5.64	5.73
(k) Human Health & Social Services	1.74	1.89	1.88	1.89	1.95
(l) Arts, Entertainment & Recreation	0.16	0.39	0.47	0.50	0.53
(m) Other Services	4.75	4.73	6.76	6.84	7.52

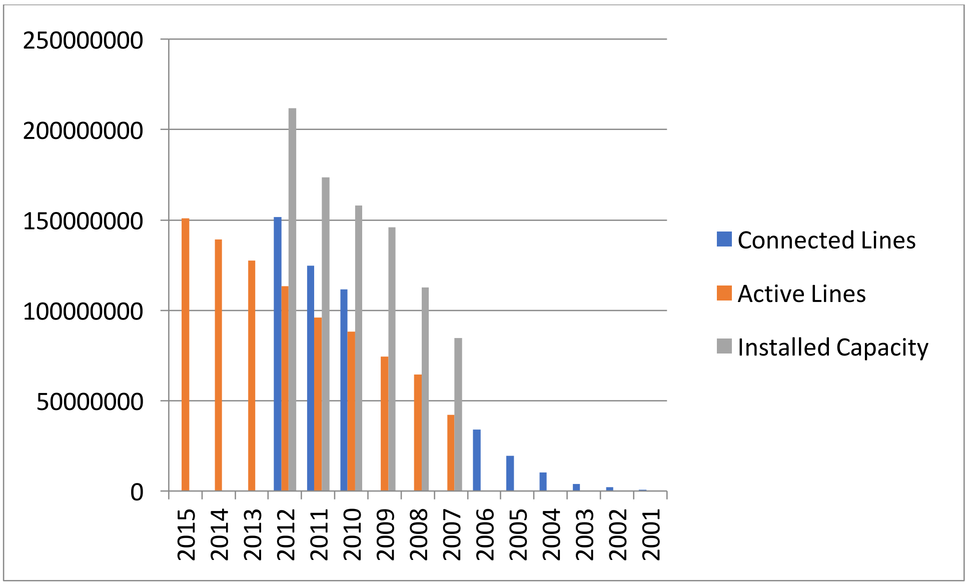
Table 2-3 below shows the number of commercial banks and other financial and non-financial institutions between 2006 and 2011. The number of microfinance banks has increased enormously; however, due to banking deregulation and policies, the number of private domestic commercial banks has reduced. Many mergers and acquisitions have taken place within the banking sector. There has also been the improvement in the number of state-owned banks. The number of security firms has reduced due to the unforeseen event of the 2007 financial crisis and the sector has also involved more fund managers.

Table 2-3 **Numbers of Banks and Financial Institutions in Nigeria** (Source: IMF Country Report 2013)

	2006		2010		2011
	Numbers		Numbers		Numbers
Commercial Banks	25		24		20
Private	25		24		17
Domestic	21		20		13
Foreign	4		4		4
State-Owned	0		0		3
Institutional Investors	124		100		91
Insurance Companies	107		61		61
Pension Funds	13		30		21
Unit Trusts	8		8		8
Other Non-Banks Financial Institution	1683		1619		1403
Finance Companies	112		108		
Specialized development institutions	6		6		6
Securities Firms	581		580		254
Fund Managers					136
Mortgage Institutions	90				
Microfinance Banks	757		800		876
Discount Houses	5				5
Bureaux de Change	126		125		125
Asset management Companies					1
Others	6				

Among the service sectors in Nigeria, the most fascinating and rapidly growing sectors with high GDP contribution is the information and communication sector. Figure 2-5 below shows the number telephones used in Nigeria regarding lines being connected, active lines and also installed IT capacity. Examining the trend reveals thatit has been on the increase. From 2007 to 2012, the number of connected lines has been parallel to the number of active lines.

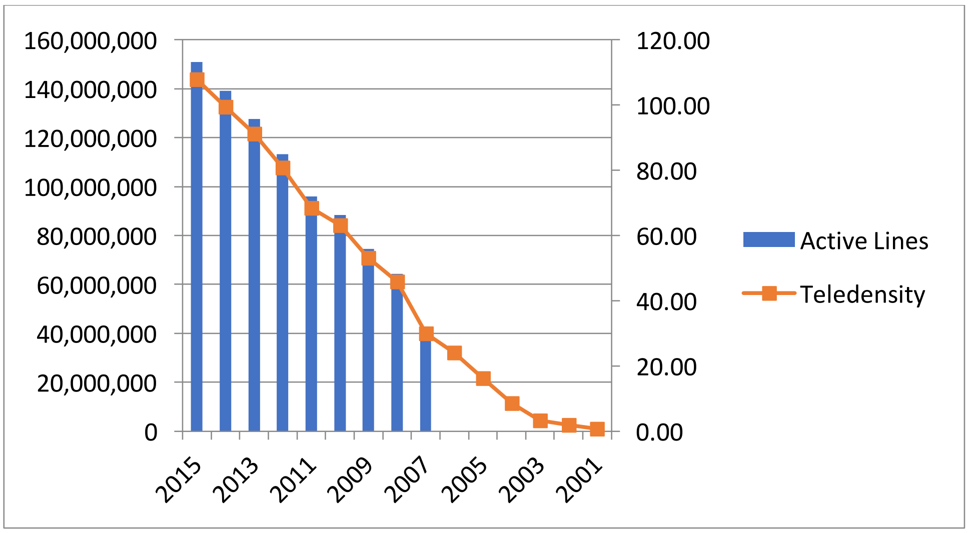
Figure 2-5. **Number of Telephone Used From 2001 to 2015**



(Source: Nigerian Communication Commission Report 2015)

Figure 2-6 below shows the relationship between active telephone lines and telephone density. Telephone density is the number of telephone connection for every hundred individuals living within an area. Between 2007 and 2015, over 140 million people have had an active telephone line at a density percentage of over 100%. This has been reflected in the GDP of the service sector.

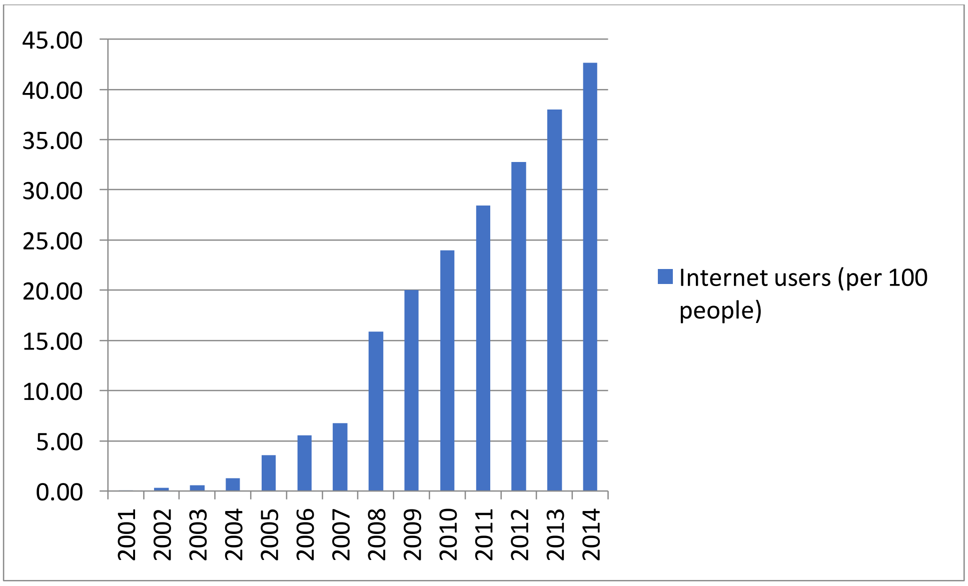
Figure 2-6 **Relationship between Active Lines and Teledensity**



(Source: Nigerian Communication Commission Report 2015)

Also, figure 2-7 below displays the number of internet subscribers based on data from the world development index. The number has steadily increased between 2001 and 2014.

***Figure 2-7.* Internet Users (per 100 people)**



(Source: World Development Indicators 2016)

2.3 Inter-Industry Linkages and Economic Growth Nexus

The economic growth process is crucially intertwined with the transformation of resources to different forms of use. Complex interactions of several variables such as demand and supply or wages and prices, as well as a series of transactions in which actual goods and services are exchanged, are involved in the transformation of resources into various uses. Given the diverse nature of contemporary economies, the process of transforming resources involves a strong mix of ideas (technology) with other factors of production such as land and labour, in addition to other resources from different activity sectors of the economy. Resources, in their natural form, have limited direct economic use in satisfying human needs but transforming them into goods and services enhances their economic value to the society. Since resources are obtained from various natural processes based on industry/sector categorisation of the economy, the mix of productive activities by different sectors of the economy is the fountain of the transformation of resources into goods and services and the bedrock of the economic growth process.

Inter-industry linkage analysis seeks to establish the multi-industry relationship that is involved in the transformation of resources into goods and services. The essence of inter-industry linkages is to describe with precision, the complex combination of numerous and diverse resources and the processes of their transformation that leads to the production of final commodities. This illuminates the different stages of the production chain in that the intensity of inter-industry linkages illustrates the level of value-adding activities of factors of production, which is also a determinant of the output level of the entire economy, a sine qua non-for economic growth. Inter-industry linkages are of two basic types, namely backward and forward linkages; backward linkages occur when an industrial activity induces domestic production and supply of inputs needed in that activity, and forward linkages occur when an industrial activity induces the utilisation of its output by other domestic production activities (Hirschman, 1958).

Technological inter-connections among various sectors of the economy could evolve from the structural and spatial interdependence of the production processes of the sectors. The rational response to inducements and incentives propels the inherent capabilities of factors of production to be transmitted into technological relationships. This leads to an increase in the level of activities of sectors of the economy in a self-reinforcing manner. The expansion of activity in a given industry leads to increase in demand for inputs from the sector(s) and the supplying sector(s) respond to the stimuli of increased demand by expanding production. The embodying expansionary effects of inter-industry linkages provide opportunities for economies of scale, which could translate into lower per unit cost of production.

The input-output model, based on the pioneering work of Wassily Leontief (1986), is a basic tool for analysing inter-industry linkages (see Appendix). The input-output table, which is anchored on the double-entry structure with all industries presented in both horizontal rows and vertical columns, reveals the fabric of the economy by showing how the various sectors/industries of the economy are woventogether. The vertical column of a basic input-output table states the inputs of each of the various goods and services that are required for production in each of the respective industries. Thisis presented in the form of outlays of all sectors within the economy, and the totals of this outlay reflect the total production for the economy (within the year under consideration). The horizontal rows represent outlays of the inputs of sectors/industries to various sectors of the economy. The total of the outlays for the columns is the total output of the economy while the total for the rows represents the extent of the supply of inputs by each of the sectors in the row. The final demand element of the vertical column usually illustrates the gross national product (GNP), which is a measure of the productive activities and by implication economic growth.

The changing pattern of inter-industry linkages, which describes inherent dynamic properties, is useful for analysing the process of economic growth (see, for instance, Bulmer-Thomas, 1982; Leontief, 1986). Also, the high linkage hypothesis (Hirschman, 1958) has gained tremendous analytical relevance by providing insights into the determination of high linkage sectors as the potential source of growth of the overall economy (Cella, 1984; Jones, 1976; Laumas, 1975, 1976; Yotopoulos & Nugent, 1973, 1976). Strategic consideration of a large activity sector identified as a key sector with high linkage relevance to other sectors can lead to gradual diffusion of value-adding activities across sectors of the economy to ensure efficient utilisation of resources and generate economic growth. Endogenous growth theory and the leading sector strategy of economic growth (Currie, 1974,1997) give additional credence to this conception of the economic growth process.

2.3.1 Compilation of the Input-Output Table

There are four basic assumptions for the transformation from supply and use tables into product-by-product input-output tables or industry-by-industry input-output tables (Eurostat, 2008).

Product technology assumption (Model A)

Industry technology assumption (Mode B)

Fixed industry sales structure assumption (Model C)

Fixed product sales structure assumption (Model D)

The first two assumptions are applied to compile product by product input-output tables. The transformation of supply and use (SU) tables to the symmetric industry by industry input-output tables are based on assumptions on the sales structure. All inputs in the product by product input-output (IO) tables are allocated to homogeneous units. Product by product IOtables are believed to be more homogenous but further away from statistical sources than the industry by industry IO tables. Inputs in the industry by industry IO tables are allocated to industries. Industry by industry IO tables is less homogeneous but closer to statistical sources and actual observations than product by product IO tables. Model A and Model C have negative values after transformation from supply and use input-output tables. To solve negative problems, hybrid technology and Almon’s procedure can be used for removing negative values. However, Model B and Model D do not have negative values.

The implication of the technology assumption is divided into two models; model A is the product technology assumptions where each product is produced in own specific way, irrespective of the industry where it is produced. In contrast, Model B is based on the industry technology assumptions; where each industry has its own specific way of production, irrespective of its product mix. To solve the models with negatives, the Almon’s procedure is used. The input-output tables for 2010 derived from the supply and use tables based on both industry technology assumptions and fixed products sales structures assumptions, used the Microsoft Visual Basic languages in Excel format. According to Eurostat (2008), the input-output table constructed used domestic production at basic price as well as the fixed product sales structures and the industry technology assumption.

The industry technology assumption is used to convert make-use tables (or supply-use tables for some international datasets) into a symmetric input-output table. It assumes that an industry uses the same technology to produce each of its products. In other words, an industry's production function is a weighted average of the inputs required for the production of the primary product and each of the by-products, weighted by the output of each of the products.

As a requirement of the industry technology assumption, industry by-product coefficients are constant. An industry will always produce the same mix of commodities regardless of the level of production. In other words, an industry will not increase the output of one product without proportionately increasing the output of all its other products.

2.3.2 Presentation of Results

The analysis seeks to unravel the structural pattern of inter-industry linkages using the results obtained for the various linkage measures. Linkage analysis has been calculated for the Nigerian economy using the results from the symmetric I-O table constructed which transformed from supply and use tables based on fixed product sales structure assumption. The 2010 Supply and Use Table was used, and an aggregated 49 sectors and sub-sectors level was constructed from the SU table.

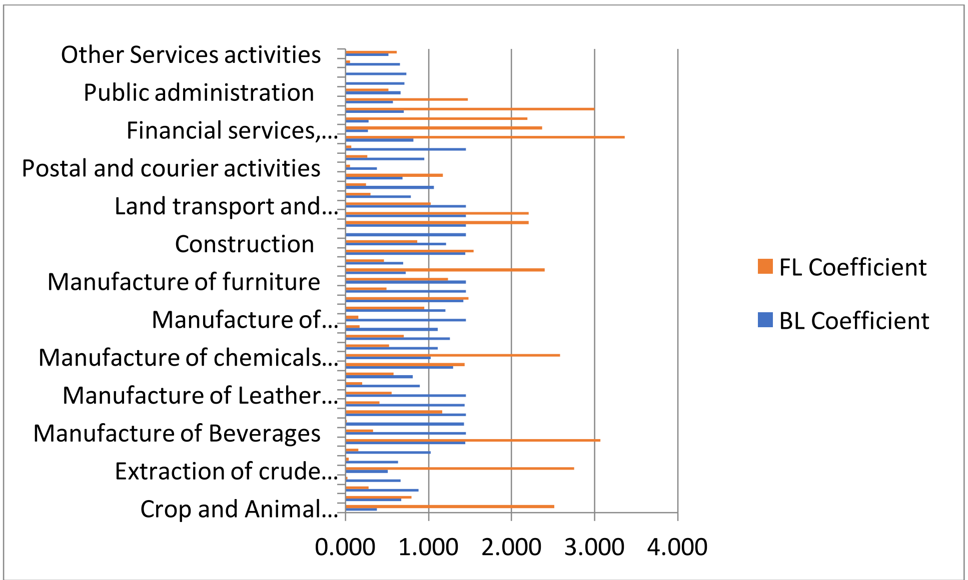
The empirical analysis is based on the Input-Output Table constructed by the researcher. The input-output transactions table is shown in appendix 1. All commodity flows between industries and other economic agents in the input-output table are in millions of Naira and recorded in basic prices. The basic price of a good or service is the amount receivable by the producer from the purchaser minus any tax payable and any subsidy receivable (except subsidy on import). The producer price is the amount receivable by the producer from purchaser minus any deductible goods and services tax invoiced to the purchaser. The purchaser's price is the amount paid by the purchaser, excluding any deductible goods and services tax to take delivery of a unit of a commodity. In the case of goods, the purchaser's price includes any trade margins and transport charges paid by the purchaser. Both basic and producer prices exclude transport charges invoiced separately by the producer.

Table 2-5 (see Appendix) shows the normalised values of forwarding and backward linkages of forth-nine sectors and sub-sector in the Nigerian economy. Here the direct input and output coefficients, as well as weighted directed input and output coefficients, are used. To find backward and forward linkages, first, the input and output coefficients matrices were constructed.

According to the size of the various linkage indicators, all sectors of an economy may be grouped into four categories. If the values of both backward linkage and forward linkage of a sector are all above the corresponding average (that is the normalised values of both backward and forward linkages is greater than 1), the sector is called as "key" sector. If only the backward linkages of a sector are greater than the average (only the normalised value of backward linkages is greater than one), the sector can be termed as a strong backward linkages sector. Similarly, if only the forward linkages of a sector are greater than the average (i.e. only the normalised value of forwarding linkages is greater than one), the sector is called a strong forward linkages sector. The fourth group refers to the weak linkages category. This is the case where a sector's backward linkages and forward linkages are all less than the averages, i.e. the normalised values of backward and forward linkages are smaller than one. Table 2-5 (see Appendix) shows these four groups of sectors according to CW method. To make the table easier to study, the key sectors are shaded.

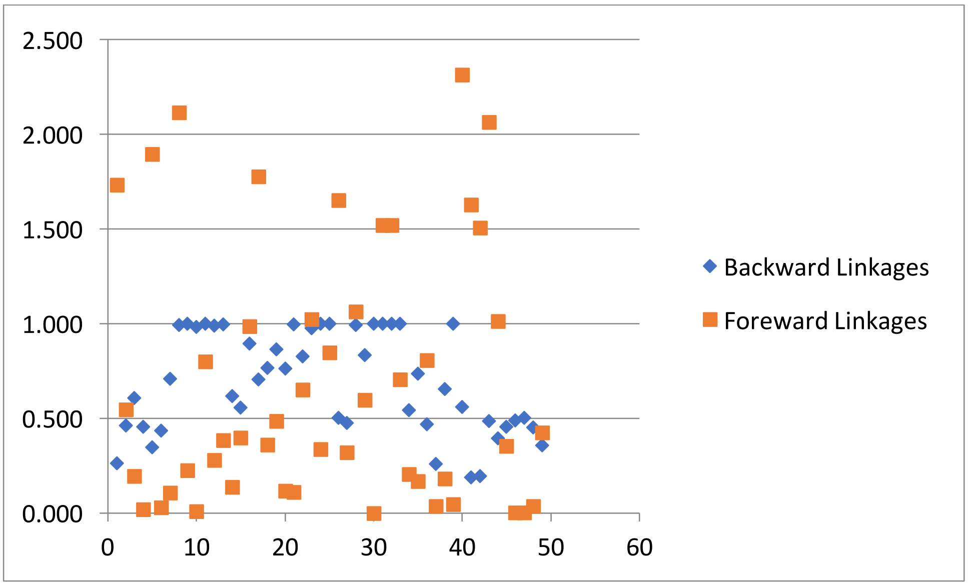
As can be seen in the 2010 data in Nigeria, according to the CW method there were ten key sectors. A sector is defined as akey sector if one of the weighted linkages or unweighted linkages or both of them show the strong backward and forward linkages. These key sectors are: Manufacture of Food Products, Manufacture of Textiles, Manufacture of coke and refined products, manufactures of chemicals and chemical products, manufacture of motor vehicles, trailer and semi-trailers, manufacture of furniture, Water collection, waste collection, remediation & sewage, wholesale trade, retail trade and land transport & transport via pipeline. Crop and animal production, Manufacture of food products and Extraction of crude oil are defined as key sectors by weighted linkages since these sectors contribute significantly to the economy output, and value added. Its shares to demand, and primary inputs account for 20.3%, 11.1% and 18.8%, respectively (see appendix 2). The unweighted linkages define crop and animal production and extraction of crude oil as sectors with strong forward linkages. Also, the diagrams below show that a large majority of industries and sub-sectors in Nigeria have lower forward linkages with the coefficients of forward linkages smaller than 1.

***Figure 2-8.* Coefficients of Backward and Forward Linkages Using C.W Method**



The sectors with strong backward linkages are other mining and quarrying, manufacture of beverages, manufacture of tobacco, manufacture of wearing apparel, manufacture of leather footwear, manufacture of rubber and plastics, manufacture of other non-metallic mineral products, manufacture of basic metals, manufacture of fabricated metals, manufacture of electronics and optical products, manufacture of machinery and equipment, construction, repair of motor vehicles and motorcycles, air transport and publish activities. Table 2-5 (see Appendix) also shows that about eighteen sectors in the data used had strong forward linkages, and the remaining sectors had weak linkages.

Figure 2-9. **Clusters of Industry Linkages in Nigeria**



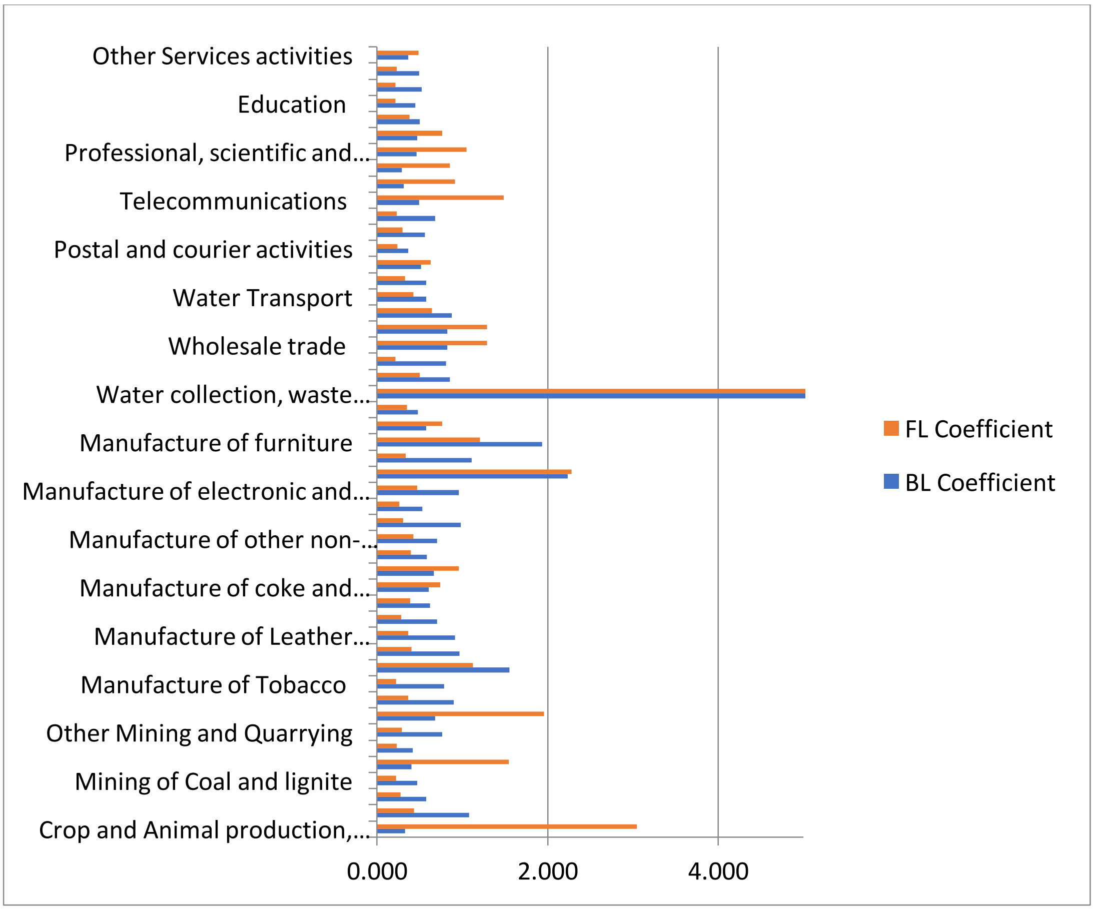
According to the weighted Chenery-Watanabe method, the repair of motor vehicle industry has the highest backward linkages, while the highest under the unweighted linkages is the construction industry (see Appendix 3). The manufacture of food products has second ranking in the weighted backward linkages, while for unweighted linkages it is the wholesale trade industry. The water collection industry and financial services have lowest rankings of the weighted and unweighted backward linkages. Concerning forward linkages, the crop and animal production industry have the highest weighted forward linkages while the telecommunication industry has the highest unweighted forward linkages. It appears that repair of motor vehicle industries both has the lowest forward linkage in both the weighted and unweighted classification.

Table 2-6 (see Appendix) shows the normalised values of backward and forward linkages of industries of Nigeria for 2010 based on the Rasmussen method. The key sectors have been defined in the same way as in the previous section and have been shaded. In comparison with the CW method, there are four key industries for Rasmussen method. However, according to the Rasmussen method, manufacture of food products is no longer a key sector and is defined as a sector with strong forward linkages. This may be the result of insignificance of indirect effects in this sector. The new sectors among key sectors are manufacture of textiles, manufacture of motor vehicles, trailer and semi-trailers, Manufacture of furniture and water collection and waste collection. These sectors appear to be part of the key sectors under the

CW method, and these sectors contribute significantly to the final demand and value added of the economy.

The water and waste collection industries have the strongest backwards and forward linkages concerning the weighted and unweighted classification under the Rasmussen method. The construction and crop production industries have the highest backward and forward linkages under the weighted classification. Moreover, the manufacture of motor vehicle industry has second strongest backward linkages under the unweighted and weighted classification. The least strong backward and forward linkages under the weighted classification are the water collection industry and the mining of metal ores. Some weighted ranking is missing and this is due to lack of data for a comprehensive share in value added.

***Figure 2-10.* Coefficients of Backward and Forward Linkages Using Rasmussen Method**



(Source: Author's calculation based on Constructed I-O Table)

The first ranking in weighted backward and forward linkages have Crop and animal production, hunting and related service activities having similar ranking positions for weighted CW and Rasmussen method. This shows the significance of this industry to the Nigerian economy (see appendix 2). As for backward linkages, there are also some differences in ranking positions of some sectors. For example, water collection, waste collection and sewage industry are ranked as the strongest with unweighted backward linkages whereas weighted backward linkages show that construction industry is the strongest regarding backward linkages among the forty-nine sectors. This picture is by the rankings given to these industries by weighted and unweighted Rasmussen backward linkages.

2.3.3 Summary

This work has investigated the production structure and inter-sectoral linkages of the Nigerian economy based on 2010 data. This analysis was undertaken at the relatively disaggregated level of industries for which data were available. These are forty-nine production sectors and sub-sector. This work is an attempt to empirically identify key sectors and industry linkages. Type I and type II output multiplier and indices of backward and forward linkages based on Chenery-Watanabe and the Rasmussen Methods were calculated. Backward and forward linkages show how much each industry buys and sells to other industries, directly and indirectly, caused by the unit increase in final demand and primary inputs. So, for the development strategy, it is essential to determine which industries possess high backward and forward linkages, Then stimulating final demand or primary inputs namely of these industries could positively influence the economic activity of the country.

To find out key sectors of the Nigerian economy, the results of CW and Rasmussen methods are presented together in table 2-7. Then it is taken into account that a key sector is a sector which is placed into this group by at least one method used. In this way, it hasbeen discovered that in 2010 in the Nigerian economy there were thirteen sectors that belonged to the category of key sectors. These are crop and animal production, manufacture of food products, manufacture of textiles, manufacture of refined petroleum products, manufacture of chemicals, manufacture of motor vehicles, manufacture of furniture, manufacture of machinery and equipment, wholesale trade, retail trade, land transport and telecommunication. Investment in these sectors would initiate economic development due to their inter-relations with other industries.

All sectors are classified using the international standard for industry classification (ISIC), and their numbers are also provided for verification. The present work may be used by policymakersto determine which sectors of the economy to stimulate (for example, using creating extra final demand, decreasing taxes, or with the help of subsiding) to gain better results in the sphere of economic development of Nigeria. However, it must be mentioned that the analysis is based on the assumption of fixed input and output coefficients, i.e. that they remained unchanged since 2010.

2.4 Overview of FDI in Nigeria

2.4.1 Pre-colonial era

Nigeria's economic relationship with the global economy existed before the creation of the country in 1914. The two main regions, the northern savannas and the southern forest regions, had trade relationships with countries within Africa and beyond. A notable and well established international trade activity was the Trans-Saharan trade of the northern region of the country. This involved trade between the northern region and the North African countries, Europe, and the Middle East. In the southern regions, trade was concentrated on the coastal regions. The geographical proximity to the Atlantic Ocean facilitated trade with different countries in the southern region. The ports of the Bights of Benin and Biafra hosted the major trade transactions of the southern region. European countries led by Britain, France and Germany were the major trading partners with Nigeria.

Within Nigeria, the two major navigable rivers: rivers Niger and Benue were the channels in which items of trade were navigated out of the region. The major items of trade in both the northern and southern regions were salt, leather goods, weapons, textiles, and slaves. These were traded by barter for items such as beads, iron, copper, and cowries. Between the sixteenth and nineteenth century, the slave trade was the most important economic activity in the region (Falola & Heaton, 2008). Indigenous leaders were deeply involved in the slave trade as a major source of revenue for their interests such as reinforcing their empire with military weapons against their opponents. Thus, slave trade was promoted by the traditional leaders and middlemen in both the centralised communities in the northern region and the southwest regions and the decentralised regions of the southeast region. This lucrative trade continued till about 1850 despite its abolition by the British in 1807.

With the decline of the slave trade in the 1850s, attention was shifted towards "legitimate commerce" which was dominated by the trade in palm products. Initially, the European firms which engaged in trade with Nigeria conducted trade from the bights of the southern region. These firms did not operate beyond the coastal regions due to fear of contracting malaria and unfamiliarity of the geographic structure of the interior of Nigeria among other reasons. As a result, they relied on intermediaries in the Delta and Calabar regions of southern Nigeria for trade negotiations. These indigenous middlemen became unreliable to their trading partners especially the British firms who gave them credit facilities on which they constantly defaulted. As a result of this unfavourable dependence on the middlemen, the British firms sought ways of bypassing these middlemen to operate directly in the interior parts of Nigeria. Expeditions made by Dr William Balfour Baikie in 1854 on the river Niger led to the demystification of the complexities attributed to the region (Falola & Heaton, 2008). Baike also made use of the quinine drug as a preventive measure against malaria infection. His success in the interior of the region inspired Macgregor Laird to establish the first steamer business in the Niger in 1857 (Falola & Heaton, 2008). Although the business folded up after some time due to competition from within and outside the region, its existence proved that foreign firms could survive in the interiors of the region and therefore bypass the useless coastal middlemen. As a result of this revelation, different firms originating from Britain, France and Germany began expanding their operations towards the interior of the region, especially along the major rivers. The expansion of French and Germans firms towards rivers Niger and Benue posed a threat to the British interests in the region. To counter the feared competition, the British granted a royal charter to a British firm, the Royal Niger Company in 1893. The charter gave the company, which was owned by George Goldie, control of the trade policies in the Niger. The Royal Niger Company consolidated with both British and French firms to become the largest firm in the Niger. This dominance led to the crowding out of both foreign and indigenous firms in the region.

This account of foreign operations in the pre-colonial era reveals the plausible reasons for investing in Nigeria. This sub-section has shown that amongst other attractions to the region, the primary pull factors were the availability of agricultural and human resources. The main agricultural resource was palm oil and the basic human resource was in the availability of slaves due to the large population of the region. Trade in these items was enhanced by the geographical proximity of the region to the Atlantic Ocean. The two navigable rivers within the interior of Nigeria, rivers Niger and Benue also became an attraction due to their links to other countries in the continent. These attractions lead to the scramble for establishing lasting interests in the area by European firms. British firms succeeded in dominating the commercial activities in the region, curbing competition from French, German and local firms. Thus, Nigeria has been an important destination for FDI. Its strategic location at the coast of the Atlantic and its abundant human resources are the most likely pull factors.

2.4.2 Colonial Era

Amongst the reasons for the colonisation of Nigeria by the British government, the trading interest of the British is of particular interest to this study. To secure their economic interests in the region, British firms called upon their government to take control of the Nigerian territory as a means of regulating the growing competition experienced in the region. The main threats to the British firms were the increased entrance of firms from other European countries such as France and Germany and the monopolistic practices of the indigenous middlemen in the coastal regions of the Nigeria territory (Falola & Heaton, 2008). Thus the perception at that time was that a take over of the territory by the British would ensure that the economic interests of the British firms were duly protected (Aremu, 2003). Colonization of Nigeria had started since 1861, but the amalgamation of the Nigerian territories only occurred in 1914, under the leadership of Frederick Lugard (Falola & Heaton, 2008).

In general, the main activity undertaken by the colonial administration was the exploitation/extraction of Nigeria's agricultural, mineral and human resources. According to the Dual Mandate established by the colonial administration, the activities of the colonial government would satisfy the interest of both the British and Nigerians. The British administration aimed at expanding trade by boosting the exportation of raw materials such as cocoa, oil palm, groundnuts, coal, tin and columbite and the importation of finished goods (Adeoti, 2002). Also, to enhance the trading activities within the region, the colonial government implemented rapid infrastructural development within Nigeria. Of particular significance in that period, was the development of transportation infrastructure to aid trade within and outside the territory.

The firms that conducted businesses in Nigeria were not all British, as French, Dutch and German firms were also operating in the region. The activities of the foreign firms constituted a large majority of the external trade on Nigeria, and enormous profits were made by these firms. At that time, the economy of Nigeria was largely controlled by international demand for the products of Nigerian farmers and traders (Adeoti, 2002). The administration promoted the production for exportation of cash crops such as groundnuts from the northern region of Nigeria; cocoa from the southwestern region; and palm oil from the southeastern and delta regions. The profits made by these firms were repatriated to their respective countries while the Nigerian workforce used to accomplish their aims received marginal wages. Thus an assessment of the impact of the activities of the foreign firms on the indigenous citizens could be ambiguous, as their operations employed the indigenes in both the upstream and downstream sectors, on the one hand, but led to crowding out of local firms and exploitation through poor wages, on the other hand. In general, before the Second World War, the activities of the foreign firms which, according to the Dual Mandate, would be of benefit to the indigenous population, had no significant positive effect on them before.

A major change in the policies of the colonial government occurred after the Second World War. As a result of the emergence of an indigenous elite class, the colonial administration was pressured towards engaging in nationalistic policies. Thus the British controlled government undertook developmental projects that were more beneficial to the indigenous citizens. The pressure laid on them also resulted in the shift from extractive activities which characterised the operations of the foreign firms to manufacturing activities. As the call for nationalisation mounted, the colonial administration enacted laws to ensure that the interest of the British owned firms was protected. The pioneer manufacturing British manufacturing firms were given preferential treatment through legal amendments. Aremu (2003) and Ogbuagu (1983) outlines the policies that were put in place prior to independence as Aid to Pioneer Industries Ordinance of 1952; Income Tax Ordinance of 1952; Industrial Development (Import Duties Relief) Acts of 1957; Industrial Development (Income Tax Relief) Act of 1958; Custom Duties (Dumped and Subsidized) Acts of 1958; Customs Drawback Regulations of 1959 and the Income Tax Act of 1959. These amendments and laws were all geared towards ensuring that the British firms remained dominant in the region after independence.

2.4.3 Post-Independence Era

The end of the colonial rule occurred on the 1st of October 1960 when Nigeria gained independence from the British government. The policies that were put in place to favour the foreign pioneer firms were still in effect for two years after independence. However, in 1962, the liberal policies towards the activities of foreign firms began to shrink. The Exchange rate Control Act of 1962 demanded the permission of the Nigerian Minister of Finance for payments outside the country. Another drift from the liberal policies towards foreigners was the campaign that Nigerians must occupy key positions in the ownership and control of the factors of production (Aremu, 2003). Three regional indigenous universities were established, with significant R&D institutes to enhance the capability of Nigerians in scientific and industrial research and technology (Adeoti, 2002). Thus, although foreign investment was promoted, indigenous participation was gradually enforced. A further departure from the liberal policies came in the form of bureaucratic obstacles imposed on potential foreign firms wishing to invest in Nigeria. The Immigration Act of 1963 demands that foreign firms wishing to operate in Nigeria must be granted a 'Business Permit' and an 'Approval Status' before being allowed to operate in the territory. The general perception in this period was the lack of trust on the activities of the foreign firms by the indigenous ruling class. Thus, a gradual departure from the liberal policies was experienced in the mid-1960s

2.4.4 Indigenisation Era

The Indigenisation Era is a crucial period in studies on FDI in Nigeria. The lack of growth in the absolute values of FDI in Nigeria during the 1970s could be attributed to the effects of the indigenisation policies. However, it should be noted that era which involved "Nigerianisation" of the economy started in the colonial era. After the Second World War, the growing pressure from the indigenous elite led to the consideration of placing Nigerians at the helm of affairs during the colonial era. The first of such attempt towards "Nigerianisation" was the establishment of a Marketing Board System which gave the Nigerian government control over the marketing of Nigeria's export crops (Ogbuagu, 1983). This followed the mild restrictive measures adopted post-1962, which has been mentioned in the previous section. In 1966, the country witnessed two military coups which led to the installation of Gen John Aguyi-Ironsi in January; and later the instalment of General Yakubu Gowon in July of the same year, after the assassination of the former. Under General Gowon's rule, preludes to the indigenisation policy included Companies Act of 1968; Banking Act of 1969; Petroleum Act of 1969; and Patents and Design Act of 1970. These were basically measures to ensure greater indigenous participation in the different aspects of the economy.

The actual indigenisation decree was declared in 1971 under Gowon's administration. The basic aims of the decree were threefold: The first was to increase the opportunities of Nigerian businessmen; the second was to promote the retention of profits into the economy; and the third was to promote foreign investment in specific sectors such as intermediate and capital goods production sectors (Ogbuagu, 1983). The indigenisation era came in three statutes: Nigeria Enterprise Promotion Act of 1972; The Nigerian Enterprise Promotion Act of 1977; and The Nigerian Enterprise Promotion Act of 1987. Enterprises in Nigeria were classified into three schedules: Schedule I, Schedule II and Schedule III.

Schedule I enterprises consisted of companies in which the ownerships were reserved exclusively for Nigerians. Foreigners were therefore not allowed to participate in the ownership or control of the listed enterprises. These enterprises include selected companies in the following categories: small-scale industries, medium scale industries, processing industries, services sector, transportation industry, entertainment, media, and retail trade (Ogbuagu, 1983).

Schedule II requires foreigners to invest a maximum of 40% of the equity in the listed enterprises. These enterprises included some large-scale import substitution industries, processing industries, food industries, commercial activities, transportation, construction industries, etc. (Ogbuagu, 1983).

The promulgation of the Nigerian Enterprise Promotion Act of 1977 led to a revision of Schedule I and Schedule II, and the addition of an entirely new schedule, Schedule III. The reviews of the first two schedules were merely the removal of a few enterprises listed previous Act. However, Schedule III involved the extension of the limit of foreign participation to 60%, especially in sectors with high technological requirements (Aremu, 2003).

The indigenisation era marked the most restrictive measures towards foreign direct investment in Nigeria's history. It is, therefore, not surprising that volume of FDI inflows in Nigeria was somewhat stagnant during this era. However, this poses some interesting questions regarding the lack of distrust on the activities of foreign firms in the region. Did Nigerians experience strong crowding out effects or negative spillovers before the indigenisation era? Alternatively, wasindigenisation motivated by mere political sentiment? A notable number of studies and commentaries have attributed the motivation of indigenisation policies to the lack cooperation of the foreign firms with the Nigerian government in difficult situations such as the civil war which lasted between 1967 and 1970 (Collins, 1977; Ogbuagu, 1983; Onoge, 1974).

2.4.5 Investment promotion Era

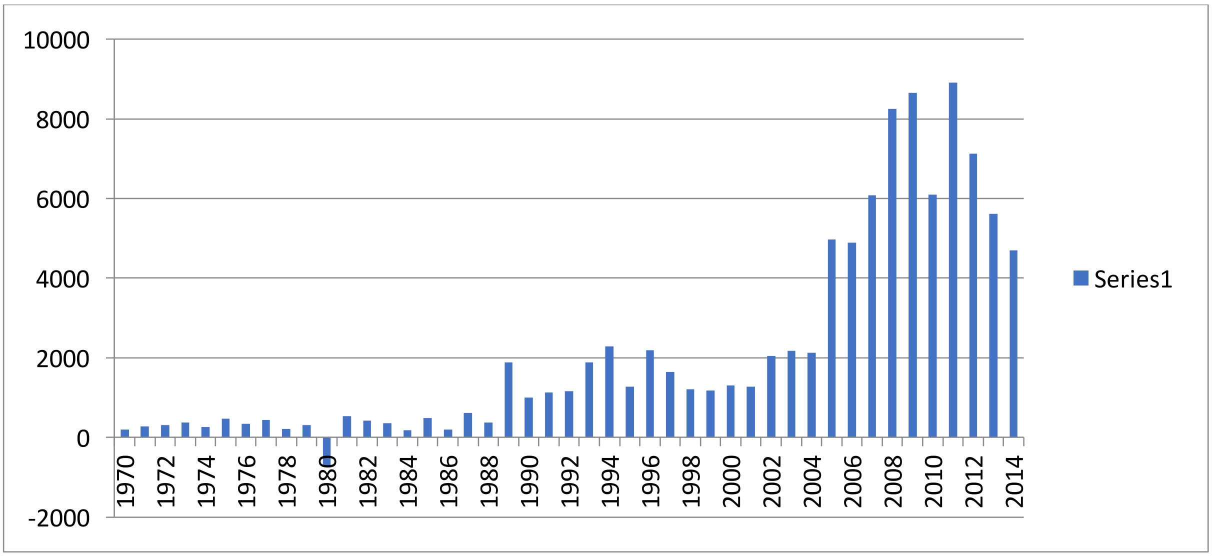
The indigenisation era was followed by another period of restrictive measures. Under the leadership of General Olusegun Obasanjo, the National Office of Industrial Property Act of 1979 was enacted. The major aim of this act was to scrutinise imported technology coming into Nigeria. The idea was to narrow the domestic technological gap by channelling imported technology to specific priority areas (Aremu, 2003). Thus, the act required that foreign firms would be scrutinised at the entry stage to ensure that they conformed to the objectives of the act.

In the wake of global calls for more FDI promotion in the 1980s, the Nigerian government sought measures to soft-peddle the restrictive measures imposed during the 1970s. This led to the promulgation of the Nigerian Enterprise Promotion Act of 1987. The basic addition made to the 1977 act was that under the 1987 act, foreign firms were given the opportunity to increase their percentage holdings in any enterprise without increasing their voting power (Aremu, 2003).

The most recent promotional acts that confirmed the "open" status of the country were the creation of the Nigerian Investment Promotion Commission (NIPC) and the Foreign Exchange Monitoring and Miscellaneous Provision (FEMAMP) in 1995. In particular, the establishment of NIPC marked the transition of Nigeria to a country completely open to FDI. The agency is, therefore, a member of the World Association of Investment Promotion Agencies. The main objectives of NIPC are to coordinate and monitor all investments in the country. The various departments of NIPC engage in diverse activities such as the provision of a one-stop investment centre, investment promotion, investor relations, policy implementation and external relationsamong others.

The government of Nigeria has over time, developed other schemes that indirectly affected FDI in the country. One of such schemes was the Export Processing Free Zones Scheme (EPFZS). The scheme provided incentives to businesses which engaged in the exportation of goods and services. Demarcated zones called Export Processing Zones (EPZs) were set up, and the management of these zones was delegated to the Nigerian Export Processing Zones Authority (NEPZA). Other notable efforts to promote FDI in Nigeria included granting of Pioneer Status which gave a tax holiday to qualified firms and legal provisions that enabled repatriation of profits (UNCTAD, 2008).

*Figure 2-11.***Inward Flow of FDI in USD (Billions)**

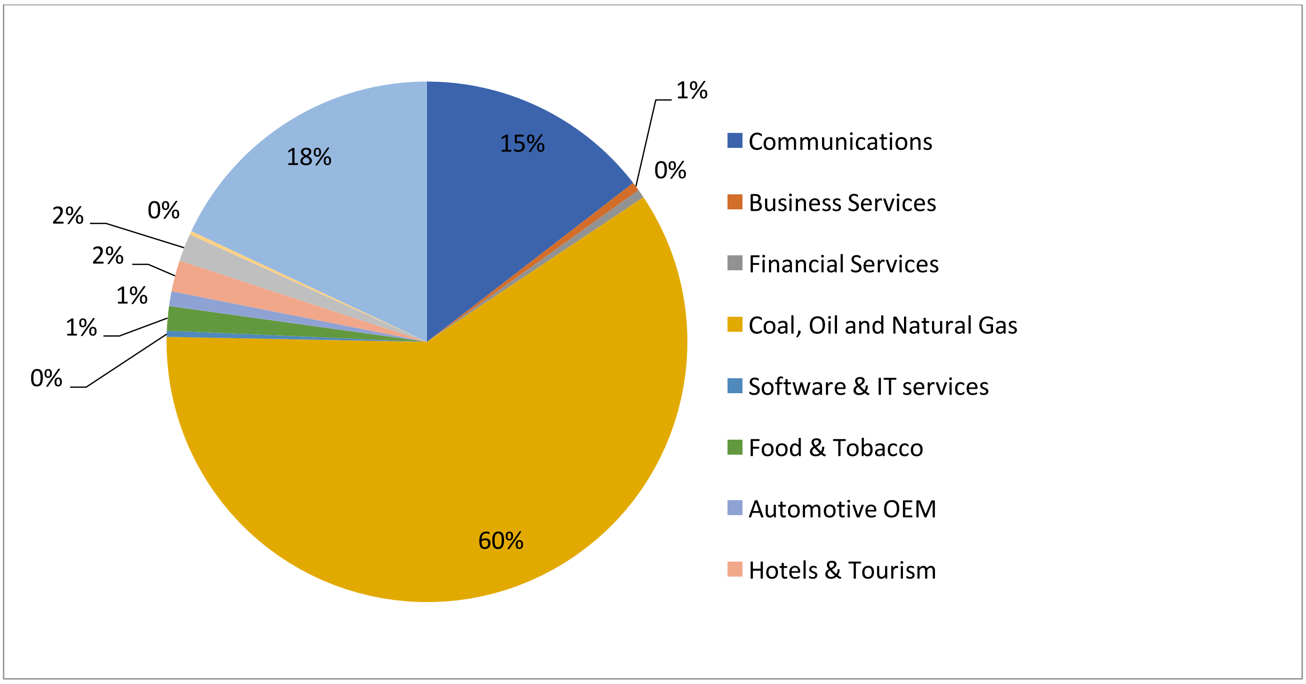


(Source: fDi Intelligence report 2016)

As a result, a large inflow of FDI has come to Nigeria seeking benefits from these incentives. Figure 3-1 above shows the change in FDI from the UNCTAD database. The data show a sharp increase from 2000 to 2009 as those where the years that the majorprivatisations took place. However, the flow of FDI started as far back as 1970 but did not pick up until 1989 due to political instability. In the last three years, FDI has begun to decline, and this is mainly due to fall in commodity prices.

From 2003 to 2015, the oil industry contributed more foreign investment in capital into the country in that, it contributed about 60% of the total investment for the period. The diagram below classified sectors based on capital investment received between 2003 and 2015. The communication industry also contributed about 15% of capital investment for the period.

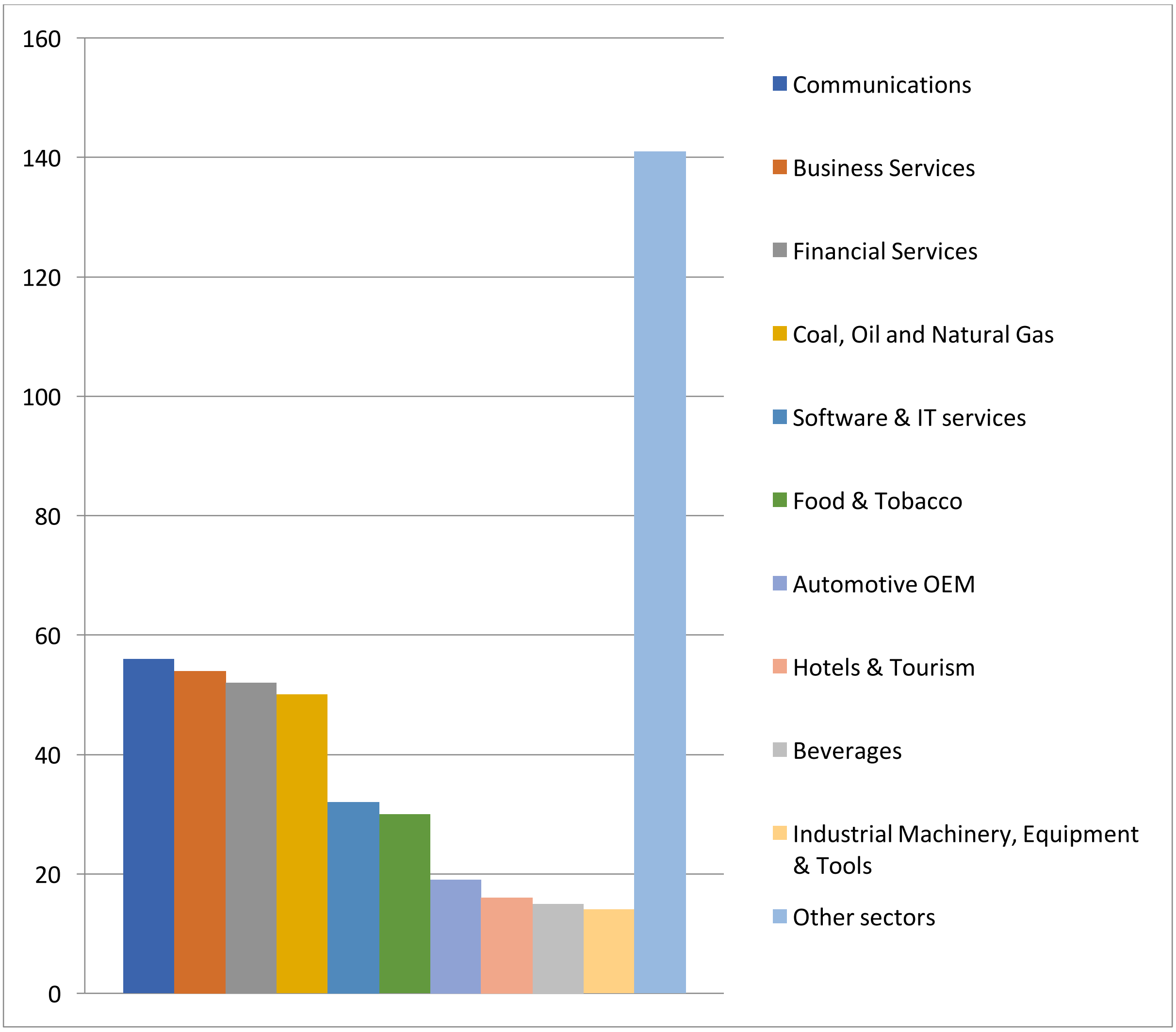
Figure 2-12. **Percentage Share of Capital Investment by Sectors 2003-2015**



(Source: fDi Intelligence report 2016)

The communication sector took more projects than any other singular sector from 2003 to 2015 as this was the era of technology innovation and also the era of internet breakthrough. The software and IT service sector attracted quite a different amount of FDI projects for the period in question. The diagram below shows how different sectors and sub-sector received foreign investment.

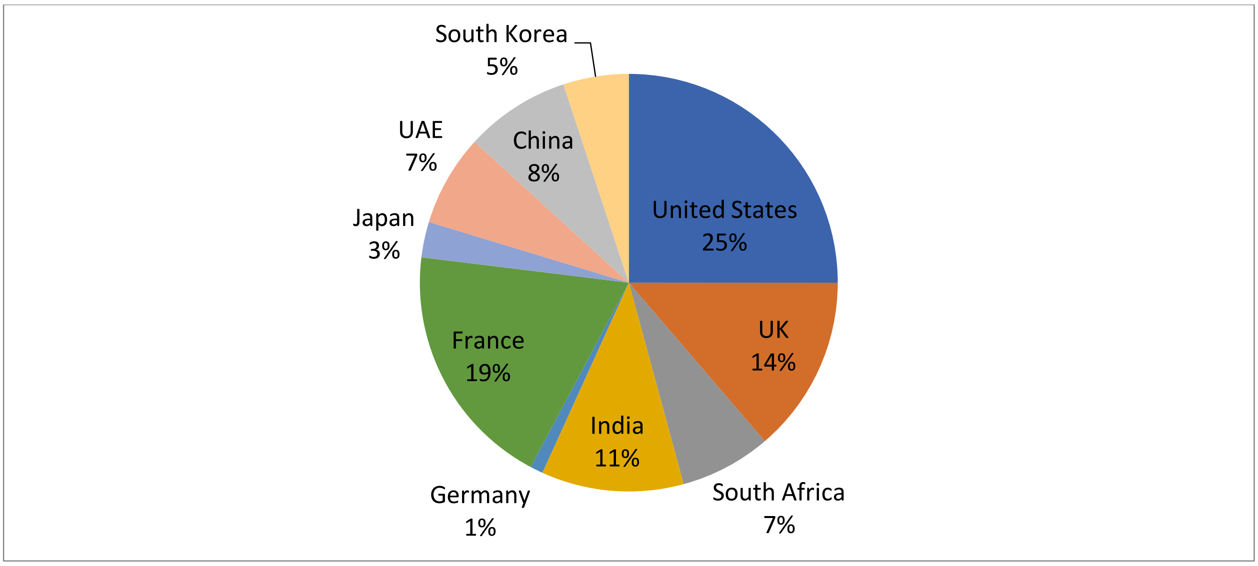
Figure 2-13. **Number of FDI Project by Sectors 2003-2015**



(Source: fDi Intelligence report 2016)

The top investor in Nigeria as of 2015 was the United States, followed by France and the United Kingdom. The diagram below shows the pie chart of FDI by country of origin. The combination of South-Korea, China, UAE, Japan and India is around 34% exceeding that of the EU and makes it the third largest investor in Nigeria after North America and the EU.

***Figure 2-14.*FDI by Country of Origin in Percentage**



(Source: fDi Intelligence report 2016)

Appendix

Table 2-5 **Backward and Forward Linkages Using the Chenery-Watanabe Method**

ISIC	Activities	Backward Linkages	BL Coefficient	Category	Forward Linkages	FL Coefficient	Category
01	Crop and Animal production, hunting and related service activities	0.261	0.379	**wB**	1.732	2.516	**sF**
02	Forestry and logging	0.463	0.672	**wB**	0.546	0.794	**wF**
03	Fish and aquaculture	0.608	0.883	**wB**	0.193	0.281	**wF**
05	Mining of Coal and lignite	0.456	0.662	**wB**	0.018	0.026	**wF**
06	Extraction of crude petroleum and natural gas	0.348	0.506	**wB**	1.896	2.754	**sF**
07	Mining of metal ores	0.436	0.634	**wB**	0.028	0.041	**wF**
08	Other Mining and Quarrying	0.708	1.028	**sB**	0.108	0.156	**wF**
10	Manufacture of Food Products	0.991	1.440	**sB**	2.114	3.071	**sF**
11	Manufacture of Beverages	0.999	1.451	**sB**	0.226	0.329	**wF**
12	Manufacture of Tobacco	0.982	1.426	**sB**	0.009	0.013	**wF**
13	Manufacture of Textiles	1.000	1.452	**sB**	0.801	1.163	**sF**
14	Manufacture of Wearing apparel	0.988	1.435	**sB**	0.280	0.406	**wF**
15	Manufacture of Leather Footwear	0.997	1.449	**sB**	0.384	0.558	**wF**
16	Manufacture of wood and wood products	0.617	0.896	**wB**	0.136	0.198	**wF**
17	Manufacture of paper and paper products	0.555	0.807	**wB**	0.396	0.576	**wF**
19	Manufacture of coke and refined petroleum products	0.893	1.297	**sB**	0.986	1.432	**sF**
20+21	Manufacture of chemicals and chemical products and pharmaceutical preparations	0.704	1.023	**sB**	1.779	2.584	**sF**
22	Manufacture of rubber and plastics products	0.766	1.112	**sB**	0.361	0.525	**wF**

23	Manufacture of other non-metallic mineral products including Cement	0.865	1.256	**sB**	0.486	0.706	**wF**
24	Manufacture of basic metals	0.763	1.109	**sB**	0.118	0.171	**wF**
25	Manufacture of fabricated metal products	0.998	1.449	**sB**	0.109	0.158	**wF**
26+27	Manufacture of electronic and optical products and electrical equipment	0.826	1.200	**sB**	0.652	0.948	**wF**
29	Manufacture of motor vehicles, trailers and semi-trailers	0.975	1.416	**sB**	1.022	1.484	**sF**
28+30	Manufacture of machinery and equipment	0.998	1.450	**sB**	0.338	0.492	**wF**
31	Manufacture of furniture	1.000	1.452	**sB**	0.847	1.231	**sF**
32	Other Manufacturing	0.501	0.728	**wB**	1.652	2.401	**sF**
35	Electricity, gas, steam and air conditioning supply	0.477	0.692	**wB**	0.320	0.465	**wF**
36-39	Water collection, waste collection, Remediation, and Sewage	0.991	1.440	**sB**	1.063	1.545	**sF**
41-43	Construction	0.833	1.210	**sB**	0.596	0.866	**wF**
45	Repair of motor vehicles and motorcycles	1.000	1.453	**sB**	0.000	0.000	**wF**
46	Wholesale trade	1.000	1.453	**sB**	1.521	2.210	**sF**
47	Retail trade	1.000	1.453	**sB**	1.521	2.210	**sF**
49	Land transport and transport via pipelines	1.000	1.453	**sB**	0.705	1.024	**sF**
50	Water Transport	0.542	0.787	**wB**	0.206	0.300	**wF**
51	Air Transport	0.734	1.066	**sB**	0.168	0.243	**wF**
52	Warehousing and support activities for transportation	0.470	0.683	**wB**	0.807	1.172	**sF**
53	Postal and courier activities	0.258	0.375	**wB**	0.036	0.052	**wF**
55+56	Accommodation and Food and beverage service activities	0.653	0.949	**wB**	0.181	0.263	**wF**
58+59+60	Publishing activities, Motion picture, video and television programme production, sound recording and broadcasting activities	0.999	1.451	**sB**	0.046	0.067	**wF**

61	Telecommunications	0.561	0.815	**wB**	2.315	3.362	**sF**
64+65	Financial services, insurance and pension funding	0.188	0.273	**wB**	1.629	2.367	**sF**
68	Real estate activities	0.194	0.281	**wB**	1.507	2.189	**sF**
69-75	Professional, scientific and technical activities	0.484	0.703	**wB**	2.064	2.999	**sF**
77	Administrative and support service activities	0.395	0.575	**wB**	1.013	1.471	**sF**
84	Public administration	0.456	0.662	**wB**	0.354	0.514	**wF**
85	Education	0.489	0.710	**wB**	0.002	0.004	**wF**
86-88	Human health and social work activities	0.502	0.730	**wB**	0.002	0.003	**wF**
90-93	Creative, arts and entertainment activities	0.451	0.655	**wB**	0.035	0.051	**wF**
94-99	Other Services activities	0.356	0.518	**wB**	0.423	0.615	**wF**

wB- Weak Backward, wF- Weak Forward, sF- Strong Forward, sB- Strong Backward

Table 2-6 **Backward and Forward Linkages Using Rasmussen Method**

ISIC	Activities	Backward Linkages	BL Coefficient	Category	Forward Linkages	FL Coefficient	Category
01	Crop and Animal production, hunting and related service activities	1.52	0.328	**wB**	14.09	3.041	**sF**
02	Forestry and logging	5.01	1.081	**sB**	2.00	0.433	**wF**
03	Fish and aquaculture	2.65	0.572	**wB**	1.28	0.276	**wF**
05	Mining of Coal and lignite	2.18	0.470	**wB**	1.03	0.221	**wF**
06	Extraction of crude petroleum and natural gas	1.86	0.402	**wB**	7.14	1.541	**sF**
07	Mining of metal ores	1.95	0.420	**wB**	1.05	0.226	**wF**
08	Other Mining and Quarrying	3.53	0.762	**wB**	1.35	0.292	**wF**
10	Manufacture of Food Products	3.16	0.683	**wB**	9.08	1.959	**sF**
11	Manufacture of Beverages	4.16	0.898	**wB**	1.70	0.367	**wF**
12	Manufacture of Tobacco	3.63	0.782	**wB**	1.04	0.224	**wF**
13	Manufacture of Textiles	7.17	1.548	**sB**	5.20	1.121	**sF**
14	Manufacture of Wearing apparel	4.47	0.964	**wB**	1.88	0.405	**wF**
15	Manufacture of Leather Footwear	4.24	0.915	**wB**	1.70	0.367	**wF**
16	Manufacture of wood and wood products	3.24	0.700	**wB**	1.29	0.279	**wF**
17	Manufacture of paper and paper products	2.89	0.623	**wB**	1.80	0.388	**wF**
19	Manufacture of coke and refined petroleum products	2.82	0.607	**wB**	3.43	0.740	**wF**
20+21	Manufacture of chemicals and chemical products and pharmaceutical preparations	3.09	0.667	**wB**	4.43	0.956	**wF**
22	Manufacture of rubber and plastics products	2.70	0.583	**wB**	1.81	0.392	**wF**
23	Manufacture of other non-metallic mineral products including Cement	3.24	0.699	**wB**	1.96	0.423	**wF**
24	Manufacture of basic metals	4.53	0.979	**wB**	1.39	0.301	**wF**

25	Manufacture of fabricated metal products	2.44	0.527	**wB**	1.19	0.256	**wF**
26+27	Manufacture of electronic and optical products and electrical equipment	4.44	0.958	**wB**	2.18	0.470	**wF**
29	Manufacture of motor vehicles, trailers and semi-trailers	10.34	2.230	**sB**	10.57	2.280	**sF**
28+30	Manufacture of machinery and equipment	5.12	1.104	**sB**	1.56	0.337	**wF**
31	Manufacture of furniture	8.95	1.932	**sB**	5.60	1.209	**sF**
32	Other Manufacturing	2.66	0.575	**wB**	3.53	0.762	**wF**
35	Electricity, gas, steam and air conditioning supply	2.23	0.481	**wB**	1.64	0.353	**wF**
36-39	Water collection, waste collection, Remediation, and Sewage	68.16	14.708	**sB**	77.61	16.749	**sF**
41-43	Construction	3.95	0.852	**wB**	2.30	0.497	**wF**
45	Repair of motor vehicles and motorcycles	3.75	0.809	**wB**	1.00	0.216	**wF**
46	Wholesale trade	3.80	0.820	**wB**	5.96	1.285	**sF**
47	Retail trade	3.80	0.820	**wB**	5.96	1.285	**sF**
49	Land transport and transport via pipelines	4.07	0.878	**wB**	2.96	0.639	**wF**
50	Water Transport	2.66	0.574	**wB**	1.98	0.427	**wF**
51	Air Transport	2.66	0.573	**wB**	1.51	0.327	**wF**
52	Warehousing and support activities for transportation	2.40	0.518	**wB**	2.89	0.624	**wF**
53	Postal and courier activities	1.69	0.365	**wB**	1.08	0.233	**wF**
55+56	Accommodation and Food and beverage service activities	2.60	0.561	**wB**	1.36	0.293	**wF**
58+59+60	Publishing activities, Motion picture, video and television programme production, sound recording and broadcasting activities	3.14	0.678	**wB**	1.07	0.232	**wF**
61	Telecommunications	2.30	0.495	**wB**	6.88	1.484	**sF**
64+65	Financial services, insurance and pension funding	1.44	0.311	**wB**	4.22	0.910	**wF**

68	Real estate activities	1.35	0.292	**wB**	3.94	0.851	**wF**
69-75	Professional, scientific and technical activities	2.14	0.463	**wB**	4.85	1.046	**wF**
77	Administrative and support service activities	2.17	0.469	**wB**	3.52	0.759	**wF**
84	Public administration	2.32	0.501	**wB**	1.75	0.377	**wF**
85	Education	2.07	0.446	**wB**	1.00	0.216	**wF**
86-88	Human health and social work activities	2.43	0.525	**wB**	1.00	0.216	**wF**
90-93	Creative, arts and entertainment activities	2.26	0.488	**wB**	1.06	0.229	**wF**
94-99	Other Services activities	1.68	0.363	**wB**	2.24	0.484	**wF**

wB- Weak Backward, wF- Weak Forward, sF- Strong Forward, sB- Strong Backward

Table 2-7 **Key sectors (K), Sectors with Strong Forward Linkages (sF), Sectors with Strong Backward Linkages (sB), Sector with Weak Linkages (W)**

		CW		**Rasmussen**		
ISIC	**Activities**	**BL**	**FL**	**BL**	**FL**	**Results**
01	Crop and Animal production, hunting and related service activities	**wB**	**sF**	**wB**	**sF**	**K**
02	Forestry and logging	**wB**	**wF**	**sB**	**wF**	**sB**
03	Fish and aquaculture	**wB**	**wF**	**wB**	**wF**	**W**
05	Mining of Coal and lignite	**wB**	**wF**	**wB**	**wF**	**W**
06	Extraction of crude petroleum and natural gas	**wB**	**sF**	**wB**	**sF**	**sF**
07	Mining of metal ores	**wB**	**wF**	**wB**	**wF**	**W**
08	Other Mining and Quarrying	**sB**	**wF**	**wB**	**wF**	**sB**
10	Manufacture of Food Products	**sB**	**sF**	**wB**	**sF**	**K**
11	Manufacture of Beverages	**sB**	**wF**	**wB**	**wF**	**sB**
12	Manufacture of Tobacco	**sB**	**wF**	**wB**	**wF**	**sB**
13	Manufacture of Textiles	**sB**	**sF**	**sB**	**sF**	**K**
14	Manufacture of Wearing apparel	**sB**	**wF**	**wB**	**wF**	**sB**
15	Manufacture of Leather Footwear	**sB**	**wF**	**wB**	**wF**	**sB**
16	Manufacture of wood and wood products	**wB**	**wF**	**wB**	**wF**	**W**
17	Manufacture of paper and paper products	**wB**	**wF**	**wB**	**wF**	**W**
19	Manufacture of coke and refined petroleum products	**sB**	**sF**	**wB**	**wF**	**K**
20+21	Manufacture of chemicals and chemical products and pharmaceutical preparations	**sB**	**sF**	**wB**	**wF**	**K**
22	Manufacture of rubber and plastics products	**sB**	**wF**	**wB**	**wF**	**sB**
23	Manufacture of other non-metallic mineral products including Cement	**sB**	**wF**	**wB**	**wF**	**sB**

24	Manufacture of basic metals	**sB**	**wF**	**wB**	**wF**	**sB**
25	Manufacture of fabricated metal products	**sB**	**wF**	**wB**	**wF**	**sB**
26+27	Manufacture of electronic and optical products and electrical equipment	**sB**	**wF**	**wB**	**wF**	**sB**
29	Manufacture of motor vehicles, trailers and semi-trailers	**sB**	**sF**	**sB**	**sF**	**K**
28+30	Manufacture of machinery and equipment	**sB**	**wF**	**sB**	**wF**	**K**
31	Manufacture of furniture	**sB**	**sF**	**sB**	**sF**	**K**
32	Other Manufacturing	**wB**	**sF**	**wB**	**wF**	**sF**
35	Electricity, gas, steam and air conditioning supply	**wB**	**wF**	**wB**	**wF**	**W**
36-39	Water collection, waste collection, Remediation, and Sewage	**sB**	**sF**	**sB**	**sF**	**K**
41-43	Construction	**sB**	**wF**	**wB**	**wF**	**sB**
45	Repair of motor vehicles and motorcycles	**sB**	**wF**	**wB**	**wF**	**sB**
46	Wholesale trade	**sB**	**sF**	**wB**	**sF**	**K**
47	Retail trade	**sB**	**sF**	**wB**	**sF**	**K**
49	Land transport and transport via pipelines	**sB**	**sF**	**wB**	**wF**	**K**
50	Water Transport	**wB**	**wF**	**wB**	**wF**	**W**
51	Air Transport	**sB**	**wF**	**wB**	**wF**	**sB**
52	Warehousing and support activities for transportation	**wB**	**sF**	**wB**	**wF**	**sF**
53	Postal and courier activities	**wB**	**wF**	**wB**	**wF**	**W**
55+56	Accommodation and Food and beverage service activities	**wB**	**wF**	**wB**	**wF**	**W**
58+59+60	Publishing activities, Motion picture, video and television programme production, sound recording and broadcasting activities	**sB**	**wF**	**wB**	**wF**	**sB**
61	Telecommunications	**wB**	**sF**	**wB**	**sF**	**K**

64+65	Financial services, insurance and pension funding	**wB**	**sF**	**wB**	**wF**	**sF**
68	Real estate activities	**wB**	**sF**	**wB**	**wF**	**sF**
69-75	Professional, scientific and technical activities	**wB**	**sF**	**wB**	**wF**	**sF**
77	Administrative and support service activities	**wB**	**sF**	**wB**	**wF**	**sF**
84	Public administration	**wB**	**wF**	**wB**	**wF**	**W**
85	Education	**wB**	**wF**	**wB**	**wF**	**W**
86-88	Human health and social work activities	**wB**	**wF**	**wB**	**wF**	**W**
90-93	Creative, arts and entertainment activities	**wB**	**wF**	**wB**	**wF**	**W**
94-99	Other Services activities	**wB**	**wF**	**wB**	**wF**	**W**

Appendix 1 Inter-Industry Transaction Table of Nigeria for the 2010 year in basic prices (in thousands of Naira)

ISIC		01	02	94-99		Final Consumption Expenditure				EXPORTS			Capital Formation					
ISIC	**Activities**	Crop and Animal production, hunting and related service activities	Forestry and logging	Other service activities	**Total Intermediate Consumption**	**Household Expenditures**	**NPISH**	**Government**	**TOTAL**	**Goods**	**Service**	**TOTAL**	**Changes in Inventories**	**Fixed Capital Formation**	**TOTAL**	**Final Demand**	**IMPORTS**	**TOTAL OUTPUTS**
01	Crop and Animal production, hunting and related service activities	3492431	0	0	**6,939,539**	11744636	0	0	**11744636**	375605	0	**375605**	18303935	1845444	**20149379**	**32,269,620**	**165,693**	**39,043,466**
02	Forestry and logging	484	82140	0	**201,753**	0	0	0	**0**	30811	0	**30811**	294122	0	**294122**	**324,934**	**5,642**	**521,044**
03	Fish and aquaculture	0	199	0	**68,486**	302051	0	0	**302051**	217	0	**217**	0	0	**0**	**302,268**	**253**	**370,501**
05	Mining of Coal and lignite	0	0	0	**6,166**	0	0	0	**0**	0	0	**0**	7764	0	**7764**	**7,764**	**35**	**13,894**
86-88	Human health and social work activities	0	0	36	**1,657**	96663	47308	329080	**473050**	0	0	**0**	0	0	**0**	**473,050**	**0**	**474,707**
90-93	Creative, arts and entertainment activities	0	0	0	**58,419**	16248	25633	93749	**135630**	11	0	**11**	0	0	**0**	**135,641**	**48**	**194,011**
94-99	Other Services activities	0	0	41104	**708,866**	636130	2263	0	638394	0	0	0	0	94814	94814	**733,208**	0	**1,442,074**
	Direct purchases abroad by residents	0	0	0	**0**	85,530	0	0	**85,530**	0	0	**0**	0	0	**0**	**85,530**	**0**	**85,530**
	Purchases on the domestic territory by non-residents	0	0	0	**0**	-836,613	0	0	**-836,613**	836,613	0	**836,613**	0	0	**0**	**0**	**0**	**0**
	Total Inputs at basic price	**4,474,691**	**116,945**	**498,335**	**57,902,885**	**34,099,517**	**224,480**	**4,832,145**	**39,815,981**	**13,778,305**	**304,003**	**12,972,589**	**79,502,500**	**19,852,768**	**96,084,731**	**148,873,301**	**2,435,158**	**204,341,028**
	Other taxes on products	2144	11	0	**0**	0	0	0	**0**			**0**				**0**	0	**0**
	TOTAL AT PURCHASERS' PRICES	**4476835**	**116956**	**498335**	**57,902,885**	**34,099,517**	**224,480**	**4,832,145**	**39,815,981**	**13,778,305**	**304,003**	**12,972,589**	**79,502,500**	**19,852,768**	**96,084,731**	**148,873,301**	**2,435,158**	**204,341,028**
	Compensation of employees	92290	834	306,008	**14,626,616**													
	Other net taxes on production	-5478	3	41,548	**296,267**													
	Consumption of fixed capital	11158	31	5,506	**2,450,720**													
	Operating surplus, net	12565490	134,852	546,960	**37,232,856**													
	Value added at basic prices	**12,663,460**	**135,721**	**900,023**	**54,606,459**													
	TOTAL INPUTS	**17,140,295**	**252,677**	**1,398,358**	**112,509,345**													

Appendix 2 Some Input-Output Coefficient Table

	ISIC	01	05	06	10	12	13	17	19	20+21	25	29	31	36-39	41-43	45	46	47	49	55 +56	61
01	Crop and Animal production, hunting and related service activities	0.20376	0.00000	0.00000	0.62054	0.01769	0.00282	0.00018	0.00000	0.15735	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.31098	0.31098	0.00000	0.09251	0.00000
05	Mining of Coal and lignite	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00006	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00026	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
06	Extraction of crude petroleum and natural gas	0.00000	0.00000	0.11127	0.00000	0.00000	0.00000	0.00004	0.80787	0.00004	0.00000	0.00001	0.00000	0.00000	0.00000	0.00000	0.09361	0.09361	0.00000	0.00000	0.00000
10	Manufacture of Food Products	0.00008	0.00000	0.00000	0.18777	0.00000	0.00000	0.02683	0.00000	0.27197	0.00000	0.00275	0.00000	0.00000	0.00005	0.00000	0.27956	0.27956	0.00002	0.15486	0.00007
12	Manufacture of Tobacco	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00580	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00089	0.00089	0.00000	0.00108	0.00000
13	Manufacture of Textiles	0.00000	0.00000	0.00000	0.00000	0.00000	0.70051	0.00009	0.00000	0.00027	0.00000	0.00000	0.00000	0.00000	0.00003	0.00000	0.04450	0.04450	0.00000	0.00310	0.00000
17	Manufacture of paper and paper products	0.00000	0.00000	0.00000	0.00000	0.04799	0.00000	0.03473	0.00000	0.01605	0.00000	0.00228	0.00000	0.00007	0.00019	0.00000	0.00224	0.00224	0.00188	0.00030	0.00250
19	Manufacture of coke and refined petroleum products	0.00000	0.00000	0.00052	0.00070	0.01472	0.00000	0.02291	0.00007	0.00248	0.00000	0.00020	0.00000	0.00178	0.00237	0.00000	0.01067	0.01067	0.18325	0.00084	0.03711
20+21	Manufacture of chemicals and chemical products and pharmaceutical preparations	0.00210	0.00000	0.00605	0.00251	0.05271	0.00000	0.26814	0.00006	0.03254	0.00000	0.00302	0.00000	0.00071	0.00093	0.00000	0.00513	0.00513	0.00746	0.00506	0.00771
25	Manufacture of fabricated metal products	0.00000	0.00000	0.00053	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00008	0.00000	0.00007	0.00503	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
29	Manufacture of motor vehicles, trailers and semi-trailers	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.86049	0.00000	0.00000	0.00371	0.00000	0.00710	0.00710	0.05479	0.00054	0.00678
31	Manufacture of furniture	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.81150	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
36-39	Water collection, waste collection, Remediation, and Sewage	0.00039	0.00000	0.00001	0.00006	0.00116	0.00000	0.00214	0.00001	0.00173	0.00000	0.00031	0.00000	0.98506	0.00000	0.00000	0.00018	0.00018	0.00044	0.00166	0.00004
41-43	Construction	0.00002	0.06098	0.00005	0.00002	0.00048	0.00000	0.00001	0.00001	0.00000	0.00000	0.00000	0.00000	0.00008	0.48799	0.00000	0.00004	0.00004	0.00055	0.00064	0.00041
45	Repair of motor vehicles and motorcycles	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
46	Wholesale trade	0.01577	0.00274	0.00879	0.06240	0.04790	0.07321	0.04513	0.03682	0.05092	0.00000	0.03473	0.07719	0.00038	0.02444	0.03399	0.05868	0.05868	0.01950	0.02308	0.00514
47	Retail trade	0.01577	0.00274	0.00879	0.06240	0.04790	0.07321	0.04513	0.03682	0.05092	0.00000	0.03473	0.07719	0.00038	0.02444	0.03399	0.05868	0.05868	0.01950	0.02308	0.00514
49	Land transport and transport via pipelines	0.00126	0.00085	0.00263	0.00538	0.08535	0.00731	0.00392	0.00001	0.00197	0.00000	0.00982	0.01574	0.00035	0.01313	0.00495	0.00901	0.00835	0.15534	0.00205	0.04389
55+56	Accommodation and Food and beverage service activities	0.00003	0.00000	0.00001	0.00004	0.00081	0.00019	0.00116	0.00000	0.00686	0.00000	0.00000	0.00000	0.00003	0.00150	0.00000	0.00064	0.00064	0.00972	0.00752	0.00477
61	Telecommunications	0.00007	0.00000	0.06864	0.00081	0.01696	0.00000	0.04030	0.00003	0.01912	0.00033	0.00000	0.00000	0.00006	0.01138	0.00000	0.00198	0.00198	0.10666	0.05990	0.13062
	TOTAL	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**

Appendix 3 Rankings of Backward and Forward Linkages for 2010

		Backward Linkages				Forward Linkages			
		CW		**Rasmussen**		**CW**		**Rasmussen**	
ISIC	**Activities**	**UBL**	**WBL**	**UBL**	**WBL**	**UFL**	**WFL**	**UFL**	**WFL**
01	Crop and Animal production, hunting and related service activities	46	3	47	3	6	1	2	1
02	Forestry and logging	38	39	6	26	22	12	23	18
03	Fish and aquaculture	28	34	30	35	34	14	39	16
05	Mining of Coal and lignite	39	46	39	46	45	34	46	34
06	Extraction of crude petroleum and natural gas	45	4	44	4	4	2	5	2
07	Mining of metal ores	42	47	43	47	44	33	44	35
08	Other Mining and Quarrying	24	33	18	34	40	28	37	24
10	Manufacture of Food Products	13	2	21	5	2	36	4	—
11	Manufacture of Beverages	7	18	11	18	32	36	31	—
12	Manufacture of Tobacco	15	42	17	43	46	36	45	—
13	Manufacture of Textiles	5	15	4	13	18	36	10	—
14	Manufacture of Wearing apparel	14	36	8	37	31	36	26	—
15	Manufacture of Leather Footwear	11	14	10	16	26	36	30	—
16	Manufacture of wood and wood products	27	32	19	32	37	21	38	20
17	Manufacture of paper and paper products	30	41	24	41	25	25	28	29
19	Manufacture of coke and refined petroleum products	17	11	25	14	15	10	17	11
20+21	Manufacture of chemicals and chemical products and pharmaceutical preparations	25	22	23	23	5	16	12	22
22	Manufacture of rubber and plastics products	21	37	26	40	27	23	27	26

23	Manufacture of other non-metallic mineral products including Cement	18	23	20	27	23	18	25	21
24	Manufacture of basic metals	22	27	7	25	38	27	35	25
25	Manufacture of fabricated metal products	10	28	32	38	39	36	40	—
26+27	Manufacture of electronic and optical products and electrical equipment	20	9	9	9	20	30	22	33
29	Manufacture of motor vehicles, trailers and semi-trailers	16	7	2	2	13	19	3	19
28+30	Manufacture of machinery and equipment	9	17	5	15	29	36	33	—
31	Manufacture of furniture	6	40	3	29	16	36	9	—
32	Other Manufacturing	33	12	27	11	7	11	15	13
35	Electricity, gas, steam and air conditioning supply	36	45	38	45	30	13	32	17
36-39	Water collection, waste collection, Remediation, and Sewage	12	49	1	49	12	15	1	9
41-43	Construction	19	1	13	1	21	7	20	7
45	Repair of motor vehicles and motorcycles	1	19	16	20	49	36	49	—
46	Wholesale trade	2	5	14	6	9	36	8	—
47	Retail trade	3	5	15	7	9	36	7	—
49	Land transport and transport via pipelines	4	10	12	10	19	36	18	—
50	Water Transport	31	38	28	36	33	31	24	32
51	Air Transport	23	35	29	39	36	26	34	27
52	Warehousing and support activities for transportation	37	30	34	28	17	20	19	23
53	Postal and courier activities	47	48	45	48	42	32	41	31
55+56	Accommodation and Food and beverage service activities	26	26	31	31	35	17	36	15
58+59+60	Publishing activities, Motion picture, video and television programme production, sound recording and broadcasting activities	8	42	22	12	41	32	42	—

61	Telecommunications	29	8	36	8	1	3	6	3
64+65	Financial services, insurance and pension funding	49	25	48	22	8	6	13	6
68	Real estate activities	48	24	49	24	11	4	14	4
69-75	Professional, scientific and technical activities	35	16	41	17	3	5	11	5
77	Administrative and support service activities	43	21	40	19	14	22	16	28
84	Public administration	40	13	35	12	28	8	29	8
85	Education	34	20	42	21	47	29	47	12
86-88	Human health and social work activities	32	31	33	33	48	35	48	30
90-93	Creative, arts and entertainment activities	41	43	37	42	43	24	43	14
94-99	Other Services activities	44	29	46	30	24	9	21	10

UBL- Unweighted Backward Linkages, WBL- Weighted Backward Linkages, UFL- Unweighted Forward Linkages, WFL- Weighted Forward Linkages

CHAPTER 3: Literature Review and the Nigerian Context

3.1 Theories of FDI

FDI theories encompass concepts of international production and international trade. International trade theories are developed to explain the motive underlining trade, trade patterns and benefits to nations as well as to individual firms. The theory of international production also tries to explain patterns and the reason for production activities in a foreign nation, envisaging that the propensity for a firm to engage in foreign production depends on the target market size. Kojima (1975) suggested that both trade and investment should be carried out according to the same principles of international division of labour and comparative costs.

This study looks at relevant theories such asneoclassical trade theory, industrial organisation theory, transaction costs theory, the OLI paradigm, entry mode theory, product cycle theory, international trade theory, International production theory, monopolistic and oligopolistic theories.

3.1.1 Neoclassical Trade theory

The initial attempt to explain the theory of FDI was madewithin the neoclassical trade theory. The trade theory known as the Heckscher-Ohlin[1] model gave the foundations for the formulation of FDI theory. The Heckscher-Ohlin (H-O) model essentially advanced on the Ricardian model by introducing a second factor of production, capital (Markusen, 1995). Specifically, the model is based on three key assumptions: The first is that there are two factors of production (capital and labour); secondly, two countries exist (for example country A and B); and two perfectly competitive goods are produced. Hence the H-O model is characterised as a "2x2x2" model. A basic departure from the Ricardian model is the assumption that technologies between countries are identical. Thus the main difference between countries in the H-O model is the difference in factor endowments. By implication, countries have different factor intensities and different factor prices. Furthermore, it is assumed that factors are mobile within countries, but immobile between countries.

[1] Heckscher-Ohlin model was developed by two Swedish economists, Eli Heckscher and Bertil Ohlin. Bertil Ohlin won the 1977 Nobel Prize in Economics.

To illustrate the H-O model, assumptions are made based on two countries, A and B, where each produces two goods: a capital-intensive good and a labour intensive good. A is the abundant capital country, and B is the abundant labour country. The H-O theorem asserts that country A will export the capital-intensive good to country B while country B will export the labour intensive good (trade takes place). It is important to note that the due to the difference in factor prices between countries, the price of the capital-intensive good will be higher in the abundant labour country and vice versa[2]. Hence both countries will continue trading until the prices of the two goods are equal in both markets. The equality of price of the two goods implies equality of the factors between the two countries, as the price of factors is equivalent to their marginal products.

A significant departure from the H-O model to the FDI theory involves the relaxation of the assumption that factors are immobile between countries. Thus, this makes provision for the fact that factor movements can also occur in the absence of trade. Mundell (1957) extended the analysis to argue that restrictions to trade would enhance factor movements and vice versa. The factor movements would be in the form of movements from a country of lower return to a country of higher return. In the case of capital movements, firms would move to countries where the returns to capital were relatively higher, in the quest for higher profits. The implication of Mundell's assertion is that trade and capital movements are substitutes. In summary, the difference in returns to capital between countries is the basic reason for capital movements from one country to another. This capital movement from one country to another was regarded as a direct investment by neoclassical economists (Kindleberger, 1969).

However, the neoclassical view towards FDI received criticism by some prominent scholars. In a doctoral dissertation, Hymer (1960) was the first to provide a credible criticism of the neoclassical theory of FDI. He questioned the notion that disparity in interest rates was the basis for capital movements and that FDI would not exist in the perfectly competitive market. According to Hymer, direct investment is the control (indicated by the extent of ownership) of an enterprise of a country by an enterprise of another country which involved capital movements. Moreover, the desire to undergo direct investment led to movements in direct investment which resulted in capital movements. This desire to undergo investment was the motivation for direct investment and not the differences in interest rates (Hymer, 1960). He

[2] The capital abundant country will have an excess supply of capital, which results in lower price of capital relative to the labour abundant country.

noted that the evidence for this viewpoint was seen in cases where capital moved from a country with the high-interest rate to a country with the low-interest rate. According to the neoclassical theory, the preceding statement would have been seen ascounter-intuitive. To contest the idea of perfect competition, Hymer noted that specific advantages which firms possessed were the main motivation for direct investment. Thus, Hymer viewed the direct investor as an oligopolist (Grubaygh, 1987; Sun, Tong & Yu, 2002). Therefore, imperfection in the market was seen as a necessary condition for direct investment.

In a similar vein, Kindleberger[3] (1969) elaborated on Hymer's theory and explained the monopolistic advantages required for direct investment. He noted that local firms already possessed some advantages which the foreign investor needed to overcome. These advantages possessed by the foreign firm could be in the form of product differentiation, superior managerial and marketing skills, advanced technology, economies of scale, etc. (Kindleberger, 1969). Caves (1971) focused on product differentiation as a necessary condition for direct investment. He added that product differentiation stimulated rivalry through activities such as advertising. Furthermore, he noted that in addition to the merits of the unique/special asset they possessed, foreign firms should also prefer direct investment to alternative forms of acquiring foreign rent. These points implied that perfect competition assumed in neoclassical trade theories would not permit FDI, as it was not characterised by product differentiation.

A different approach was taken by Vernon (1966) in the product life hypothesis. The main objection of this hypothesis to trade theories lay in its approach of de-emphasisingfactor-proportions theory of comparative advantage and emphasisingthe timing of innovation, scale economies effects and the role of uncertainty in trade patterns (Vernon, 1966). To explain the reason for FDI, Vernon asserted that at some stage after the introduction of a new product, the producers switched from exporting to foreign production. Thus after a new product emerged, it was gradually transformed from a differentiated product to a standardised product. At the standardised or maturity stage, the product experienced a threat of competition from local products in the export target countries. According to Vernon, this threat was a significant motivation for shifting production abroad. In summary, Vernon's

[3] Prof. Charles Kindleberger was Stephen Hymer's thesis supervisor at the Massachusetts Institute of technology (MIT).

theory attempted to answer the question: 'when' does foreign investment occur (Dunning, 1979)?

3.1.2 Industrial Organisation theory: Internalisation

Hymer's work marked a turnaround point from the neoclassical trade theory to the industrial organisation theory (Dunning and Rugman, 1985). It changed the focus of multinational theory from the nation (macro) to the firm (micro) (Hennart, 2001). The question (Dunning, 2001) that remained unanswered at that point was: '*Why do firms, rather than markets internalise cross-border transactions*?' Buckley and Cason (1976) made the first comprehensive attempt to show how cross-border transactions involving intermediate products were internalised within MNCs rather than within markets. The theory was based on Coase's (1937) market failure theories. The basic assumption underlying these theories was that profit maximisation occurred in the midst of imperfect markets. These theories assumed that modern businesses extended their activities to include interdependent activities such as marketing, research and development, training, and managerial skills. These activities were linked by flows of intermediate products which required a separate market. Buckley and Cason (1976) opined that due to the imperfect nature of these intermediate markets, internal markets emerged to avoid the demerits of imperfections in the external market. Thus, the existence of imperfect markets created theincentive for internalisation of the firm. Another theory of internalisation was developed by Hennart (1977) under the inspiration of McManus (1972). He asserted that the existence of imperfect competition generated transaction costs which could be eliminated through internalisation.

3.1.3 Transaction costs theory

This theory started with the work of Coase (1937), who argued that the boundaries of a firm could be determined by the relative costs of carrying out a transaction within a firm's hierarchy. However, in Coase's work, he did not make any categorical mention of international firms; his framework in transaction cost was applied to the question of international production by Hymer in 1960. It was thereby credited to Hymer as he was the first to address the question of why firms carry out activities outside their home country.

3.1.4 The OLI paradigm

By the late seventies, there was a need to unify the theories of foreign direct investment, as previous theories had focused on particular directions in their analysis. This was intended to consolidate the different reasons why a firm would decide to engage in FDI. Thus in 1976, during a Nobel symposium at Stockholm, John Dunning introduced a comprehensive blend of the trade theories with internalisation theory to develop the OLI eclectic theory of FDI. OLI is an acronym for Ownership-Location-Internalisation advantages. According to Dunning, a firm will engage in FDI if these three conditions of ownership advantage, locationadvantage and internalisation advantageare satisfied (Dunning, 1979). At this juncture, each of these conditions is explained in turn.

In an attempt to respond to the criticisms associated with the transaction cost theory, the OLI paradigm was developed by John Dunning in 1977. He argued that a firm would engage in international production if there were ownership advantages, location advantages and internalisation advantages. When talking about ownership advantages, it referred to some unique assets or knowledge that firms mightpossess from which they could generate profit. Also, they could refer to a firm’s competitive advantage.

The Location advantages, on the other hand, referred to advantages of one potential FDI host country relative to another and this could include natural resources, input prices, investment incentives, cultural differences and more.

Internalisation advantages described why a firm would exploit the advantages mentioned above by FDI rather than through licensing or export. Within the internationalisation advantage, the theory of transaction cost was well expanded by Kogut and Zander (1993) as well as by Williamson (1985).

3.1.4.1 Ownership (O) advantages

These are unique advantages which a firm possesses relative to its competitors in the foreign market. By Dunning’s theory, FDI would occur when the merits of implementing the advantages were higher than its opportunity costs. These “O” advantages could be in different forms (Dunning, 2000). It could be in the form of monopoly advantages possessed by firms as shown in Bain (1956) and Hymer (1960). The creation of barriers to entry could also depict ownership advantages as identified in Caves (1971, 1982) and Porter (1980, 1985). In the same vein, the ability of managers to detect and explore resources and potentials globally can be seen as “O” advantages.

In recent times, “O” advantages appear in the form of alliance capitalism, which involves synthesising assets with comparative advantages of a firm and that of its competitors. Dunning (2000) indicates that the following theories explain the “O” advantages: Product Cycle theory (Vernon, 1966), Industrial Organisation theories (Caves, 1971, 1974; Dunning, 1958; Hymer, 1960); Internalisation theory (Buckley and Casson, 1976; Hennart, 1982).

3.1.4.2 Location (L) advantages

This explains the advantages that determine where FDI is situated. Particular countries possess advantages that enhance the ownership advantages. These “L” advantages could be in the form of complementary assets (Dunning, 2001).

Dunning (2000) pointed out that the idea of L advantages had different perspectives according to disciplines. Economists have investigated the impact of exchange rates on the location of FDI (Cashman, 1985; Froot & Stein, 1991; Rangan, 1998). Business scholars asserted that a competitive advantage involved the optimal location of portfolio assets (Enright, 1991, 1998; Porter, 1994, 1996). In the nineties, economists and industrial geographers explored the clustering of economic activity in certain geographic regions (Audretsch, 1998; Krugman, 1991, 1998; Scott, 1996; Storper, 1995; Storper and Scott, 1995; Venebles, 1998). According to Dunning (2000), theories that explained location advantages included Traditional Location theory (Hoover, 1948; Hotelling, 1929; Isard, 1956); Internationalisation related theories (Anderson & Gatignon, 1986; Cavusgil, 1980; Daniels, 1971); Agglomeration theories (Audretsch, 1998; Enright, 1991, 1999; Forsgren, 1990) Spatial Concentration related theories (Florida, 1995; Scott, 1996; Storper and Scott, 1995) Complementary Assets related theories (Chen & Chen, 1998, 1999; Teece, Pisano & Shuen, 1997); Government Induced Incentives theories (Loree & Guisinger, 1995; UN 1996a) and Exchange Rate theories (Aliber, 1971; Cashman. 1985; Froot & Stein, 1991).

3.1.4.3 Internalisation advantage

Following the acknowledgement of the fact that a firm with ownership advantages would decide to invest in a country with location advantage, an important question will be: why would the firm choose to carry out the foreign investment by itself instead of engaging in other arrangements such as licensing or exportation? The answer to this question was given in the various forms of internalisation theory. When transaction and organisation costs of these other arrangements outweigh the costs of internalising the market, the firm will choose to engage in FDI. These transaction costs are known to rise as imperfections in the market rises (Dunning, 2000). It should be noted at this juncture, that one of the distinctive features of I advantages is that it requires O and L advantages. Dunning (2000) outlines the following theories that explain internalisation advantages: Orthodox Internalisation theory (Buckley & Casson, 1976; Caves, 1996; Ghoshal, Hahn & Moran, 1997) and Efficiency related theories (Caves, 1982; Liu, 1998; Teece, 1981). It is important to note that the eclectic theory assumes that all the three advantages must be present before there is aforeign direct investment. In other words, all three advantages are necessary, but no one of them is alone sufficient (Sodersten & Reed, 1994).

3.1.5 Product cycle approach

Vernon (1966) developed this approach which focused on consumer durables; this was a US experience in the post-war period. This approach was in response to the observation that US firms were among the first to develop new labour-saving methods in response to large domestic market and the high cost of skilled labour. Vernon suggested that the role of FDI followed a 3-stage life cycle which included innovation, growth and maturity. The principalassumption of the theory was that firms which developed the products in their domestic markets would shift the production plants to countries with abundant unskilled labour rather than sell or license their technology to host-country competitors.

3.1.6 Entry mode theory

Canabal and White (2008) explained this theory as one of the major research areas in the international business discipline concerning trade and investment. If companies made entry mode choice that entailed the investment of equity capital in local operation, then FDI inflow would occur. The OLI theory and transaction cost theory has been used to look at this particular phenomenon.

3.2 Types of FDI

The OLI framework led to the classification of FDI into four different types, namely: natural resource seeking FDI, market seeking FDI, efficiency-seeking FDI, and strategic asset seeking FDI (Dunning, 1998). Identification of these types of FDI underpins most empirical literature on the determinants of FDI. These types of FDI are now discussed in the following sections.

3.2.1 The Natural Resource Seeking FDI

Some countries or regions are known to possess certain resources in abundance. Thus it is not surprising for MNCs which use such resources to choose to locate subsidiaries in such locations. However, what are these resources and what type of MNCs seeks them? The answers to these questions lie in the further categorisation of natural resource seekers. According to Dunning (2008), there are three groups of natural resource seekers.

The first group is the seekers of the physical natural resource. This comprises mainly MNCs engaged in primary production and manufacturing, seeking for resources in mostly two broad categories: fossil fuels led by crude oil, coal, gas, metals, diamonds, etc. and agricultural products such as palm oil, cocoa, rubber, sugar, etc. Africa is known to be the hub of natural resources (Adams, Gurney, Hook & Leydesdorff, 2014). This could explain the recent surge in FDI flows to Africa, particularly from China and India (UNCTAD, 2006) where the main attraction of MNCs to Africa is its abundance of natural resources. The second group is the seekers of cheap and efficient labour. Recently, this motive for FDI has been increasing due to the emergence of industrialising developing countries such as Mexico, Taiwan an Malaysia which seek cheap and resourceful labour in China, Morocco, Vietnam, and Turkey (Dunning, 2008). The manufacturing and services sector is the main undertaker of cheap labour seeking FDI. Due to the desired impact on host nations' economies, especially on employment, host countries have implemented free trade and export processing zones (EPZs) to attract such FDI.

The third group is the seekers of technological know-how, managerial and organisational skills. This motive usually leads to collaborative alliances between countries and regions.

3.2.2 Market-seeking FDI

The motive for FDI could be to invest in a country due to the size/growth potential of its market, or of the countries within the same region. This motive that entails seeking for suitablemarkets for goods and services is known as market-seeking FDI. It has been noted that most MNCs that engage in this form of investment were previously exporters to the host country, who decided to carry out direct investment due to unfavourable tariffs and other barriers levied on their exports (Dunning, 2008; Nicholas, 1986). Thus, host governments play an active role in encouraging this form of investment through imposing controls and barriers on imports. In addition to the size of the market, there are other reasons for market-seeking FDI. These other reasons were outlined in Dunning (2008). The first reason was that some firms reacted to the decision to invest abroad by their suppliers and customers. Thus, it became economically reasonable for them to follow them to invest overseas. Another reason for engaging in this type of investment arose due to the need for products to adapt to the culture and tastes of the host country. As a result, firms decided to engage in direct investment to ensure that their products remained competitive in the midst of local products. The third reason was to reduce production and transportation cost by supplying in the market or the regions around it. A final reason for market-seeking FDI was to respond to competitors' investments in major markets across the globe. This situation was also known as the "follow your leader" or "bandwagon" strategy (Dunning, 2008; Knickerbocker, 1973).

3.2.3 Efficiency-seeking FDI

One motive for FDI could be to reduce the cost of production or to achieve economies of scale. Due to structural differences among countries, firms can take advantage of the favorable factor costs and product prices to diversify risk. This type of FDI is known as efficiency-seeking FDI and it entails rationalisation of the structure of international activities by firms to improve efficiency.

3.2.4 Strategic asset seeking FDI

To protect O advantages, firms may acquire or purchase the assets of existing firms. The aim is to strengthen their global competitiveness as part of their long-term strategic objectives (Dunning, 2008). Thus, strategic seeking FDI involves the pursuit of physical assets, R & D, market knowledge, human capital, etc., to enhance ownership advantages on the one hand and subdue those of the competitors (Dunning, 2008). The existence of strategic assets stems from the imperfections of the intermediate product market.

3.3 Determinants of FDI to Nigeria

Foreign Direct Investment is considered as desirable for host countries, especially in emerging markets. Following the Asian debt crisis of 1997, FDI is seen as a more stable source of capital than portfolio investment (Lipsey, 2001). FDI is also said to have important spill-over effects for host countries, such as transfer of technology and managerial expertise

(Lipsey, 2001; Meyer & Sinani, 2009). Hence, many emerging economies, including those in the African region, have been taking steps to encourage FDI.

The question as to what the determinants of FDI flows areis,therefore, an important one for policymakers and academics alike. A number of studies have considered either the importance of individual elements on FDI flows, (for example, Bénassy-Quéré, Coupet & Mayer, 2007; Globerman & Shapriro, 2002) or have attempted to construct an overall model of the determinants of FDI flows (Chakrabarti, 2001; Jun & Singh, 1995; Sethi, Guisinger, Phelan & Berg, 2003). Emerging or transition economies have received particular attention in this area, given the importance of FDI in their development (Bevan & Estrin, 2000; Jun & Singh, 1996; Nunnenkamp, 2002). Despite the growing academic interest in FDI in emerging markets, the evidence for the determinants of FDI flows into developing markets is incomplete, particularly as far as the relationship between FDI, natural resource endowments and the more traditional FDI determinants found in the literature is concerned.

Regarding overall FDI flows into a country, existing research has concentrated on factors related to market size, a country's openness to trade and environmental risk factors (both political risk and business operating conditions).

3.3.1 Market size

The least controversial factor associated with FDI inflows is a country's market size, usually measured by a country's GDP (Gross Domestic Product). Large economies can reasonably be expected to attract more FDI than smaller economies. Other measures of market size or market attractiveness such as GDP per capita or GDP growth can have a more ambiguous impact. Considering GDP per capita, for market-seeking FDI, high levels of per capita GDP indicate markets with high spending power and would, therefore, seem to promote FDI. However, for efficiency-seeking FDI, high per capita GDP is typically associated with high wage rates, making the country less attractive for investments in, for example, export-oriented manufacturing industries. Artige and Nicolini (2005) state that market size as measured by GDP or GDP per capita seems to be the most robust FDI determinant in econometric studies. This is the main determinant for horizontal FDI. It is irrelevant for vertical FDI. Jordaan (2004) mentions that FDI tends to move to countries with larger and expanding markets and greater purchasing power, where firms can potentially receive a higher return on their capital and by implication receive higher profit from their investments. Chakrabarti (2001) states that the market-size hypothesis supports an idea that a large market is required for efficient utilisation of resources and exploitation of economies of scale: as the market-size grows to some critical value, FDI will start to increase after that with its further expansion. This hypothesis has been quite popular, and a variable representing the size of the host country market has emerged as an explanatory variable in nearly all empirical studies on the determinants of FDI.

In ODI (1997), it is stated that econometric studies comparing a cross-section of countries point to a well-established correlation between FDI and the size of the market, which is a proxy for the size of GDP, as well as some of its characteristics, such as average income levels and growth rates. Some studies found GDP growth rate to be a significant explanatory variable, whereas GDP was not, probably indicating that where the current size of national income wasvery small, increases might have less relevance to FDI decisions than growth performance, as an indicator of market potential.

Econometric results on market size are far from being unanimous. Edwards (1990) and Jaspersen, Aylward and Knox (2000) use the inverse of income per capita as a proxy for the return on capital and conclude that real GDP per capita is inversely related to FDI/GDP, but Asiedu (2002),Schneider, Friedrich and Frey (1985) and Tsai (1994) find a positive relationship between the two variables. They argue that a higher GDP per capita implies better prospects for FDI in the host country. Pärletun (2008) finds that the variable GDP is positive and statistically significant at the 1% level. She argues that the enlargement of market size tends to stimulate the attraction of FDI to the economy. Ang (2008) finds that real GDP has a significant positive impact on FDI inflows. He also finds that growth rate of GDP exerts a small positive impact on inward FDI.

Market size has been the single most widely accepted factor as a significant determinant of FDI flows (Chakrabarti, 2001). The larger the host area's (country, region, and sub-region) total income and its potential for development, the greater the amount of the FDI investment (Billington, 1999). A large market is necessary for efficient utilisation of resources and exploitation of economies of scale (Chakrabarti, 2001). On the other hand, Asiedu (2002) argues that market size is not a determinant for a developing country due to low income.

The market size itself cannot be easily ascertained (Billington, 1999). Regressions of Schimitz and Bieri (1972) are estimated for the USA's FDI to Canada, the EEC and EFTA. Their market size proxy is GNP and growth of GDP. Root and Ahmed (1979) identify unattractive, moderately attractive and highly attractive countries regarding FDI per capita for 58 countries based on 38 variables. The unattractive category represents FDI per capita as less than \$1, the moderately attractive as between \$1 and \$4.1, and the attractive as more than \$4.1. They use GDP, GDP per capita and growth per capita as a proxy for market size. They argue that the absolute size of GDP is more likely to reflect population size rather than per capita income. They conclude that developing countries that have attracted FDI have a relatively advanced infrastructure, comparatively high growth rates and per capita GDP and political stability.

Culem (1988) tests the impact of market size for 14 countries for the period 1969-1982. A bigger market allows the benefits of large-scale production to be more readily captured. Moreover, investors naturally prefer faster-growing markets, which offer more promising prospects. Billington (1999) is the first author to consider population as a variable; she uses population density as a determinant of FDI. Population density implies a more concentrated consumer and labour market as well as a more integrated infrastructure (Billington, 1999). However, Chakrabarti (2001) is more cautious, stating that total GDP is a poor indicator since it reflects the size of the population rather than the income per capita.

Larger market size should receive more inflows than that of smaller countries having lesser market size. Market size is measured by Gross Domestic Product (GDP), GDP per capita income and size of the middle-class population. It is expected to be a positive and significant determinant of FDI flows (see: Bevan & Estrin, 2000; Duran, 1999; Garibaldi, 2002; Lankes & Venables, 1997; Nunes, Oscategui Artera & Peschiera, 2006: Resmini, 2000; Sahoo, 2006). In contrast, Asiedu (2002) and Holland and Pain (1998) consider growth and market size to be insignificant determinants of FDI flow.

Besides these traditional factors, market size has gained a relative vital place in the literature on FDI for developing and emerging economies. Among the many authors who acknowledge the role of market size in attracting FDI inflows are Bandera and White (1968), Pistoresi (2000), Schmitz and Bier (1972) and Wheeler and Mody (1992). Moreover, more recently, Asiedu (2006), Mlambo (2006) and Zhang (2008) have explored the pivotal importance of market size in attracting FDI inflows. These authors argued that increased market size was a motivational factor for a foreign investor.

Asiedu (2006) recognises the market size benefit of regionalism. The study suggests that there are three reasons for FDI enhancement due to regional economic cooperation. The first is that regionalism can promote political stability by restricting membership only in order to elect a democratic government. Secondly, is the coordination of policies among member countries which reveals curbing corruption, implementing sound, stable macroeconomic policies and investor-friendly frameworks to be important. The third reason is that it expands the size of the market, which makes the region more attractive for FDI. The study also highlights the importance of regionalism to those countries which are small in sizeand income. Small countries can also attract FDI in a better manner as they join a coalitionto achieve large market size. Thoughregionalism provides an opportunity to enhance FDI, policy coordination among member nations of a bloc remains a major issue to be addressed.

The regional distribution in huge market size may also have regionalised FDI determinants. Zhang (2008) narrates that regional distribution factors affecting FDI are incentives, historical and cultural linkages with foreign investors along with other location factors.

Many studies have cited the host country's market size (measured by the Gross Domestic Product, GDP) as an important determinant of FDI inflows (Chakrabarti, 2001; Masayuki & Ivohasina, 2005: Moore, 1993; Raggazi, 1973; Wang & Swain, 1995). However, if the host country is only used as a production base due to low production costs to export their products to another or home market, then the market size may be less influential or insignificant (Agarwal,1980). Bajo-Rubia and Sosvilla- Rivero (1994) and Yin Yun Yang, Groenewold and Tcha (2000) discovered that rising prices (inflation) also influenced FDI.

3.3.2 Openness to trade

The impact of a country's openness to trade on FDI flows can be argued to be one of either increasing or reducing FDI flows into a country. On the one hand, openness to trade (particularly exports) can encourage export-oriented FDI in a country. On the other hand, trade barriers can be said to attract tariff-jumping FDI. In the literature, the empirical evidence points towards a positive relationship between openness to trade and FDI inflows as demonstrated by Jun & Singh (1995) and Nunnenkamp (2003). Chakarbarti (2001) also found a positive relationship between openness to trade and FDI, but not as strong as between market size and FDI. Similarly, a UN study on the determinants of FDI (Pearce, Islam, Sauvant, 1992) quotes some older studies that find no evidence of the tariff-hopping's argument that FDI would be positively related to trade protection (and therefore lead to a negative relationship between FDI and openness to trade).

Charkrabarti (2001) states that there is mixed evidence concerning the significance of openness, which is measured mostly by the ratio of exports plus imports to GDP, in determining FDI, as well. The maintained hypothesis is: given that most investment projects are directed towards the tradable sector, a country's degree of openness to international trade should be a relevant factor in the decision. Jordaan (2004) claimed that the impact of openness on FDI depended on the type of investment. When investments are market-seeking, trade restrictions (and therefore less openness) can have a positive impact on FDI. The reason stems from the "tariff jumping" hypothesis, which argues that foreign firms that seek to serve local markets may decide to set up subsidiaries in the host country if it is difficult to import their products to the country.

In contrast, multinational firms engaged in export-oriented investments may prefer to invest in a more open economy since increased disadvantages that accompany trade protection imply higher transaction costs associated with exporting. Wheeler and Mody (1992) observe a strong positive support for the hypothesis in the manufacturing sector, but a weak negative link in the electronics sector. Culem (1988), Edwards (1990) and Kravis and Lipsey (1982) find a strong positive effect of openness on FDI and Schmitz and Bieri (1972) obtain a weak positive link. Pärletun (2008) finds that trade openness is positive but statistically insignificant from zero. In ODI (1997), it is stated that while access to specific markets – judged by their size and growth – is important, domestic market factors are predictably much less relevant in export-oriented foreign firms. A range of surveys suggests a widespread perception that "open" economies encourage more foreign investment.

Anyanwu (1998) places a particular emphasis on the determinants of FDI inflows into Nigeria. He identifies a change in domestic investment, change in domestic output or market size, indigenisation policy and change in the openness of the economy as major determinants of FDI inflows into Nigeria and thereby maintains that effort in this wise must be made to raise the nation's economic growth to be able to attract more FDI. Ayanwale (2007) investigates the empirical relationship between non-extractive FDI and economic growth in Nigeria and also examines the determinants of FDI inflows into the Nigerian economy. He adopts both single equation and simultaneous equation models to examine the relationship. His results suggest that the determinants of FDI in Nigeria are market size, infrastructure development and stable macroeconomic policy. Openness to trade and human capital are not found to be FDI inducing.

In this study, the authors focus on trade openness as a significant factor affecting FDI inflows. Although openness can be considered a social or socio-economic indicator, Kosteletou and

Liargivas (2000) are only concerned, in their study, with the economic (i.e. trade) dimension of openness.

Trade openness induces export-oriented FDI, while trade restriction attracts ''tariff jumping'' FDI, the first target of which is to take advantage of the domestic market (Kosteletou & Liargovas, 2000).
Theoretically, trade restrictions or openness could affect FDI inflows positively or negatively. Some policies on trade openness might produce a significant impact in attracting FDI. For example, through the implementation of free trade agreements (FTA), several Latin American countries have been able to attract greater flows of foreign direct investment. Goldberg and Klein (1999) suggest that FDI fosters exports, import substitution, or greater trade in intermediary inputs. On the other hand, Raff (2004) argues that under certain conditions, an FTA does not lead to FDI, even though FDI would be welfare improving.This may happen, because equilibrium external tariffs are too low to induce FDI or because there are multiple equilibria and countries are stuck in one that does not support FDI. There are studies which have found a positive relationship between trade openness and FDI flows (see for example Biglaiser & DeRouen 2006; Chakrabarti 2001). On the other hand, some authors (e.g. Seim, 2009), find a negative relationship between FDI inflows and the degree of openness for countries in transition. In other terms, the relationship between trade openness and FDI inflows is very complex, needs careful explanation and may depend on the characteristics of each case. Theoretically, the effect of trade openness on the inflow of FDI varies according to the motivation for engaging in FDI activities (Dunning 1993; Markusen & Maskus 2002).

Asiedu's work on FDI determinants, in 2001, explored whether factors that affected FDI in developing countries in sub-Saharan Africa were different. The result indicated that a higher return on investment and better infrastructure hadpositive impacts on FDI to non-SSA countries but had no significant impact on FDI to SSA andthat openness to trade promoted FDI to SSA and non-SSA countries, althoughthe marginal benefit from increased openness was less for SSA (Asiedu, 2001).

Open economies of the developing countries is a vehicle for succesful FDI penetration compared with closed economy countries, which hardly permits room for external intervention. There are numerous findings that suggest the fact that open economy is a great determinant of FDI inflow. Ajayi (2006) indicates that exports, particularly manufacturing exports, are a significant determinant of FDI flows and tests show that there is strong evidence that exports precede FDI flows. China has been identified, in particular, as attracting much foreign investment into the export sector. Several studies also find a greater positive effect of openness on inward FDI.

3.3.3 Environmental risk (external uncertainty)

Environmental risk in the context of FDI can be defined as the unpredictability of an entrant's external environment (Anderson & Gatignon, 1988) and is also referred to as external risk or country risk (since environmental risk is usually measured at a country level). Sometimes, the term political risk is used, although this is more accurately considered to be a component of environmental risk rather than equivalent to it. Agarwal and Ramaswami (1992) use the term external risk and define it as the uncertainty over the continuation of present economic and political conditions and government policies which are critical for the survival and profitability of a firm's operations in that country. Root (1994) uses the term political risk and states that political risk arises from uncertainty over the continuation of present political conditions and government policies in the foreign host country that are critical to the profitability of an actual or proposed equity/contractual business arrangement.

Root (1994) distinguishes four main types of political risks to be evaluated by investors; general instability, expropriation risk, operations risk and transfer risk. The concept of environmental risk is closely related to that of institutional stability and business operating conditions. As countries develop stable and effective institutions, political change is less likely to have a significant impact on business operating conditions.

Foreign investors who expand into a foreign market, thus, have tobe concerned about the political risk of the host economy, since political volatility and violence may damage the investment, diminish the efficiency of the overall market and, thus, impair the profitability or survival of their investment. Political risk is an important determinant of foreign investors' location decisions, also due to the nature of FDI. FDI, "while mobile ex-ante, is relatively illiquid ex-post" (Vernon, 1971 cited in Jensen, 2003a, p.24); for example, when affected by unfair trade policies, exporting MNCs can easily deflect their goods to other markets. However, when protectionist pressure, for example, leads to an unfair policy change that hurts the profitability of foreign investment, MNCs cannot simply move out from the host market.

The sunk cost of FDI makes it extremely costly for foreign investors to withdraw investments they have already made in the host market (Tarzi, 2005). This is based on the knowledge that the host country can exploit or expropriate foreign assets, although they initially promised fair and favourable terms and policies to foreign investors to attract FDI (Berger, Busse, Nunnenkamp & Roy, 2010a; Büthe & Milner, 2008; Jensen, 2008; Neumayer & Spess, 2005; Vernon, 1971). Foreign investors, thus, have tomaximise the profitability of investment by taking advantage of the lower factor-costs and location advantages of the host economy but, at the same time, weigh the dangers and potential losses incurred by investing in politically unstable countries. Political risk, thus, is one of the major constraints on foreign investors who seek to expand into foreign markets.

Time-inconsistency problem, - changing FDI-related policies to be less favourable to foreign investors, and, thus, violating the initial terms of foreign investment−can occur in both developing and advanced economies. However, developing nations often suffer from the shortage of capital and resources, and they "have an even greater incentive than governments in advanced industrialised countries" to "change the terms of existing foreign investment" (Büthe & Milner, 2008, p.743). Based on the data collected by the World Bank "in Latin America since the late 1980s, 40% of all concessions were renegotiated, with the average time for renegotiation being only 2.2 years" (Ramamurti & Doh 2004, p.158). According to the UNCTAD, "10 percent of all FDI-related regulatory changes were less favourable for foreign investors" in 2003 and by 2007 it was 25 percent, and even before the recession in 2008 "in Latin America, as much as 60 percent of policy measures taken in 2007 were less favourable to FDI" (UNCTAD, 2009, p.10). Political instability and abrupt policy changes can handicap the productivity and profitability of foreign investment.

The ranking of political risk among FDI determinants remains rather unclear. According to ODI (1997), where the host country owns rich natural resources, no further incentive may be required, as is seen in politically unstable countries, such as Nigeria and Angola, where high returns in the extractive industries seem to compensate for political instability. In general, as long as the foreign company is confident of being able to operate profitably without excessive risk to its capital and personnel, it will continue to invest. For example, large mining companies overcome some of the political risks by investing in their infrastructure maintenance and their security forces.

3.3.4 Natural resource endowments

Natural resource endowments such as oil and gas are believed to attract resource-seeking FDI (Dunning, 1998; Estrin & Meyer 2004), but the topic has not been the subject of much empirical research until recently. Dunning (1998) drew attention to the availability ofnaturalresources as one of the possible location determinants for resource seeking FDI. The availability of such resources is a necessary but not sufficient condition for natural resource-seeking FDI, as Dunning acknowledges by listing infrastructure, government restrictions on FDI and investment incentives as other relevant location factors.

The availability of natural resources might be a major determinant of FDI to the host country. FDI takes place when a country richly endowed with natural resources lacks the amount of capital or technical skill needed to extract or/and sale to the world market. Foreign firms embark on vertical FDI in the host country to produce raw materials or/and inputs for their production processes at home. This means that certain FDI may be less related to profitability or market size of host country than natural resources which are unavailable to the domestic economy of the foreign firms.

The availability of natural resources is of great interest to any nation domestically and also to bring the foreign investors into the country. Africa influenced FDI basically because of the presence of resource in the region. Traditionally, about 60% of Africa‘s FDI is allocated to oil and natural resources UNCTAD (1999). The rising profits in the sector induced a flow of investment. Asiedu (2006) concludes that, besides market size, natural resources are the key determinants for FDI in Africa. Nigeria is blessed with enough resources to attract the interest of FDI in the country, but the major problem facing the country, in terms both of improvements in domestic investments and foreign investment, is leadership problem.

3.3.5 Labour Costs and Productivity

Charkrabarti (2001) claims that wage as an indicator of labour cost has been the most contentious of all the potential determinants of FDI. Theoretically, the importance of cheap labour in attracting multinationals is agreed upon by the proponents of the dependency hypothesis as well as those of the modernisation hypothesis, though with very different implications. There is, however, no unanimity even among the comparatively small number of studies that have explored the role of wage in affecting FDI; results range from higher host country wages discouraging inbound FDI to having no significant effect or even a positive association.

There is no unanimity in the studies regarding the role of wages in attracting FDI. Culem, (1988), Flamm (1984), Goldsbrough (1979), Saunders (1982), Schneider and Frey (1985) and Shamsuddin (1994) demonstrate that higher wages discourage FDI. Tsai (1994) obtains strong support for the cheap-labour hypothesis over the period 1983 to 1986, but weak support for the periodfrom 1975 to 1978. In ODI (1997), it is stated that empirical research has also found relative labour costs to be statistically significant, particularly for foreign investment in labour-intensive industries and for export-oriented subsidiaries. However, when the cost of labour is relatively insignificant (when wage rates vary little from country to country), the skills of the labour force are expected to have an impact on decisions about FDI location.

The idea of investing in the developing countries is considered advantageous due to the low labour cost and wages. According to Pigato (2001), all other factors remaining unchanged, lower labour cost reduces the cost of production, but the availability of cheap labour justifies the relocation of a part of the production process in foreign countries. Pigato shows that with FDI moving toward intensive technological activities, low-cost unskilled labour is not in vogue; rather it is the demand-qualified human capital that counts. Konings and Murphy (2001) found that, in the post-1992 United States, FDI in EU periphery was discouraged in high labour cost countries. Braconier et al. (2005) found that about 20% of U.S. multinational sales are based on low wages of skilled labour. Konings and Murphy (2001) argued that wage level may not be the only labour-related factor that determines FDI investment decisions, but it is the availability of skilled labour and its productivity that also seems to be important for firms. Azemar and Desbordes (2009) and Suliman and Mollick (2009) analyse FDI flows to developing countries and conclude that the relatively low FDI flows into sub-Saharan Africa are partly explained by poor human capital and illiteracy. Noorbakhsh, Paloni and Youssef (2001) wonder why FDI flows to developing countries have reached only a limited part of them. Both affordable labour cost and the quality of labour with a high level of education attract the interest of the foreign investors to come into the economy of any nation.

3.3.6 Infrastructure

Infrastructure covers many dimensions ranging from roads, ports, railways and telecommunication systems to institutional development (e.g. accounting, legal services, etc.). According to ODI (1997), poor infrastructure can be seen, however, as both an obstacle and an opportunity for foreign investment. For the majority of low-income countries, it is often cited as one of the major constraints. However, foreign investors also point to the potential for attracting significant FDI if host governments permit more substantial foreign participation in the infrastructure sector. Jordaan (2004) claims that good quality and well-developed infrastructure increases the productivity potential of investments in a country and therefore stimulates FDI flows towards the country. According to Asiedu (2002) and Ancharaz (2003), the number of telephones per 1,000 inhabitants is a standard measurement in the literature for infrastructure development. Nevertheless, Asiedu (2002) contends that this measure falls short, because it only captures the availability and not the reliability of the infrastructure. Furthermore, it only includes fixed-line infrastructure and not cellular (mobile) telephones.

Infrastructure availability promotes both types of FDI, with comparatively more impact on vertical FDI as it reduces operational costs. Khadaroo and Seetanah (2007) claimed that gainsrendered by infrastructure growth were associated with greater accessibility and reduction in transportation costs. Furthermore, public goods reduce the cost of doing business for foreign enterprises which leads towards maximisation of profit. Recent empirical studies also propose that public goods have an important impact on cost structure and productivity of private firms (Benassy-Quere, Coupet & Mayer, 2007; Morrison & Schwartz, 1996). Erenberg (1993) assumes that if such kinds of infrastructure were not extended to local and multinational enterprises publicly, then these enterprises would be operating with less efficiency as they would have to build their infrastructure which results in duplication and wastage of resources and so public inputs reduce their transportation cost. Nadiri and Mamuneas (1994) reported a cost elasticity forecastconcerning infrastructure capital range from -0.1 to -0.21 depending on the business sector. In contrast, Bae (2008) recognised that investment in public inputs did not pose statistically substantial direct influence on production performance in private business firms. However, Haughwout (2001) took an opposite position arguing that availability of public goods lowered the cost of private firms even if there was no direct role of infrastructure in the production performance and cost structure of private firms.

Poor infrastructure causes an increase in transaction cost and limits access to both local and global markets which ultimately discourages FDI in developing countries. A greater efficiency can be achieved in extending infrastructure facilities by considering economic principle and shifting liability for provisioning of infrastructure facilities through management contracts or leases such as build-operate-transfer (BOT), build down operate (BOO) and full privatisation. Privatisation has emerged as a useful means of attracting inward FDI (Mlambo, 2006).

Although thequality of infrastructure has an impact on FDI, it also facilitates export performance which ultimately is a motivational factor for inward FDI for a country as well as trading blocks. Iwanow and Kirkpatrick (2006) argue in favour of the significant contribution of quality infrastructure improvement in export performance. Furthermore, the study indicates quantitative results that an improvement of 10% in infrastructure will yield 8% improvement in export performance in a developing country. Moreover, Suh and Khan (2003) explore the impact of infrastructure in the form of increased exporting level of major trade blocks CEFTA and ASEAN/AFTA.

In emerging economies, the role of infrastructure is twofold: the promotion of FDI and greater return on investment to business owners. Fung, Garcia-Herrero, Iiazaka and Siu (2005) classify infrastructure as hard in the form of roadways, communications installations and highways and soft infrastructure is associated with transparent institutions and intensive reforms. Soft infrastructure is far moreimportant as overly hard infrastructure for FDI.

Infrastructure can have a different impact on developing and developed nations. In developing economies, infrastructure has a significant attractiveness for FDI inflows (Asiedu, 2006; Khadaroo & Seetanah, 2010).

Sekkat and Varoudakis (2007) contend that infrastructure has a significant attractiveness for FDI even than that of openness and investment climate in developing countries. Addison et al. (2006) acknowledge such promotional impact only for developed nations but, on the other hand, that such a situation does not exist for developing countries. In contrast, Bae (2008) stated that, in developed countries, infrastructure was not a motivator but rather an indicator to attract FDI in large emerging economies.

Poor infrastructure is one of the main obstacles hindering FDI inflow in any country, and good infrastructural facilities will ensure that a nation is more attractive to foreign investors as well improving the qualities of the domestic investment. Infrastructure covers many dimensions, ranging from roads, ports, railways, and telecommunication systems to institutional development (e.g., accounting, legal services) Ajayi (2006). Asiedu (2002b) stated that good infrastructure increases the productivity of investment and can, therefore, stimulate FDI flows. With the use of cross-section data, Alfaro et al. (2003) found that poorly developed financial infrastructure could adversely affect an economy's ability to take advantage of the potential benefits of FDI. In a study by Bhinda, Griffith-Jones, and Martin (1999), it was found that problems related to funds mobilisation were on the priority list of the factors discouraging investors in Uganda, Tanzania, and Zambia. Surveys in sub-Saharan Africa indicated that poor accounting standards, inadequate disclosure, and weak enforcement of legal obligations had damaged the credibility of financial institutions to the extent of deterring foreign investors. Bad roads, delays in shipments of goods at ports, and unreliable means of communication have added to these disincentives (Ajayi, 2006). FDI depends highly on the infrastructure of the host countries, so it is most imperative for every nation to develop her infrastructure to improve her domestic investments and also to attract the foreign investors.

3.3.7 Growth

The role of growth in attracting FDI has also been the subject of controversy. Charkrabarti (2001) stated that the growth hypothesis, developed by Lim (1983), maintained that a rapidly growing economy provided relatively better opportunities for making profits than the ones growing slowly or not growing at all. Culem (1988), Lunn (1980), and Schneider and Frey (1985) find a significantly positive effect of growth on FDI, while Tsai (1994) obtainsstrong support for the hypothesis over the period 1983 to 1986, but only a weak association for the period from 1975 to 1978. On the other hand, Nigh (1985) reports a weak positive correlation between growth and FDI attractiveness in the less developed economies and a weak negative correlation in developed countries. Ancharaz (2003) finds a positive effect with lagged growth for the full sample and the non-Sub-Saharan African countries, but an insignificant effect for the Sub-Saharan Africa sample. Gastanaga, Nugent and Pashamova (1998) and Schneider and Frey (1985) found significant positive effects of growth on FDI.

The growth rate of the economy or the absolute annual changes of GDP may be used to measure the economic growth. The greater output growth means,a possible investment may be attracted. It is obvious that the market and economy that are thought to grow fast should be favourable for absorbing FDI inflows. Thus, economic growth should be expected to have a positive effect on FDI inflows. The Economic developing level is expressed by per capita GDP. A higher economic developing level shows the strong purchasing power and good economic performance.

In the meantime, this variable also means that an economy with high per capita GDP has high labour productivity, good local infrastructure and investment environment. Thus, economic development level should have a positive relationship with FDI inflows. A rapidly growing economy provides relatively better opportunities for making profits than one growing slowly or not growing at all. A high rate of economic growth is an indicator of development potential.

3.3.8 Tax

The literature remains fairly indecisive regarding whether FDI may be sensitive to tax incentives. Some studies have shown that host country corporate taxes have a significant negative effect on FDI flows. Others have reported that taxes do not have a significant effect on FDI. Cassou (1997), Grubert and Mutti (1991), Hartman (1981), , Hines and Rice (1994), Kemsley (1998) and Loree and Guisinger (1995) find that host country corporate income taxes have a significant negative effect on attracting FDI flows. However, Jackson and Markowski (1995), Lim (1983), Porcano and Price (1996), Root and Ahmed (1979), Wheeler and Mody (1992) and Yulin and Reed (1995) conclude that taxes do not have a significant effect on FDI. Swenson (1994) reports a positive correlation. The direction of the effects of determinants mentioned above on FDI may be different. A variable may affect FDI both positively and negatively. For example, factors, such as labour costs, trade barriers, trade balance, exchange rate and tax have been found to have both negative and positive effects on FDI. In the empirical studies, various combinations of these determinants as explanatory variables have been used.

Moosa (2002) states that due to the absence of any consensus on a theoretical framework to guide empirical work on FDI, there is no widely accepted set of explanatory variables that can be regarded as the “true” determinants of FDI.

Fakile and Adegbile (2011) and Morisset (2003) supported the view that tax incentive was a tool to attract FDI. In fact, Edmiston, Mudd andValev (2003), opined that government often sought to attract FDI by offering tax incentives to firms in exchange for certain benefits. Curiously, the empirical evidence of the benefits of offering tax incentives both at the firm level and at the national level remains ambiguous. Although trade theory expects FDI inflows to result in the improved competitiveness of host countries' exports, the pace of technological change in the economy as a whole will depend on the innovative and social capabilities of the host country, together with the absorptive capacity of other enterprises in the country (Carkovic & Levine, 2002).

However, in attracting FDI, there is no doubt that more important are such factors as basic infrastructure, political stability and the cost and availability of labour. According to Morisset (2003), some empirical analysis and surveys have confirmed that tax incentives are a poor instrument for compensating for negative factors in a country's investment climate, but that still does not mean that tax incentives do not affect FDI. Morisset (2003) expressed the view that in recent years there has been growing evidence that tax incentives influenced the location decisions of companies with regional economic groupings such as the European Union, North American Free Trade Area and Association of Southeast Asian Nations. Also, in the United States of America, incentives can play a decisive role in the final location decisions of foreign companies once the choices are narrowed down to a handful of sites with similar characteristics. Fakile and Adegbile (2011), elaborated on the effectiveness of tax incentives in Nigeria.The effectiveness of tax incentives is likely to vary depending on a firm's activity and its motivations for investing abroad. Growing evidence shows, for example, that tax incentives are a crucial factor for mobile firms and firms operating in multiple markets, such as banks, insurance companies, and Internet-related businesses. This is because these firms can better exploit different tax regimes across countries.

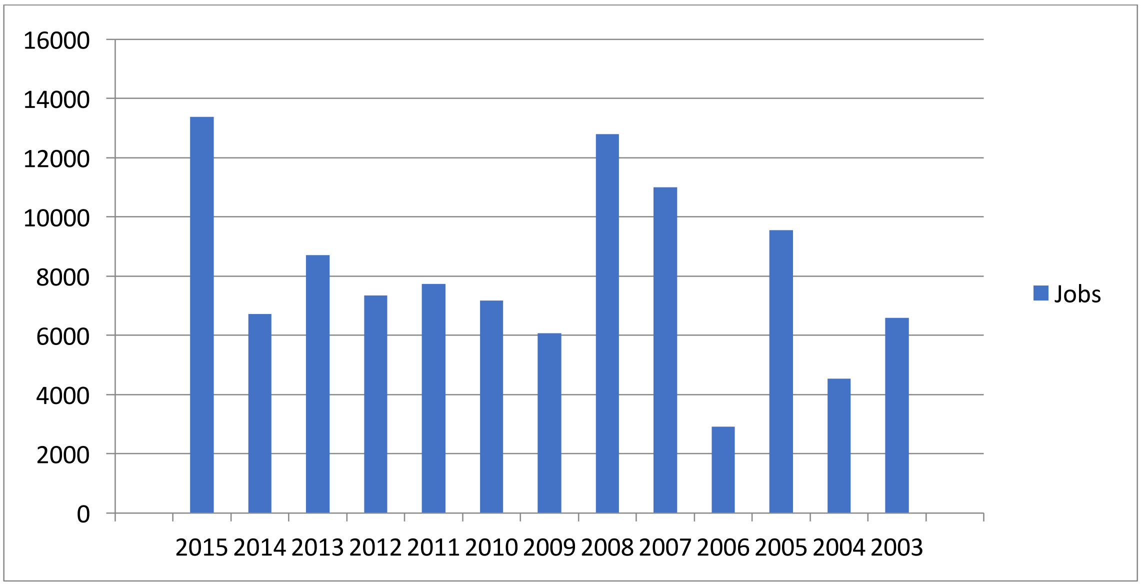
3.4 FDI and Job Creation in Nigeria

Labour unemployment persistence in developing economies remains worrisome as unemployment data reveals a yearly rise in most of the countries. However, the type of labour under consideration will determine the explanation of unemployment as a general equilibrium phenomenon. In a three- sector general equilibrium model with simultaneous existence of both unskilled and skilled labour unemployment, Chaudhuri and Banerjee (2010) analysed agricultural land in a developing economy in respect of the consequences of FDI. They revealed that unemployment of unskilled and skilled labour and national welfare improvements unequivocally improvedas a consequence of FDI in agriculture. Theoretically, the study supports the view that FDI inflow to agriculture in the developing economies is very desirable.

Despite the large rents from oil exportation, export growth rate does not contribute meaningfully to employment growth in the country, implying that the large revenue from oil is not used to generate employment for Nigeria’s surplus labour. Nigeria is the most populous country in Africa, and it is blessed with a large pool of surplus labour. Nigeria’s labour market is dualistic as it is characterisedby both formal and informal employment with the bulk of its labour force engaged in agriculture particularly at the substance level (Ogunlela & Mukhtar, 2009). Oni (2006) argues that reducing the level of unemployment will increase the income level in the economy and thereby reduce the level of poverty. To increase the level of employment, some scholars have argued that the flow of goods and services (trade flows) could propel employment generation, especially in developing countries. Growth in employment has feedback on economic growth, such that an increase in labour incomes would expand domestic demand, which in turn would lead to sustainable GDP growth and reduce the risks of excessive reliance on uncertain foreign markets (Wheeler & Moody, 1992).

According to the diagram below (Figure 3-1), the total number of jobs created on a yearly basis has been dwindling for the last twelve yearsin comparison with the level of capital invested. Job creation has notbeen totally reflectedcurrently in the influx of foreign investment within the country; this could be due to lack of systemic policy on the role of multinationals and foreign firms. U.S. FDI in Nigeria was estimated at $6.1 billion in 2010, down 29% from $8.65 billion in 2009 (UNCTAD World Investment Report, 2007). According to UNCTAD World Investment Report (2007), the decline in US FDI in 2010 was due to ongoing uncertainty related to the proposed Petroleum Industry Bill (PIB) as well as political unrest in Nigeria. UNCTAD World Investment Report (2007) further states that Nigeria’s unemployment is concentrated in the younger age group, with unemployment rates of 41.6% among 15-24 years old, 11.5% among the 45-59 years old, and 16.7% among those over 65. Unemployment rates are higher for females (24.9%) than for males (17.7%). The states with the highest unemployment rates are concentrated in the North Eastern part of the country and the Niger Delta, and the unemployment rate increased from 21.1% in 2010 to 23.9% in 2011 (UNCTAD World Investment Report, 2007).

Figure 3-1.**Jobs Created from 2003-2015**



(Source: fDi Intelligence report 2016)

Baldwin (1995) investigated the impact of trade and foreign direct investment on employment and relative wages using factor content methodology. Although he found support for a small impact of trade on employment in OECD countries, yet, the employment-creating effects of increased exports usually dominated the employment displacing effects of increased imports. Morawezynski and Wach (2003) investigated whether Polish foreign trade impacted on employment by pooling data for 28 sectors between 1993 and 1999 using regression analysis. They analysed employment effect of trade using employment, export and import and output. Their results found moderate evidence for traditional theories linking trade and employment as they found that import growth negatively affected employment changes in all the 28 sectors. Badwin (1995) found that international trade has little or no association with employment although the countries they studied were not oil-rich countries.

3.5 Domestic Investment and SME in Nigeria

3.5.1 Overview of Domestic Investment in Nigeria

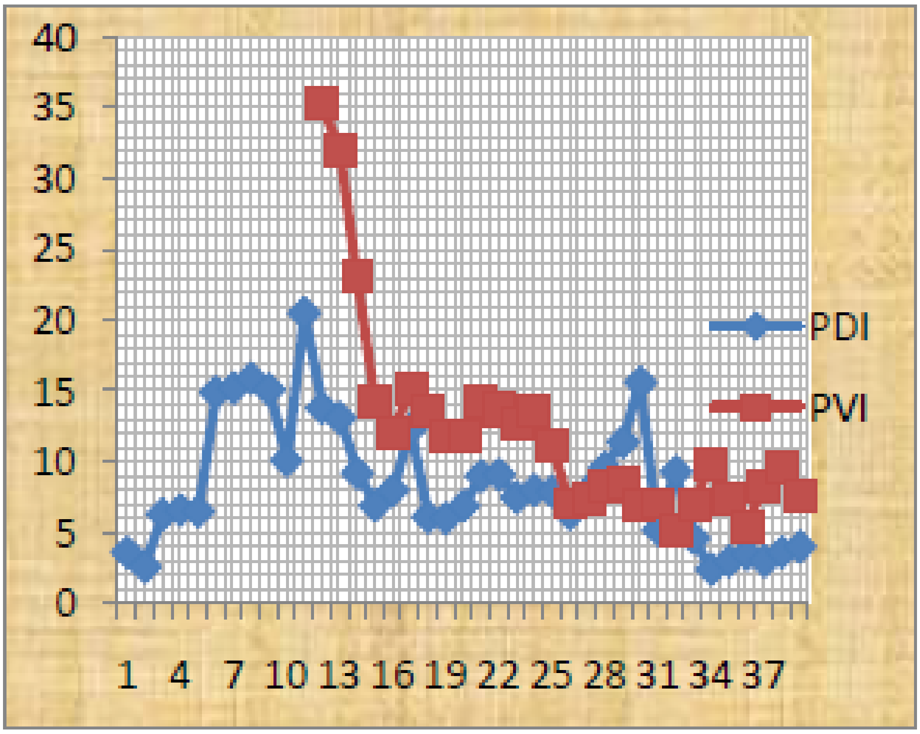
Domestic investment, which comprises private and public investment, is a vital component of total investment. For most economies, especially developed countries, the share of domestic investment is significantly large, sometimes higher than foreign capital; this is, however, a visibly opposing feature for most developing economies, where internally sourced capital is insufficient and inhibits targeted investment. For these economies, Nigeria in particular, public and private investment as a percentage of the GDP is significantly small, and her economy relies heavily on foreign capital.

During the first decade following independence, public investment as a percentage of GDP in Nigeria was, on the average, below 5%. Most social capital projects were mainly concentrated in urban areas, while the rural areas were wholly disconnected from the investment web. Following the discovery of oil in huge reserves in the Niger Delta and backed with foreign preference for Nigerian sweet crude, government revenue generation received a boost, and the capital expenditure of the government soared.

Empirically, public investment (as % of GDP) increased by 400%, from a staggering value of 3.6% in 1970 to 14.9% in 1975. This impressive rate remained relatively stable, maintaining an average of 15% of the GDP until the oil market crashed in the late 70s, which resulted in falling revenues and declining public investment by the government. Public investment plummeted from 13% to 9% in 1982 and 1983, respectively. Though a value of 12.3% was recorded in1986, resulting from the augmentation of domestic revenue by the IMF and World Bank, public investment has stayed below 10% after that, except for an anticipated rise fuelled by the electoral process in 1998 and 1999.

The poor rates of public investment in the mid-2000s could be linked to the global financial crisis of the period that affected government revenue earnings from crude oil export. Gross capital formation, which measures total investment undertaken by private individuals in the domestic economy, complements public investment. Similarly, private investment in Nigeria has trended the same pattern with public sector investment. In the late 70's and 80's, private investment as a percentage of GDP was averaging 25% annually, and during this period, was higher than public investment. However, since 1995, private domestic investment has been on a decline, averaging below 10% annually. The figure below reveals the trend analysis of private and domestic investment as percentages of the GDP.

Figure 3-2. **Relationship between Private Domestic and Foreign Investment**



(Source: Central Bank of Nigeria Bulletin 2009)

The poor trend of private investment in Nigeria is linked to unfavourable investment climate occasioned periodically by dysfunctional infrastructural base, insecurity, institutional failure, and unsupportive economic policies. The collective effect of these irregularities is an increase in the cost of doing business in Nigeria, which hampers firms' formation, shutting down of existing ones and the repatriation of foreign capital.

3.5.2 Overview of SMEs in Nigeria

Small and medium enterprises (SMEs) in Nigeria are seen as the backbone of the economy and a key source of economic growth, dynamism and flexibility. A study conducted by the Federal Office of Statistics shows that 97% of all businesses in Nigeria employ less than 100 employees, implying that 97% of all businesses in Nigeria are "small businesses". The SME sector provides, on average, 50% of Nigeria's employment and 50% of its industrial output (General Statistics Office 2007). Indeed, there appears to be agreement that the development of SMEs in Nigeria is a step towards building a vibrant and diversified economy (Mahmoud, 2005).There are over 1.7 million SMEs in Nigeria, and most of them are within the retail and manufacturing sector.

The definition of SMEs depends mainly on the level of development of the country. In most developed market economies such as the United States of America (USA), U.K. and Canada, the definition criterion adopted a mixture of annual turnover and employment levels. In Nigeria, the Small and Medium Industries Enterprises Investment Scheme (SMIEIS) defines SME as any enterprise with a maximum asset base of N200 million (GB£423) excluding land and working capital and with staff numbers not less than 10 or more than 300. Nwokoye (1988) defines a Small and Medium-Scale business as any enterprise employing between five and one hundred workers and which has an annual turnover of approximately 400,000 Naira (N400, 000). The Federal Ministry of Commerce and Industry defines SMEs as firms with a total investment (excluding the cost of land but including capital) of up to N750, 000, and paid employment of up to 50 persons. SMEs exist in the form of sole proprietorship and partnership, though some could be registered as limited liability companies and characterisedby simple management structure, informal employer/employee relationship, labour intensive operation, and simple technology, a fusion of ownership and management and limited access to capital. The seven major sources of funding available to SMEs in Nigeria include personal resources, family and friends, partners or business associates, informal financial markets, banks, specialised funding facilities, e.g. NERFUND and specialised financial institutions, e.g. NBCI, BOI, NIDB etc (Owualah, 1999). Their role in economic development includes: technological/industrial development, employment generation, technology acquisition, capacity building, promotion of economic growth, increased standard of living, industrial dispersal or spread, servicing of large-scale industries, export promotion, structural transformation of rural areas, flexibility and low take-off requirements (Odubanjo, 2000).

3.6 FDI, SME and Industrial Policy in Nigeria

Nigeria's government is currently implementing a policy to promote small and medium-sized enterprises (SMEs) while encouraging the inflow of FDI. The relation between domestic firms and FDI inflow needs a critical study to analyse whether better opportunities are available to build linkages between domestic and foreign firms.

The government of Nigeria has laid out four strategic policies for its development. They are

- Investment in infrastructure (particularly electricity and transportation, but also water and irrigation for agriculture, with a focus on attracting private sector investment.
- Building capacity in financial markets and increasing credit access to productive sectors of the economy;
- Improving governance and institutional capacity (notably by aligning policy formulation and implementation across federal and state level, and up-scaling the fight against entrenched corruption); and
- Improving the business and investment climate (in particular by adopting a holistic legal investment framework, reversing the trend towards informality, accelerating the privatisation of state enterprises and improving the ease of doing business.

Among these four main policies, the role of investment and SMEs has been emphasised by the fourth policy - the private sector development and employment - which has the following priorities in implementing the policy: (1) strengthening the private sector and attracting investment, (2) creating jobs and ensuring improved working conditions, (3) promoting SMEs, and (4) creating social safety nets for civil servants, employees and workers. Thecore development programme of the government outlined above, points out the two important issues of this study, that is, the promotion of SMEs and attracting FDI. These two issues are related to one another because attracting FDI while trying to build its linkages with SMEs will help achieve these two priorities.

3.6.1 FDI and Incentive Policies

Policies that affect FDI in Nigeria have been alternating between promotion and restriction of various degrees. The foremost FDI policies were enacted in the colonial administration. Thus, their economic interest was a major motivation. The Aid to Pioneer Industries of 1952 and Industrial Tax relief of 1958 were enacted to promote investments from both British and non-British MNCs. The later policy involves granting a 5-year tax relief to foreign companies on entry into Nigeria (Aremu, 2003). This development was soon overridden by desperate calls from Nigerian citizens to "Nigerianise" the economy after independence in 1960 (Ekundare, 1972). The Exchange Control Act of 1962 came as the first post-independence restrictive measure on FDI by prohibiting the transfer of money outside Nigeria without the consent of the Nigerian Federal Ministry of Finance. Thus, the act went against the basic precepts of FDI liberalisation: assurance for the repatriation of earnings and capital (UNCTAD-WIR, 1993).

Of greater scale and intensity regarding FDI restriction, was the Indigenisation Decree which began with the enactment of Nigerian Enterprises Promotion Decree, No. 4 of 1972. This imposed ceilings on foreign ownership of 60% on a total of 22 business activities, and minimum capital requirement. The business activities affected included advertising, electronic manufacturing, basic manufacturing and road transport, among others (UNCTAD, 2009). Further restrictions on foreign ownership came with the Nigerian Enterprise Promotion Decree of 1977, which lowered foreign ownership limit from 60% to 40% and expanded the list of business activities restricted. The 1977 amendment was known as the most severe cases of government control on foreign ownership in Africa and the developing world (Biersteker, 1987; UNCTAD, 2009). However, a further amendment of the decree in 1989 led to the relaxation of some of the restrictions previously imposed, but the controls were still present at that time.

Part of the objectives of the Structural Adjustment Programme of 1986, was to privatise major public institutions in Nigeria, especially those of the oil sector. However, foreign investors were excluded from the privatisation process, as domestic Nigerian firms became the beneficiaries. The actual opening up of Nigerian economy to foreign investment came with the establishment of the Nigerian Investment Promotion Decree in 1995. According to the Nigerian Investment Promotion Commission (NIPC) charter, the decree mandates the commission to provide investment services such as investment promotion, investor relations, investment-friendly policy advocacy and to build associations with multilateral institutions such as UNIDO, Multilateral Investment Guarantee Agency (MIGA) and Foreign Investment Advisory Service (FIAS) among others.Thus,the Nigerian economy was transformed from being a rather FDI restrictive economy to a FDI promotion one, allowing up to 100% foreign ownership in many sectors, especially in non-oil sectors (Kehl, 2009).

The government has provided various incentives to attract FDI, which has been mentioned in the Law of Investment of 1988 and later amended in 2002. The incentive according to article 12 is aimed at the following sectors: pioneer or high-technology industries, job-creating industries, export-oriented industries, tourism industry, agro-industry, transformation industry, physical infrastructure and energy, provincial and rural development, environment protection and investment in the export promotion zone (EPZ). Some of the incentives given are as the follows: corporate income tax rate of 20%, corporate tax exemption with the rule of a trigger period + three years + n, 5 years loss carried forward, full import duty exemption on the machine, intermediate goods, raw material, no export tax and reinvestment of profit to receive special depreciation rate.

A free trade zone is a designated area that eliminates traditional trade barriers, such as tariffs, and minimises bureaucratic regulations. The goal of a free trade zone is to enhance global market presence by attracting new business and foreign investments. It also seeks to limit trade restrictions, promote employment and alsoto stimulate export by giving the exporter a hedge against duties on the raw materials used in production. In these zones, trade is not limited by customs, trade tariffs or other barriers that can impede the exchange of goods.

The Nigeria Free Trade Zone Act 1992 established the Nigerian Export Processing Zone Authority (NEPZA) which is mandated to grant all approvals for operators within the free trade zones to the exclusion of other government bodies and agencies. The purpose of free trade zones in Nigeria is to help facilitate an environment conducive to organisations becoming profitable.

Some of the business opportunities available in the free trade zones across Nigeria include supply of raw materials, provision of cleaning services, freight forwarding services, cold storage facilities, warehousing facilities, security services, manufacture of electrical and electronic products, leather products, plastic products, petroleum products, rubber products, cosmetics, garments, chemical products, metal products, educational materials and equipment, sports equipment and material amongst others.

The term free trade zone is often used interchangeably with export processing zones. The former refers to specially designated geographical areas within a nation that are exempted from the regulations and taxation normally imposed on business while the latter refers to a designated area in a country in which production for export is encouraged, usually by special tax treatment and by permitting firms to import duty-free so long as the imports are used as inputs in production of export.

Overall, there are 25 special economic zones. These zones are established to provide 'one-stop service'to investors who are willing to reduce the time and other procedures in the investment process. The one-stop service is an on-site-service and enables the investor to apply for the establishment of factory and another service quicker and at lower costs.

***Table 3-1.* List of Special Economic Zones in Nigeria** (Source: Nigeria Export Promotion Zone Board)

No	Name	Location
1	Calabar Free Trade Zone (CFTZ)	Cross River
2	Kano Free Trade Zone (KFTZ)	Kano
3	Tinapa Free Zone & Resort	Cross River
4	Snake Island Int. Free Zone	Lagos
5	Maigatari Border Free Zone	Jigawa
6	Ladol Logistics Free Zone	Lagos
7	Airline Services EPZ	Lagos
8	ALSCON EPZ	Akwa Ibom
9	Sebore Farms EPZ	Adamawa
10	Ogun Guandong FT Zone	Ogun
11	Lekki Free Zone	Lagos
12	Abuja Tech. Village Free Zone	FCT
13	Ibom Science & Tech. FZ	Akwa Ibom
14	Lagos Free Trade Zone	Lagos
15	Olokola Free Trade Zone	Ondo & Ogun
16	Living Spring Free Zone	Osun
17	Brass LNG Free Zone	Bayelsa
18	Banki Border Free Zone	Borno
19	Oils Integrated Logistics Services Free Zone	Lagos
20	Specialized Railway Industrial FTZ	Ogun
21	Imo Guangdong FTZ	Imo
22	Kwara Free Zone	Kwara
23	Koko Free Trade Zone	Delta
24	Oluyole Free Zone	Oyo
25	Ibom Industrial Free Zone	Akwa Ibom

3.6.2 SMEs Related Policies

The regulatory environment constitutes an important component required to ensure the growth and development of a viable and vibrant SME sub-sector of the economy. It has been posited that the operating environment such as government policies, effects of globalisation, activities of financial institutions, local government policies, and SMEs'attitude to work and their inherent characteristics were factors responsible for the challenges that SMEs faced in their operations (Onugu, 2005). Regulation is part and parcel of contemporary business life as it helps to shield the businesses, the employees, and the general public from unwarranted risks just as it protects the environment from pollution. Besides, regulation is the medium through which government targets her policy aims and objectives. The regulatory environment includes all the stipulated conditions, rules and regulations, as well as the government policies and guidelines that dictate the setting up of SMEs and that influence their mode of operations. In this context, therefore, the regulatory environment includes the legal framework, financing regulations, tax administration, as well as ownership and management structure among others.

Policies and regulations targeted at the promotion of SMEs in Nigeria can be traced to include the Nigeria Enterprises Promotion Act No. 3 of 1997; Patent Right and Design Act No. 60 of 1979; and Industrial Development Tax Act No. 2 of 1971 among others. Some microlending institutions established to enhance capacity and development of SMEs were identified in Ogechukwu (2006) as including the defunct Nigerian Bank for Commerce and Industry (NBCI), National Economic Reconstruction Fund (NERF) and the National Export and Import Bank (NEIB). Others are the Bank of Industry (BOI), Small and Medium Scale Enterprises Development Agency of Nigeria (SMEDAN), National Poverty Eradication Programme (NAPEP), National Economic Empowerment and Development Strategies (NEEDS), Small and Medium Industries Equity Investment Scheme (SMIEIS), Small and Medium Enterprises Credit Guarantee Scheme (SMECGS) and the Microfinance Development Fund (MDF).

The government of Nigeria has adopted a framework for the development of SMEs in alignment with the core rectangular strategy. The framework for the development of SMEs focuses on three main issues: (1) regulatory and legal framework, (2) access to finance and (3) SMEs support activities. The main interest of the thesis lies in the third key issue, SMEs' support activities. There is no need for government intervention when the market is efficient. However, with the presence of public goods or the failure of markets, the role of government is needed. According to the SMEs' development framework, the supporting activities will include support for improved access to the market, upgrading the technology and human resource and developing linkages, especially with large enterprises.

3.7 Conclusion

Over the years, the structure of the Nigerian economy moves along a transformation and transition trajectory of its structures. Before late 1980, the country adopted the planned economy, where the agricultural sector was the main sector of the economy regarding revenue, growth and investment. After the introduction of the structural adjustment programme in 1988, the country adopted the free-market economy, and the growth of manufacturing and service sectors has been noticeable. After 2009, the growth of the service industry superseded that of the agricultural and industrial sector. The growth of the country regarding GDP has been dwindling however in the last ten years and the petroleum sector has contributed to the GDP more than ever before.

The service sector with high potential growth includes the telecommunication, financial services and trade sectors. The industrial sector with high-potential to grow are the crude petroleum and natural gas sector, solid mineral sector and food and beverages and tobacco sector.Major export markets include the US, EU, South American countries and Asia. The agricultural sector seems sluggish regarding exportation and external revenue creation and alsoregarding output; however, the crop production sector has produced significantly more than other sectors within the agricultural industry.

Industry linkages in Nigeria based on the input-output table created reveal that the country tends to have a considerable amount of strong forward and backward linkages. The growth and investment of the petroleum sector do induce growth on other related sectors through those linkages. After adopting the free market policies in 1988, and with the integration of membership in world organisationssuch as the WTO, the country experiences a high inflow of FDI. The top investors in Nigeria are the EU, US, Canada, China and South American investors. The most favoured sector for foreign investment is between the industrial and service sector especially the petroleum sector, communication sector and the financial sector. Compared to other sub-Saharan states, Nigeria can attract more FDI. However, Nigeria still receives less amounts of FDI than South-Africa and Egypt. In fact, the role of FDI in promoting growth and generating employment and transferring technology is very significant for Nigeria.

The next couple of chapters capture various estimations from productivity through to the inclusion of horizontal and vertical industry integration. Chapter 4 provides an empirical approach toward productivity spill-overs, FDI and industry linkages. The chapter analysed intra-sectoral spill-overs and inter-sectoral spill-overs; which included forward and backward linkages. The chapter also introduced new proxies for absorptive capacity and defines technology gap through mathematical formulation. Chapter 5 explores the role innovation inproductivity and defines firm-level innovation empirically. Chapter 6 provides both a theoretical and empirical approach towards spill-overs and industry linkages by looking at the impact of export-platform FDI on backward linkages in the host country. Chapter 7 provides an empirical approach toward FDI and financial constraints of domestic firms using a modified Euler framework. Chapter 8 provides the overall conclusion of the thesis which points out how the research questions were answered and indicated issues where there was the need for further research.

CHAPTER 4: Productivity Spill-overs, FDI and Industry Linkages

4.1 Introduction

The host country expects that the technology brought by FDI can spill-over to domestic firms and promote growth because theories of multinational firms and FDI suggest that foreign firms possess superior knowledge, which is their competitive advantage (Markusen & Venables, 1999; Penrose, 1956). Furthermore, the experience of the emerging economies shows that such spill-overs promote growth.

In Nigeria, the amount of FDI has rapidly increased from 2003 to 2016; totalling about US$ 107.36 billion in capital investment. The most-favoured investment sector is the coal, oil and natural gas sector which account for 60% of total investment. Moreover, along with policies to attract FDI, the Nigerian Government is also implementing several policies to support domestic small and medium-scale enterprises (SMEs).

Developing country governments often provide investment incentives targeting foreign firms to attract foreign direct investment (FDI) boost capital formation and enhance the quality of capital stock in their economies. FDI is often seen as a vehicle for increases in productivity and consequently, as a driver for economic growth. Specifically, foreign presence in each sector is often associated with the transfer of superior technical and managerial know-how, better organisational practices, etc., that not only improves the productivity of firms that are recipients of FDI, but also spills over into the surrounding economy through worker turnover and/or demonstration effects (Damijan & Knell, 2003; Vahter, 2004). Not surprisingly, developing countries go to great lengths to provide investment incentives targeted at foreign firms. According to the 2005 World Investment Report, no fewer than 2156 regulatory changes in investment regimes were introduced by 102 countries between 1991 and 2004, of which 93% were more favourable to FDI, and only 7% were less favourable to FDI (UNCTAD, 2005).

FDI spill-overs can be broadly defined as the impact of foreign firms'presence on domestic firms'economic performance. The standard approach in the empirical literature is to analyse spill-overs as complementaryanalysis explaining total factor productivity (TFP) in a production function framework. Spill-overs are based on different types of linkages between MNEs and local firms. First, spill-overs can flow from foreign to local firms (international spill-overs) or, conversely, from local to foreign firms (reverse spill-overs). A second distinction can be made between horizontal (between firms belonging to the same industry) and vertical spill-overs (between firms and their suppliers or customers). Furthermore, the presence of specific vertical relationships between firms, such as outsourcing, or the absorptive capacity of firms may influence spill-overs.

In this literature, horizontal spill-overs are distinguished from vertical effects. Horizontal spill-overs occur between firms in similar stages of the production chain, while vertical spill-overs occur between firms in customer-supplier relationships. Horizontal spill-overs have received widespread attention at least since Caves (1974). The vertical spill-over discussion launched by Lall (1980) and McAleese and McDonald (1978) languished for nearly two decades before the theoretical work by Markusen and Venables (1999) andRodriguex-Clare (1996) and empirical work by Jaxorcik (2004) revived the interest in vertical spill-overs as a more likely channel for (positive) productivity spill-overs.Since then, a considerable amount of empirical work has focused on vertical spill-overs and has found that especially backward spill-overs are more likely to generate a substantial positive impact on domestic firms' TFP, often outweighing horizontal spill-overs, for which the empirical evidence is much more mixed (see Crespo & Fontoura, 2007; Görg & Greenaxay, 2004; Meyer & Sinani, 2009). Based on a meta-analysis of 1996 estimates of backward spill-overs (covering literature up to March 31, 2010), Havranek and Irsoxa (2011) confirm that the average spill-over to suppliers is economically significant.

The studies of the 1980s and 1990s use a pipeline model: they presume that spill-overs are independent of domestic firms' capabilities. In the 2000s, a shift occurs toward the domestic capability model. This new strand of the literature assumes that spill-overs do not occur automatically, but may depend on the capabilities of domestic firms. The findings, however, remain contradictory. Blyde, Kugler and Stein (2004) for Venezuela, Bwalya (2006) for Zambia, Chudnovsky, Lopez and Rossi (2008) andMarin and Bell (2006) for Argentina, and Mebratie and Bedi (2013) for South Africa did not find any spill-overs. Jordaan (2008a, 2008b) for Mexico and Waldkirch and Ofosu (2010) for Ghana found negative FDI effects. In contrast to these findings, studies of Asian countries report positive spill-overs (Khalifah & Adam, 2009 for Malaysia; Nguyen & Nguyen, 2007, for Vietnam; Taymaz & Yilmaz, 2008, for Turkey). Because of the possibility of spill-over effects from FDI, empirical studies that model the productivity gains from foreign presence often include gains to domestic firms that are not direct recipients of foreign investment. However, the evidence on whether FDI is the source of positive (or negative) productivity spill-over effects is decidedly mixed (for a good overview see Fan, 2003). Studies using data from industrialised countries are, on average, more likely to find positive intra-sectoral spill-overs from FDI (Driffield, 2001;Globerman, 1979;Liu et al., 2000). For developing countries, however, data is often incomplete and, historically, there have been few studies of productivity spillovers from FDI. More recently, the increasing availability of better datasets for a larger number of countries has produced a significant increase in the number of such studies, but the results across countries remain inconclusive.

FDI is often seen as a catalyst for a country's development and economic growth, which is the reason for attracting FDI to a country. The expectation of higher return from investment than domestic counterparts leads a plant to operate in a foreign country. Local firms could indirectly benefit from the presence of foreign firms if foreign firms could not prevent technological externalities. There is a large economic literature that stresses the importance of FDI and its spill-over effects to the host economy (Görg & Greenaway 2004). Spill-over effects may take place when the entry or presence of foreign firms leads to productivity and efficiency benefits in the host country's local firms (Blomström & Kokko 1998). Such benefits, however, may raise the productivity of indigenous plants without compensating the foreign firms. The spill-over effects of foreign firms to the local industries can be divided into two groups; Inter- and Intra- industry spill-over effects:

4.2 Intra- Sectoral (horizontal) spill-overs

This is the most researched topic in the literature as far as benefits of FDI are concerned. Horizontal spill-over arises from the presence of MNCs in a sector and its influence on the host sector's competitors (Halpern and Muraközy 2007). According to Görg and Greenway (2004), there are four transmission channels through which horizontal spill-over effects might occur. These are (a) imitation: This is the classic type of technology spill-over (Görg & Greenaway 2004; Wang & Blomström 1992). It mainly involves imitation of proprietary technology, management and marketing skills of the foreign firms (Halpern & Muraközy 2007). In other words, as such, imitation of new technologies may enhance the productivity of local firms. (b) Human capital and labour turnover: when domestic workers trained by or having worked in MNCs' affiliates may decide to leave and join an existing domestic firm, or open up a new domestic firm, taking with them some or all of the MNC-specific knowledge (Fosfuri et al. 2001). Thus, this can generate productivity improvement via two mechanisms (Görg & Greenaway 2004). First, a direct spill-over to complementary workers, as skilled labour working alongside unskilled labour tends to raise the productivity of the latter. Second, workers that move carry knowledge with them of new technology; new management techniques and consequently can become direct agents of technology transfer. Human capital is a very important factor for a company. Human capital is determined by the quality and equity of the domestic educational and training system. MNEs' main reason to go abroad is often that of low wages. At the same time, they demand relatively skilled labour (ibid). This can be arranged through training. They create exposure to modern technology and management techniques. (c) Competition: when the increase in competition that occurs because of foreign entry forces domestic firms to introduce new technology and increase their efficiency (Glass & Saggi 2002). However, the competition effect may entail adverse effects on the part of the domestic firms if their cost of production drastically increases because of the competition. (d) Export: through cooperation, or most likely imitation, local firms can acquire penetration tactics which are deemed to be essential for the export market (Görg & Greenaway 2004). Hence, local firms may experience a reduction in costs associated with exportation due to the presence of foreign firms.

Externalities may also be observed through industrial management. According to Blomström and Sjöholm (1999), when more foreign affiliates operate in a sector of the host economy, domestic firms enhance their productivity by imitating foreign production technologies. They will also invest more in product development and quality assurance, or simply allocate resources more efficiently to stay competitive. Likewise, domestic business partners of jointly-invested projects can apply management skills acquired from their foreign partners in projects of their own.

Other channels for the diffusion of information on foreign market conditions are trade associations and other industry organisations, of which MNEs are often a member. This kind of market access spill-overs may be most important where the indigenous resources are weakest, especially in developing countries (Blomström & Kokko, 1996,1998)

However, spill-over effects may depend on the technological gap between foreign and indigenous firms. It is believed that before the technologyis widely spread in the market, local companies have little information about the benefits of the technology (Blomström and Kokko 1996). This makes it risky to implement the technology, but when they come in touch with the existing users, more information will be available, and uncertainty will be removed. Then it is likely that adoption or imitation of the technology by local companies increases.

However, it is unlikely to anticipate spill-over benefits having a huge technological gap between the foreign and domestic firms (Blomström & Sjöholm 1999).

MNCs may try to prevent the leakage of technology to the domestic firms. This mainly occurs when MNCs afraid to lose their intangible assets to a local partner;therefore they may abandon investing or else, bring technologies of low quality to their subsidiaries (Blomström & Kokko 1998). In other words, MNCs may try to internalise their intangible assets. Consequently, in such circumstances, the possibility of acquiring positive externalities will be low. Also, leakages of the MNCs' technology do not occur automatically. Local companies must be active to search for information, reverse engineering, personnel training for the new production methods, etc. This makes it costly and time-consuming.

According to the literature, foreign subsidiaries are expected to be more productive than local firms (Aitken & Harrison 1999; Blomström & Kokko 1996). This is due to higher technology inputs and a more efficient production and distribution process. MNEs affiliates work on lower production and distribution costs than local firms and are therefore able to compete more successfully. On the other hand, their knowledge of local markets and consumer preferences may be a disadvantage. Their higher productive efficiency helps to increase the productivity in their industries, which is beneficial for the general productivity of the host country.

There is little or no consensus in the empirical literature regarding the effect of horizontal spill-overs. Keller and Yeaple (2009) highlight a positive horizontal effect for the U.S. manufacturing firms, and Sánchez-Sellero, Rosell-Martínez and García-Vázquez (2014) report evidence of horizontal spill-overs in Spain. However, Reganati and Sica (2007) find limited evidence of horizontal spill-overs for Italian manufacturing firms and Kugler (2006) obtains similar mitigated results for Colombian firms.

Horizontal spill-overs can also operate in the opposite direction, i.e. from local firms to MNEs' affiliates (Blanchard & Mathieu 2016; Driffield & Love 2003; Potterie & Lichtenberg 2001). The same arguments apply to these reverse spill-overs as to international spill-overs. According to Driffield and Love (2003), whose study was based on the U.K. manufacturing sector over the 1984–1992 period, reverse spill-overs were sectorally limited to relatively R&D-intensive industries and were geographically restricted to locations with a high degree of spatial concentration in the industry. From a panel of French firms over the 1990–2003 period, Blanchard and Mathieu (2016) report that reverse spill-overs were present not only in R&D-intensive manufacturing industries but also in knowledge-intensive service industries.

4.3 Inter-Sectoral (vertical) spill-overs

Vertical spill-overs occur when the knowledge held by MNEs in the host country reaches the suppliers and customers of their affiliates in the upstream and downstream sectors, respectively. These spill-overs primarily occur through transactional processes (outsourcing contracts, cooperative agreements or arm's length transactions) and are either backward, when MNEs' affiliates are supplied by local firms in the upstream sector, or forward, when local firms purchase their inputs from foreign firms (Clark, Highfill, de Oliveira Campino & Rehman, 2011; Gorg & Greenaway 2004;).

It occurs through foreign companies' impact on the local suppliers/buyers. Vertical spill-overs take place when the foreign firm and a local supplier/buyer, in different sectors, are engaged in a long-term relationship (Halpern and Muraközy 2007). Inter-sectoral spill-overs appear through the creation of linkages between the foreign company and domestic firms, and it is a process that is mostly multi-sectoral (Javorcik 2004). There exist two types of linkages between the domestic and foreign firms, i.e., backward and forward linkages. Spill-overs in the downstream sectors, which are known as backward linkages, occur when the local suppliers have to meet the demand from the foreign firm in the form of higher quality, price and delivery standards (Javorcik 2004). Another implication of inter-industry spill-over effects is the increased demand by the MNC for local intermediate inputs, thus increasing production possibilities in the host economy (ibid). Similarly, MNCs may provide new and better intermediate inputs with affordable prices to local customers. Hence, this interaction in the upstream sector may be vital for the transmission of technology. In support of these theories, there are case studies which show that knowledge is transferred from downstream foreign affiliates to upstream domestic suppliers through intensive monitoring, training, and assistance as well as supervision in the implementation of new technologies (Moran, 2001). Moreover, if there is a technology gap between the foreign and the domestic firms, there is potential for technological improvement in the host economy. The local firms must upgrade their products to meet the foreign firm's demand for advanced products. In summary, the lack of observed positive horizontal spill-overs from FDI leads researchers to search for spill-overs across industries through forward and backward linkages.

In contrast, forward FDI is the FDI in the input industry that supplies high-quality intermediate goods to domestic producers of final products. By supplying intermediate goods of high quality, foreign firms indirectly help improve the productivity of their domestic buyers. This relationship was empirically studied by Javorcik (2004).

Although it is clear in the theory how backward or forward FDI facilitates the productivity spill-over, empirical evidence of the effect of these two channels is mixed. Some researchers find positive productivity spill-over (Bitzer, Geishecker & Gorg, 2008; Blalock & Gertler, 2009; Jabbour & Mucchielli, 2007; Javorcik, 2004) while other researchers report only limited or weak vertical productivity spill-over (Girma & Gong, 2008; Giuliani, 2008).

There is greater empirical consensus for vertical spill-overs than for horizontal spill-overs, as noted previously by Havranek and Irsova (2011) in a quantitative review of the literature on international vertical FDI spill-overs. Conducting a meta-analysis (a collection of 3,626 estimates covering 47 countries) and accounting for misspecification and publication biases, the authors argue that there is evidence of a large positive effect of backward spill-overs and a small effect of forward spill-overs.

Outsourcing relationships between MNEs' affiliates and local firms may amplify backward spill-over effects. Indeed, affiliates may demand a greater volume of specific intermediate inputs from their local upstream outsourcers than they can purchase on the local market. MNEs' affiliates may perceive that a large share of their technology must be transferred to local outsourcers to allow the latter to meet MNEs' quality requirements for intermediate products (Pack and Saggi 2001). Regarding forward linkages between MNEs' outsourcers and local customers, knowledge transfers arise through three main channels: product embodied knowledge, exchanges with sales employees and exchanges with customer service employees. The availability of higher quality inputs and services as a result of inward FDI enhances the productivity of local firms, provided that such firms can absorb this foreign knowledge. Conversely, if inputs are overly expensive or are not adapted to local requirements, then the effect will be negative. Paradoxically, the potential amplification effect of outsourcing relationships has not been explored, except in Girma and Görg (2004). Using a panel of the UK manufacturing establishments over the 1980 to 1992 period, they demonstrate that MNEs' affiliates have a greater propensity to outsource than local firms do.

The magnitude of vertical spill-overs may also depend on the technological capacity of local firms. A smaller technological gap between local firms and foreign firms is typically associated with greater externalities, as shown by Liu (2008) for knowledge spill-overs in the UK and by Behera (2015) in India. Here, the absorptive capacity of firms determines their ability to assimilate and utilise the available external information (Cohen & Levinthal 1989).

In a recent contribution, Barrios and Strobl (2011) challenged some of the implicit assumptions underlying the measure for vertical spill-overs proposed by Javorcik (2004). For a panel of Irish firms, they found that alternative measures yielded different results. Although Barrios and Strobl (2011) dealt with several important issues, including the use of input-output tables in constructing spill-over variables, they did not consider the level of industry aggregation in these tables as potentially affecting spill-over effects. However, given the way horizontal and vertical spill-over variables were typically defined and constructed, the level of industry aggregation was crucial in discriminating between horizontal and vertical spill-overs. Following Caves (1974), most empirical work defined the variable to capture the horizontal spill-over potential as the share of industry output produced by foreign firms. Because firm-level data on linkages with foreign affiliates were usually unavailable, variables to capture vertical spill-over potential were calculated -following Javorcik (2004)- as a weighted average of foreign presence (measured by the horizontal variable) in industries upstream and downstream of a domestic firm in a given industry. These weights are technical coefficients derived from input-output (IO) tables, conveying industry-level relationships with upstream and downstream industries. Therefore, the input-output tables' level of industry aggregation determines the definition of horizontal and vertical spill-overs. The more aggregated the input-output tables used, the more likely that the horizontal spill-over variable will also capture customer-supplier relationships. Recent work by Alfaro and Charlton (2009) makes a similar point in a closely related matter: the classification of multinational firms' investment as horizontal or vertical. They show that for a large sample of multinational firms, that due to a finer level of detail in industry classification,considerably more multinational investment than previously thought should be classified as vertical rather than horizontal.

What explains these differentials in the findings on productivity spill-over? Among the myriad factors, two important explanations are technology gap and absorptive capacity of domestic firms.

Existing conceptual debates suggest that the technology gap between domestic firms and foreign firms influences the ability of domestic firms to benefit from the productivity spill-over, but it is unclear whether a large gap or a small gap is better. Findlay (1978) argues that the rate of technological progress in the relatively "backward region" is an increasing function of the gap between its level of technology and that of the "advanced region". The gap indicates the existence of new technological knowledge for domestic firms to learn. However, this disparity must not be too wide for the thesis to hold. In contrast, Wang and Blomstrom (1992) explain that the profit of the domestic firm is negatively related to the technology gap, while that of the multinational firm is positively related to the gap.

Conversely, firms which are already technologically advanced are thought to have little room for further advancement. This is supported by the works of Chuang and Hsu (2004), Jordaan (2008, 2013), Lai, Wang, and Zhu (2009), Sjöholm (2007), Smeets (2008), Tian, Jiang, and Jiang (2010), Xu and Zhao (2012) and Yin and Zhou (2014). The other strand of the literature emphasises the importance of a small technology gap in aiding technology transfer from foreign firms, given that these firms have the basic skills level to follow and adopt the technology being used by foreign-owned firms (Cantwell, 2009). This is endorsed by the works of Dimelis (2005), Farole and Deborah (2015), Hamida and Gugler (2009), Jabbour and Mucchielli (2007), Marcin (2008), Takii (2005), Ubeda and Pérez-Hernández (2016) and Wang et al. (2016). Thus, the current literature either accepts or rejects the sweeping statement that absorptive capacity matters for FDI spill-overs, but is devoid of differentiating whether intra- or inter-industrial linkages between local and foreign affiliates may respond differently to changes in absorptive capacity (Imbriani, Pittiglio, Reganati & Sica 2014; Khalifah, Salleh & Adam 2015).

Therefore, when the gap is small, foreign firms transfer more advanced technology as they need to compete with domestic firms to guarantee their profits (Glass & Saggi, 1998).

Existing empirical studies also report conflicting findings on the effect of the technology gap on productivity spill-over. In the case of Mexican manufacturing firms, Kokko (1994) shows that large gap (ratio of value added per worker of foreign firms to that of domestic firms) is an obstacle to productivity spill-over. Using the ratio of total factor productivity (TFP) to the maximum TFP in the UK's electronic and engineering sector, Girma and Gorg (2007) showed that reduction in the technology gap enhanced the ability of domestic firms to benefit from the productivity spill-overs. In contrast, Castellani and Zanfei (2003), measuring the technology gap by using the ratio of domestic firms' TFP to their industries' average TFP, fnd that a large gap positively affects the technology transfer.

Nelson and Phelps (1966) were among the first to assert the crucial role of absorptive capacity on growth, emphasising the link between higher education and technological diffusion. Their approach assigned an indirect role for human capital (through its incidence in technology), rather than the more conventional consideration of human capital as an additional input of production. In the same line, Cohen and Levinthal (1990) argued that the ability to exploit external knowledge is largely a function of prior related knowledge, which depends, among other factors, on the advanced technical training of workers; whereas Benhabib and Spiegel (1994) claimed that the ability of an economy to adopt and implement external technology depended on its human capital stock. Recent empirical evidence has provided support for the role of human capital as a key determinant of absorptive capacity. For example, results on the entrepreneurial activity in the U.S. metropolitan areas studied by Qian et al. (2013) led the authors to conclude that the chief contribution of human capital was on building entrepreneurial absorptive capacity rather than creating knowledge-based entrepreneurial opportunities. On the other hand, technological diffusion soon became linked with geography. For instance, Keller (2002) found that technological spill-overs were local, not global, as the benefits from foreign externalities decreased with distance. The idea of spatially bounded spill-overs, in addition to the stylized fact of a spatial distribution of wealth and poverty in the world, plus the development of the New Economic Geography literature (see for instance, Krugman, 1991) made the spatial dependence patterns almost impossible to ignore in the analysis. In recent years, Ertur and Koch (2007), Fingleton and L´opez-Bazo (2006), Koch (2008, 2010) and L´opez-Bazo, Vaya and Artis (2004) proposed growth models that explicitly accounted for spatial dependence and externalities. Basile, Capello and Caragliu (2012) even claimed that other forms of proximity, such as technological, relational and social, reinforced the effects of geographical proximity.

On the other hand, the question arises as to precisely how absorptive capacity affects productivity spill-over. Firstly, Cohen and Levinthal (1989, p. 128) define the term "absorptive capacity" as "the ability to recognise the value of new information, assimilate it and apply it for commercial end". They explain that an organisation needs prior related knowledge to assimilate new knowledge (Cohen & Levithal, 1989,1990). So far, existing studies have employed various indicators of absorptive capacity, including research and development (R&D) and non-R&D, to investigate the effect of absorptive capacity on productivity spill-over. R&D represents the absorptive capacity of firms because investment in R&D gives domestic firms prior knowledge that enables them to acquire new knowledge from foreign firms. They also postulate that there are costs associated with the imitation of new knowledge, but those costs are minimisedby existing R&D conducted by the firm to enhance its absorptive capacity in the relevant field.

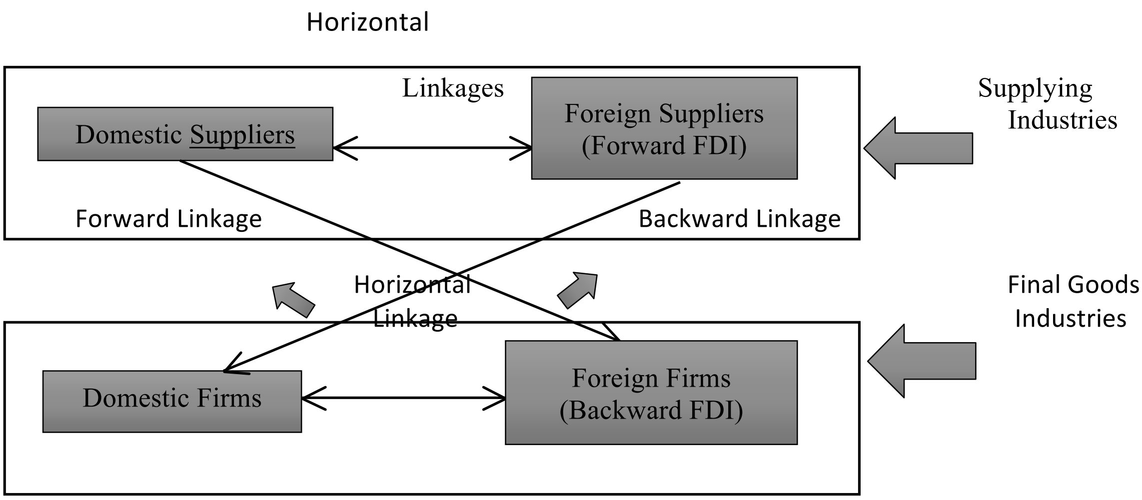
Findings from existing studies consistently suggest the positive impact of absorptive capacity on productivity spill-over. For example, Cohen and Levinthal (1989) studiedUS firms and found that they hada high level of ability to acquire new knowledge due to their munificent investment in R&D activities. Similarly, Kinoshita (2000) and Griffith, Redding and Reenen (2004) have found that R&D enabled domestic firms to imitate the technology of foreign firms in the case of the Czech Republic and in 12 OECD countries. Regarding non-R&D indicators, Barrios and Strobl (2002) and Girma, Gorg and Pisu (2008) showed that the export status of domestic firms in Spain and UK, as an indicator of absorptive capacity, affected their ability to benefit from the productivity spill-over.

The previous literature's application of quantile regressions to productivity spill-overs is limited to the works of Békés, Kleinert, and Toubal (2009), Dimelis (2005), Görg and Girma (2005), Kim (2015) and Kosteas (2008). The first two studies explicitly allow for the role of absorptive capacity onto FDI spill-overs originating from intra-industrial linkages, while ignoring inter-industrial linkages altogether. Görg and Girma (2005) found that absorptive capacity mattered and that a U-shaped relationship existed between productivity growth and FDI interacting with absorptive capacity. This implies that any increase in absorptive capacity beyond a certain threshold level translates into an increase in the benefits from horizontal spill-overs, and if it is below this threshold, it results in a decrease in firm-level productivity. For the UK electronics sector, the firms located in the lowest quantiles benefited the most from an increase in absorptive capacity beyond the threshold level while, in the engineering sector, firms located in the highest quantiles tended to benefit the most. Using firm-level data for Greece, Dimelis (2005) also found evidence that the significance of the interaction term between horizontal spill-overs and absorptive capacity varied across quantiles, wherein the highest impact was noted for firms located in the middle and upper quantiles of the growth distribution. Similarly, Kim (2015) allows for interaction between absorptive capacity and FDI-induced intra- and intersectoral spill-overs to conclude a heterogeneous response to an increase in absorptive capacity across quantiles, with firms located in higher quantiles possessing greater ability to capture the positive horizontal spill-overs as absorptive capacity increases. As for forward spill-overs, an increase in absorptive capacity enhanced forward spill-overs for firms operating in the twenty-fifth and fiftieth quantiles, while absorptive capacity retarded backward spill-overs for firms operating in the median quantile. This heterogeneous response of intra- and inter-sectoral linkages across quantiles suggests the need to identify the profile of firms which benefited the most as a result of an increase in their absorptive capacity.

Kosteas' (2008) study, which does not explicitly incorporate the technology gap into its regression model, finds a positive and significant impact of horizontal spill-overs for Mexico; however, these benefits are only experienced by firms operating in the higher quantiles. Békés, Kleinert, and Toubal (2009), using firm-level data for Hungary and incorporating the effects of both intra- and inter-industry spill-overs on firm-level productivity, reveal that horizontal and backward spill-overs have a negative impact on local TFP for the least productive firms, i.e., for firms operating in the lower quantiles. However, the impact monotonically increases and becomes positive for higher quantiles. As for forward linkages, a positive impact emerges for Hungarian firms, which decreases with higher quantiles. Békés, Kleinert, and Toubal (2009), however, fall short of incorporating the role of absorptive capacity into the model.

This study is conceived with the aim of filling two substantial gaps in the existing literature (see Figure 4-1 for the analytical framework). Firstly, very few studies have examined the effect of vertical FDI and the technology gap on the productivity spill-over on domestic firms. Moreover, notwithstanding the fact that the productivity spill-over can occur through vertical and horizontal channels, only a limited number of studies have been conducted to examine the effect of vertical productivity spill-over and the technology gap together (see, for example, Marcin, 2008; Girma et al., 2008; Wang, 2010). Most of the existing studies on technology gap and productivity spill-over focus principally on the horizontal productivity spill-over. This study, therefore, extends the literature by incorporating both vertical and horizontal channels into the investigation. To put it another way, this paper examines how backward and forward FDI affect the productivity of domestic firms when there is a gap in the technology level between domestic firms and foreign firms.

Figure 4-1. **Analytical Framework of Industry Linkages and FDI**



Secondly, this study attempts to introduce two new proxies of absorptive capacity to measure the effect of absorptive capacity on productivity spill-over. In the case of labour-intensive and service firms, the proxies of workers' education and training seem more suitable than those of R&D for two reasons. Firstly, as it is labour-intensive, FDI often brings less complicated technology to host countries; hence, domestic firms do not necessarily invest heavily in R&D activities to catch up with foreign firms. The high level of workers' education and additional training may do the work. Secondly, although R&D is probably needed, SMEs may not have a sufficient budget to spend on it. For these reasons, R&D is probably less visible in the case of labour-intensive and service industries. Wang (2010) also uses workers' education to examine the effect of absorptive capacity in the vertical channel.

This study chooses to analyse evidence of spill-overs in Nigeria for three reasons. Firstly, Nigeria has enjoyed impressive economic growth due to the largeinflow of FDI. Secondly, along with efforts to attract FDI, the Nigerian Government is also working hard to promote SMEs. Finally, although there are a few studies examining the productivity spill-over in manufacturing firms in Nigeria (see, for example, (Adejumo, 2013, Dutse, 2012; Dutse, Okwoli & Kurfi, 2011; Onyekwena, 2012) and reporting positive spill-over from FDI, they did not investigate the effect of the vertical linkages and technology gap on productivity spill-over.

The findings show that domestic firms can benefit from the productivity spill-over when the level of their technology is moderately below that of the foreign firms. The absorptive capacity measured by workers' education and training do not have statistically significant effects on the productivity spill-over.

The next section will look at how best to analyse productivity spill-overs and absorptive capacity and what model econometrically can be used. The section will look at previous methods used and willjustify the selected model as best fitting the objective of this research work. Also, the model will include capturing problems of unobserved variables as well as simultaneity bias.

4.4 Methodology and Data

4.4.1 Model specification

It is widely believed that FDI is an important resource to increase a domestic firm's productivity and efficiency through positive spill-over effects. Due to this strong belief in the positive effects of FDI, governments of developing countries try to attract more FDI by providing many types of incentives such as tax holidays and regulatory exemptions. Since multinational firms are usually technologically and managerially superior to domestic firms in developing countries, the presence of multinational firms benefit domestic firms through technology and information spill-over. As discussed in the previous literature (Blomström 1986; Blomström & Kokko 1998; Liu 2008; Suyanto et al. 2012; Suyanto & Salim 2013) show that FDI generates positive knowledge externalities such as new technology and advanced managerial skills in the host country. These knowledge spill-over effects of FDI may enhance efficiency and raise the productivity of a domestic firm. However, there exists mixed empirical evidence that proves the beneficial spill-over influence of FDI on the productivity of a domestic firm.

Spill-overs of FDI on the productivity of domestic firms linked to the production chain are analysed in many empirical studies. There exists a large body of literature that focuses on horizontal spill-over from FDI including Aitken and Harrison (1999) on Venezuela; Djankov and Hoekman (2000) on the Czech Republic and Haddad and Harrison (1993) on Morocco. According to Aitken and Harrison (1999), horizontal spill-overs are less likely to be found or can be negative, due to the increase in competition. In other words, foreign multinationals force domestic firms to contract by stealing business from them, resulting in a decrease in the productivity of the domestic firms.

To estimate the productivity spill-over, the researcher follows the conventional method by regressing domestic firms' production level (productivity) on the presence of FDI in the same industries (horizontal FDI), upstream industries (forward FDI) and downstream industries (backwards FDI). Gorg and Greenaway (2004) and Smeets (2008) conducted a thorough literature survey of this conventional method. The effect of productivity spill-over is present if the coefficient of FDI is positive. However, this conventional method, as pointed out by Blalock and Gertler (2009) and Javorcik (2004), has problems of unobserved variable and simultaneity bias. This study deals with these problems by using panel data and random and fixed effect models.

To study how the absorptive capacity and technology gap affect the productivity spill-over, this study uses interaction terms of FDI with proxies of the absorptive capacity and technology gap. The interaction method is used due to its simplicity and the convenience of interpretation. Girma (2005) explains that this method permits identification of the threshold level of absorptive capacity (see also Marcin, 2008; Girma et al., 2008; Blalock and Gertler, 2009).

Following Dimelis and Louri (2004), the production function in Cobb-Douglas form is:

$$Y_{ijt} = L^{\propto}{}_{ijt}K^{\beta}{}_{ijt}M^{y}{}_{ijt}E^{\theta}{}_{ijt}e^{\lambda 0+\lambda FDI_{ijt}} + \varphi FDI_{ijt} * AC_{ijt} + \mu AC_{ijt} + \rho FDI_{ijt} * TGap_{ijt} + \pi TGap_{ijt} + \varepsilon_{ijt} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

Where *Y_{ijt}, L_{ijt}, K_{ijt}, M_{ijt} and E_{ijt}* are output, labour, capital, materials and energy of firm*I* in sector *j* at time *t* respectively. AC is an alternate for absorptive capacity, and *TGap* is the technology gap. *E_{ijt}* is the error term. The Foreign direct investment includes horizontal, backward and forward FDI.

By taking the logarithm of both sides of (1), I have:

$$lnY_{ijt} = \lambda_0 + \alpha lnL_{ijt} + \beta lnK_{ijt} + \gamma lnM_{ijt} + \theta lnE_{ijt} + \lambda FDI_{ijt} + \varphi FDI_{ijt} * AC_{ijt} + \mu AC_{ijt} + \rho FDI_{ijt} * TGap_{ijt} + \pi TGap_{ijt} + \varepsilon_{ijt} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.. (2)$$

By subtracting lnL_{ijt} from both sides of the equation, i get:

$$\ln\left(\frac{Y_{ijt}}{L_{ijt}}\right) = \lambda_0 + \beta\ln\left(\frac{K_{ijt}}{L_{ijt}}\right) + \gamma\ln\left(\frac{M_{ijt}}{L_{ijt}}\right) + \theta\ln\left(\frac{E_{ijt}}{L_{ijt}}\right) + (\alpha+\beta+\gamma+\theta-1)lnL_{ijt} + \lambda FDI_{ijt} + \varphi FDI_{ijt} * AC_{ijt} + \mu AC_{ijt} + \rho FDI_{ijt} * TGap_{ijt} + \pi TGap_{ijt} + \varepsilon_{ijt} \dots\dots (3)$$

To control for time and sector-specific effects, time and sector-specific dummies η_t and a_j are added.

$$\ln\left(\frac{Y_{ijt}}{L_{ijt}}\right) = \lambda_0 + \alpha\ln\left(\frac{K_{ijt}}{L_{ijt}}\right) + \gamma\ln\left(\frac{M_{ijt}}{L_{ijt}}\right) + \theta\ln\left(\frac{E_{ijt}}{L_{ijt}}\right) + (\alpha+\beta+\gamma+\theta-1)lnL_{ijt} + \lambda FDI_{ijt} + \varphi FDI_{ijt} * AC_{ijt} + \mu AC_{ijt} + \rho FDI_{ijt} * TGap_{ijt} + \pi TGap_{ijt} + \eta_t + a_j + \varepsilon_{ijt} \dots\dots (4)$$

Therefore, the estimation equation for labour productivity spill-over is:

$$\ln\left(\frac{Y_{ijt}}{L_{ijt}}\right) = \lambda_0 + \alpha\ln\left(\frac{K_{ijt}}{L_{ijt}}\right) + \gamma\ln\left(\frac{M_{ijt}}{L_{ijt}}\right) + \theta\ln\left(\frac{E_{ijt}}{L_{ijt}}\right) + lnL_{ijt} + \lambda FDI_{ijt} + \varphi FDI_{ijt} * AC_{ijt} + \mu AC_{ijt} + \rho FDI_{ijt} * TGap_{ijt} + \pi TGap_{ijt} + \eta_t + a_j + \varepsilon_{ijt} \dots\dots (5)$$

Where$\delta = (\alpha+\beta+\gamma+\theta-1)$.

Marcin (2008) used the interaction method in his work, and it explained the threshold level of absorptive capacity. His work examined the existence of externalities associated with a foreign direct investment (FDI) in a host country by exploiting firm-level panel data covering the Polish corporate sector. Also, he aimed at distinguishing between horizontal spill-overs (from foreign to domestic firms operating in the same industry) and two types of vertical spill-overs: backward (from FDI in downstream industries) and forward spill-overs (from FDI in upstream industries). The findings from hiswork suggested that local firms benefited from a foreign presence in the same industry and downstream industries. The absorptive capacity of domestic firms was highly relevant to the size of spill-overs: vertical spill-overs were larger for R&D-intensive firms, while firms investing in other (external) types of intangibles benefit more from horizontal spill-overs. Competitive pressure facilitated backward spill-overs, while market power increased the extent of forward spill-overs. Horizontal spill-overs were particularly strong in services, while the remaining results, including backward spill-overs and the role of absorptive capacity and competition, were mainly driven by manufacturing. Host country equity participation in foreign firms was consistent with higher unconditional productivity spill-overs to domestic firms.

Blalock and Gertler (2009) also used the interaction term when measuring technology gap. Their findings suggested that the marginal return to new knowledge was greater for firms that hadmore room to 'catch up' than it was for already competitive firms.

Also, the works of Ubeda and Perez–Hernandez (2016) used the interaction method to investigate the effect of the foreign direct investment on productivity in the Spanish manufacturing industries. The results showed that Spanish domestic firms with high absorptive capacities benefited from positive spill-overs and had sufficient capacity to internalise the more complex knowledge provided by multinational firms. The remainder of the firms were negatively affected by the presence of multinational firms.

The next sub-heading focuses on the description of the data and various variables used in this research work. Descriptive statistics based on the Nigerian context are discussed as well as various sources of data are also explained. The main variables are explained carefully, and the application of mathematical formulas are also explained as well as the symbols used.

4.4.2 Data Description and main variables

From 2003 to early 2016, the total amount of FDI received wasapproximately US$ 107.36 billion, according to the FDI intelligence report 2016. Regardingsome projects, the communication sector received most of the projects in this period. The sector accounted for 11.7% of the total project. The project volume in this sector peaked in 2012 with 14 projects tracked with a capital investment of US$ 15.62 billion from 2003 to 2016. However, the oil sector contributed the highest amount of investment with a bountiful sum of US$ 64.07 billion, and the sector created additional jobs.Regarding industry, the manufacturing industry accounted for most the projects recorded, as it accounted for 27.6% of the projects tracked.

In this study, data from a firm survey conducted in 2013 by the World Bank (data available on the website of the World Bank enterprise surveys) are used. Although the sample target was 2660, there were only 580 firms with complete information which were included in the sample. The surveyed firms consist of both manufacturing and non-manufacturing firms. All the firms were asked about their sales and input used in 2009 and 2013. If the foreign share was 50% or more, the firm was regarded as a foreign firm. The table below shows the distribution of observations.

Based on the input-output table constructed in chapter 2 of this research work, the distribution of firms in the sample indicates that this survey is very suitable for the analysis because it has a similar distribution of the whole population of firms in Nigeria. The table 4-1 below in the appendix shows that the sector is receiving the largest number of foreign firms in the manufacturing industry (35 firms) and is followed by the service industry (9 firms). Food products absorbed the highest number of foreign firms in the manufacturing industry (10 out of 35 firms). Regardingsome foreign firms based on the ownership structure, the food sectorreceived more foreign firms than any other sector. It could be argued that the oil sector in Nigeria captured more foreign investment but, based on the available data and as noticed, there quite an amount of missing data; I have decided to use a uniformed database that records sales and other very important variables.For this reason, some sectors are dropped. However, based on capital structure, the petroleum sector captures more foreign investment. The distribution of firms in Nigeria also follows a similar pattern.

To study the linkages between sectors, the input-output table (I-O Table) of Nigeria is used. There has been one other I-O table for Nigeria. The I-O table was developed in the year 1999 Patrick Osakwe from the trade and regional integration division of the UNECA. Ever since then, there has not been any symmetric I-O table done for Nigeria, at least to the knowledge of the researcher. To this end, a more updated symmetric I-O table has been developed in this research work in other to build the robustness of the findings. The I-O table developed in this work has used data from 2001 through to 2010 to capture the inter-relationship between sectors within the Nigerian economy. The sectors within this I-O table comprises 33 different production sectors, and input is classified into four factors; capital, unskilled labour, skilled labour and land. The second chapter of this research explains in detail what methodology was used to develop the table and speaks about the data sources.

In this chapter, the developed I-O table is used basically because it is more updated than the 1999 table and also because the classification of sectors in the table is very suitable for studies at the firm level. Also, the developed I-O table is more aggregated than the 1999 table. For example, the Global Trade Analysis Project (GTAP) constructed an I-O table for Nigeria based on 2006 data, but it only focused on the agricultural sector and did notconvey a full picture of the whole economy.

To estimate equation five the following four main variables are defined. Output Y is taken from the variable of total sale in the survey questionnaire, which was measured in current US dollars[4]. Labour L is the number of permanent workers in the survey questionnaire. Capital K is measured by spending on investment in land, building and equipment. The spending on investment is chosen to represent capital because there is no panel data on the book value of fixed assets. The information on Material M and Energy E are directly taken from firms' expenditure on material and energy. All relevant variables are deflated using consumer price. All relevant variables are deflated using consumer price index (CPI).

The horizontal FDI is calculated by following Blalock and Gertler (2008) and Javorcik (2004).

$$HFDI_{jt} = \frac{\sum_{i\epsilon j} Foreign\_Y_{ijt}}{\sum_{i\epsilon j} Y_{ijt}} \dots\dots\dots\dots..(6)$$

Where $\Sigma_{i\epsilon j}$indicates, the summation is taken over firms in given sector j. $Foreign\_Y_{ijt}$ is equal to the amount of sales Y_{ijt} of firm i if this firm is foreign and 0 if not (otherwise).

As defined in the first section, the backward FDI is the FDI in the final goods sectors that create demand for intermediate goods produced by domestic firms. Similar, to Marcin (2008), it is calculated as follows:

$$BFDI_{jt} = \sum_{k(\neq j)} a_{kj} HFDI_{kt} \dots\dots\dots.(7)$$

The coefficient a_{jk} is the share of sector j's output supplied to sector k in its total output, which is taken from input-output table[5]. Therefore, i can assume that FDI invested within sector k at time t,$HFDI_{kt}$, induces the backward FDI of $a_{jk}HFDI_{kt}$ of sector j which supplies intermediate goods to sector k. If that is the case, $BFDI_{jt}$ defined in equation (7) might be a plausible index of the backward FDI of sector j at time t.

Furthermore, the forward FDI is the FDI in the input industry that supplies intermediate goods to domestic producers of final products. It is calculated as follows;

$$FFDI_{jt} = \sum_{k(\neq j)} a_{kj} HFDI_{kt} = \sum_{k(\neq j)} a_{kj} \left\| \sum_{i\epsilon k} Foreign\_Y_{ikt}] / \left[\sum_{i\epsilon k} Y_{ikt} \right\| \right. \dots\dots.(8)$$

[4]There are many studies that use deflated sales as dependent variable such as Altomonte and Pennings (2009), Barbosa and Eiriz (2009), Bekes, Kleinert, and Toubal (2009), Buckley, Wang, and Jeremy (2007), Chudnovsky, Lopez, and Ross (2008), Damijan and Knell (2005), Du, Harrison, and Jefferson (2011), Monastiriotis and Alegria (2011).

[5] The coefficients αjk and αkj in equations (7) and (8) do not have a time subscript t because i have only one input-output table over the years of analysis.

The coefficient a_{kj} is the share of sector j's input bought from sector k in its total input, which is taken from the input-output table. Therefore, I can assume that FDI invested within sector k at time $t, HFDI_{kt}$, induces the forward FDI of $a_{kj}HFDI_{kt}$ of sector j which buys intermediate goods from sector k. If that is the case, $FFDI_{jt}$ defined in equation (8) might be a plausible index of the forward FDI of sector j at time t.[6]

The table 4-2 in the appendix below presents horizontal, backward and forward FDI indexes calculated by sector. The result shows that the retail sector has significant high indexes when compared to other sectors across the indexes. For example, the horizontal, backward and forward FDI indexes of the retail sector are 0.37, 0.199 and 0.123 respectively. HFDI index of this sector is relatively acceptable because most of the output is produced by foreign firms. Additionally, HFDI index in other sector induces 0.199 unit of backward FDI to the retail sector by supplying intermediate goods to them. Similarly, HFDI in other sector induces 0.123 units of forward FDI to the retail sector by buying intermediate goods from them. However, based on individual indexes, the machinery and equipment sector is the highest within the HFDI index, indicating that all the output of the sector is produced by foreign firms. The service of motor vehicle sector also has a very high HFDI consisting of 0.993 units.

Regarding absorptive capacity, this study uses the percentage H of workers with low secondary education (grade 7th or higher) and a dummy variable TR which indicates whether or not firms offer training to their workers. The table 3-3 in the appendix below presents means of these variables. Although the food sector absorbs the largest number of foreign firms, only 27% of the firms in this sector provide training to their workers. On the other hand, the paper sector, despite its small share in the manufacturing industry, offers the largest amount of training. The construction sector provides the highest amount of training in the service industry. More sectors in the service industry employ workers with secondary education or higher than sectors in the manufacturing industry. Within the manufacturing industry, the paper sector hires the least number of workers with this level of education at 27%.

The technology gap is the difference between a firm's average labour productivity over the period (2009 and 2013) and that of all foreign firms in the same sector. The technology gap is

[6] Equation (8) is slightly different from the forward FDI defined by Javorcik (2004): $FFDIjt = \alpha kjForeignShareikt*(Yikt-Xikt)\ i\in k$ / $(Yikt-Xikt)\ i\in kk(\neq j)$ where ForeignShare is used as weight to sum up over firms, while equation (8) uses zero weight for non-foreign firms whose share of equity owned by foreign investors falls short of 50%. Note also that equation (8) does not subtract export. Equation (8) is used because data on foreign share and export for year 2009 and 2013 is not available.

the natural logarithm of the knowledge stock ratio; according to this specification below, the gap (TGap) is positive if $k_l > k_f$ and it is zero if$k_l = k_f$; and negative if$k_l < k_f$, at which case the follower has over taken the leader's position. The technology gap *TGap*$_{ij}$can be calculated by the following formula:

$$TGAP_{\boldsymbol{ij}} = \frac{LP^*{}_j - Mean(LP_{ijt})}{LP_j^*} - \frac{k_l}{k_f} \dots\dots\dots\dots\dots..9$$

Where $LP_{ijt} = \frac{Y_{ijt}}{L_{ijt}}$ $and\ Mean\ (LP_{ijt}) = \frac{(LP_{ij2009} + LP_{ij2013})}{2}$. $LP^*{}_j$ Is the mean of $Mean(LP_{ijt})$ of all foreign firms I in sector j[7]. K_l is the technological knowledge stock of the leader (in most cases the foreign firm), while K_f is the technological knowledge stock of the follower (in most cases the domestic firm). Positivity technology gap means the firm's productivity is below that of foreign firms. A negative technology gap means the opposite.

Table 4-3**,** presents the mean of the technology gap for each of the sector. It showed that onaverage, a large majority of firms are below the international frontier except for wood and furniture sector. However, technology gaps in some sectors are positive with a high amount of training, and this could be as a result of low human capital.

4.5 Estimation Results

Table 4-4 (below in the appendix) indicates that correlations between the horizontal and backward FDI are very low, while the correlation between horizontal FDI and forward FDI is moderately acceptable. The correlation between forward and backward FDI is very high, and this could be because of different factors. Also, table 4-5 below in the appendix also shows proxies of absorptive capacity and technology gap which are included in the estimation equation, and they have a high correlation with each other.The high correlation between the backward and forward FDI could be as result of the foreign firm having an impact on both the production and distribution processes in various industrial sectors. Examples of such industrial sectors are the manufacturing sector and the publishing and printing sector.

The two-year panel data are used to estimate equation (5).To deal with unobservable effects, the author adopts the fixed effect (FE) estimation. Moreover, the Hausman test is used to test the random effect model (RE) against the fixed effect model (FE) estimator for the three

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[7] $TGapij$ has no subscript for time because labour productivity is averaged over the two years.

types of FDI (horizontal, backward and forward). Table 4-6 below in the appendix presents the results of estimated coefficients as well as Hausman test. The result shows that the null hypothesis is strongly rejected. Therefore, the fixed effect is preferred to the random effect.

Based on the results of fixed effect model (FE) estimation, I now examine the interaction terms between technology gap or absorptive capacity and the three types of FDI in table 4-6**.** The coefficients are positive but not statistically significant. Only in the case of horizontal FDI (HFDI) is it significant at 10%. However, the coefficients become statistically significant when all the three types of FDI interact with the technology gap (TGap*HFDI, TGap*BFDI and TGap*FFDI). The coefficients of the interactions terms between FDI and human capital (H*HFDI, H*BFDI and H*FFDI) are negative and statistically insignificant. As for the case of the other interaction term (Training) and the types of FDI (TR*HFDI, TR*BFDI and TR*FFDI), TR*HFDI is negative but statistically significant, while the other two types of FDI are negative and statistically insignificant.

The estimation results can be interpreted as follows. In the case of horizontal FDI, the positive and statistically significant coefficient of the interaction terms between horizontal FDI and the technology gap (TGap*HFDI) suggests the potential role of the technology gap in enabling the horizontal productivity spill-over. When the technology gap exists, it indicates an available learning opportunity from their foreign competitors for domestic firms. The resulting outcome validates the works of Dutse et al. (2011) by providing empirical evidence that indicates that significant technology spill-over is most likely to occur among subsidiary firms that are technologically active as well as domestic firms with absorptive capability while those that are not active are unlikely to do so. In the works of Dutse (2012), empirical results also so show that there is positive and significant effect between technology gap and horizontal FDI in Nigeria. These findings are consistent with those of Keller and Yeaple (2009) and Sánchez-Sellero, Rosell-Martínez and García-Vázquez (2014). Also, the works of Khalifah et al. (2015) showed that the positive (negative) coefficient of the interaction term between the forward (horizontal) spill-over variable and the technology gap supports the 'catching-up' (technology accumulation) hypothesis. However, some research work such as that of Aitken and Harrison (1995), Hadad and Harrison (1993), Zukowska–Gagelmann (2000) and Adejumo (2013) among others have revealed insignificant or even negative spill-over effects in horizontal foreign direct investment and technology gap.

Similarly, the positive and statistically significant coefficient of the interaction term between backward FDI and the technology gap (TGap*BFDI) implies that the technology gap leads to backward productivity spill-over in two ways. In the case of contracted foreign buyers, they need to improve the productivity of their domestic suppliers, since they want higher quality intermediate goods. In another relationship, domestic suppliers, aiming at attracting foreign buyers, must improve their productivity up to a level that enables them to gain confidence from potential foreign buyers. The works of Pittiglio et al. (2016) buttress this finding that technology gap matters considerably for a spill-over effect both in the horizontal forward and backward FDI level. The results indicated that there isa positive relationship between forward FDI and technology gap. However, Italian enterprises exhibit a negative effect from backward linkages with foreign affiliates, probably because MNEs benefit from their knowledge of the market to diversify their supply network and thus to impose low prices on their suppliers. Bai (2012) and Ferragina and Mazzotta (2014) also found a positive and significant relationship between technology gap and vertical (forward) FDI.

Finally, the positive and statistically significant coefficient of the interaction term between forward FDI and the technology gap (TGap*FFDI) shows that, due to the presence of the technology gap between the domestic firms in the final goods sector and their foreign competitors, domestic firms need to improve their productivity by using higher quality intermediate goods produced by foreign suppliers. This purchasing channel leads to forward productivity spill-over.In addition, in the work of Khalifah et al. (2015), the results indicated that there was a significant relationship between backward FDI and technology gap, and this was because foreign presence was measured in terms of the abundance of capital. Foreigners built their local supply chain by transferring technology to foreign establishments in Malaysia with sufficient absorptive capacity. Onyekwena (2012) recorded in his work the presence of FDI spill-over to domestic firms within the Nigerian Manufacturing, by estimating productivity variables which showed that the result of this research work was in line with previous research works.

On the other hand, the statistically insignificant coefficients of the interaction term between FDI and two proxies of absorptive capacity may be explained in the following way. It may be caused partly by relatively small variations in H (percentage of workers with higher education) and TR (training dummy). Also, the survey used in this study reported that less than 50% of domestic firms offered training. It also reported that most of the domestic firms (about 70% of domestic firms) still needed more workers with higher skill and education for their operation, which means their workers did not have sufficient skills for their jobs. These situations were likely to weaken effects of those proxies on productivity spill-over from increased FDI.

To check robustness of these results, value added$V_{ijt} = Y_{ijt} - M_{ijt} - E_{ijt}$, instead of the gross outputY_{ijt}, is used to estimate the following equation:

$$\ln(\frac{V_{ijt}}{L_{ijt}}) = \gamma_0 + \delta lnL_{ijt} + \gamma_2 \ln(\frac{K_{ijt}}{L_{ijt}}) + \gamma_3 FDI_{jt} + \gamma_4 FDI_{jt} * AC_{ijt} + \gamma_5 AC_{ijt} + \gamma_6 FDI_{jt} * TGap_{ijt} + \gamma_7 TGap_{ijt} + d_t + \alpha_i + \varepsilon_{ijt} \qquad (10)$$

Where $\delta = \gamma_1 + \gamma_2 - 1$. The technology gap in equation (10) is calculated based on equation (9) where value-added based labour productivity is used instead of output per worker. The table 4-7 in the appendix below presents the estimation results of equation (10). It shows quite similar results to table 4-6 regarding coefficients of the interaction terms between TGap, H, TR and FDI indexes suggesting robustness of the estimation results. However, the results from table 4-7contradicts the findings of Adejumo (2013) as he used the value-added approach to measure labour productivity of domestic firms in Nigeria and his findingsconcluded that in the long run, FDI will have negative effects on the manufacturing sector in Nigeria. The reasons for the negative effect could be as a result of old data, as he used data from the period of 1970 through to 2009.

4.6 Using Total Factor Productivity to Estimate Productivity Spill-overs from FDI

4.6.1 Specification of Total Factor Productivity Model

To further check the robustness of the analysis in the previous section, productivity spill-over from FDI is also estimated using total factor productivity (TFP). The total factor productivity (TFP) index is widely used to measure agricultural productivity performance because it provides a broad indication of how efficiently farmers combine all inputs to produce outputs (Liua et al. 2016). According to Amann and Virmani (2014), recent trends show that the emerging and developing economies have been experiencing rapid TFP growth since the early 2000s. Compared with the advanced economies where the growth rate dropped from 0.4% per year between 1995 and 2005 to -0.1% between 2005 and 2008, the emerging economies had witnessed an improvement of 1.0% in 1995-2005 to 2.2% in 2005-2008.

Comin (2007) describe Total Factor Productivity (TFP) as the portion of output not explained by the number of inputs used in production. As such, its level is determined by how efficiently and intensely the inputs are utilised in production. Gains in total factor productivity (TFP), reflecting the more efficient use of inputs, has long been recognised as an important source of improvements in income and welfare. Cross-country differences in income levels and growth rates are mostly due to differences in productivity (Easterly & Levine 2000;Klenow & Rodriguez-Clare 1997).

Total factor productivity analysis in this chapter is a complementary analysis to the various computation done in this chapter. It measures the level of output produced, by calculating the growth in domestic output unexplained by the growth in all input in the production process. The TFP analysis refers to the combined efficiency of labour inputs and capital; inputs relative to the growth in GDP or value added. In addition, TFP measures disembodied technological change as exemplified in its original application by Solow Residual as indicated in Solow (1957). TFP analysis also includes growth impact of unmeasured inputs such as the expenses on certain “soft” or “intangible” inputs such as R&D, software, human capital skills development and branding & marketing.

Measuring TFP is therefore important in assessing countries’ past and potential economic performance. However, it is also difficult, for two reasons. Fairly innocuous differences in assumptions can lead to very different estimates of TFP growth. Moreover, the interpretation of measured TFP growth can be problematic when such growth reflects factors other than purely technical change— such as increasing returns to scale, markups due to imperfect competition, or gains from sectoral reallocations.

Following Pavcnik (2002), the specification below to assess the productivity spill-over of FDI on TFP is used.

$$lnTFP_{ijt} = \gamma_0 + \gamma_1 FDI_{jt} + \gamma_2 FDI_{jt} * AC_{ijt} + \gamma_3 AC_{ijt} + \gamma_4 FDI_{jt} * TFPGap_{ijt} + \gamma_5 TFPGap_{ijt} + a_i + d_t + \varepsilon_{ijt} \quad \text{.........} 11$$

Where TFPGap is technology gap based on TFP, which will be introduced in section 3.6.2. a_i and d_t are dummies of sectors and time, respectively. ε_{ijt} is the error term.

Similarly, to Schoar (2002) and Blalock and Gertler (2009), I used a method developed by Levinsohn and Petrin (2003) to calculate TFP.

$$TFP_{ijt} = exp\big(lnY_{ijt} - \hat{\beta}_1 lnK_{ijt} - \hat{\beta}_2 lnL_{ijt} - \hat{\beta}_3 lnM_{it} - \hat{\beta}_4 lnE_{ijt}\big) \dots\dots\dots\dots\dots\dots\dots\dots\dots..12$$

$\hat{\beta}_i$ is the estimate of β_i of the following production function.

$$lnY_{ijt} = \beta_0 + \beta_1 lnK_{ijt} + \beta_2 lnL_{ijt} + \beta_3 lnM_{it} + \beta_4 lnE_{ijt} + \omega_{ijt} + \eta_{ijt} \dots\dots\dots\dots\dots\dots\dots\dots\dots 13$$

ω_{ijt} is productivity shock observed by the firms but not by econometrician and η_{ijt} is error term.

4.6.2 Detailed Estimation Methods and Calculation of TFP

For the calculation of TFP, I use the method proposed by Levinsohn and Petrin (2003) which uses intermediate input as an instrument to estimate production function. The estimation is based on the assumptions that firms adjust input usage across time according to the change in productivity. There is an alternative method proposed by Olley and Pakes (1996). It is similar to that of Levinsohn and Petrin (2003), but it uses investment as an instrument. However, Olley and Pakes (1996) control for survival and use unbalanced panel data, which is not suitable for the balanced panel data used in this paper. Moreover, data on investment are not available. Ackerberg et al. (2006) have suggested the use of dynamic estimation structure for production parameters, but the estimation requires a long lag-length, which is impossible for two-year panel data in this study. Due to the limited availability of data and the absence of data on investment, this study uses the method developed by Levinsohn and Petrin (2003)

To simplify the notation, equation (13) is rewritten as:

$$y_t = \beta_0 + \beta_1 l_t + \beta_k k_t + \beta_m m_t + \omega_t + \eta_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots...14$$

Where $y_t, l_t, and\ m_t$ are the logarithms of $Y_t, L_t, K_t, and\ M_t,$ respectively. For simplicity of explanation, E_t is omitted and subscripts for firms and sectors are omitted. The error has two components: the transmitted productivity component (ω_t) and the error term which is uncorrelated with the input's choice (η_t). ω_t is not observed by econometricians and affects firm's decision of input, which leads to the simultaneity problem in estimating the production function. Ignoring this problem will yield inconsistent estimates. Firm's demand for intermediate input m_t is assumed to depend on k_t and ω_t:

$$m_t = m_t(k_t, \omega_t) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 15$$

The assumption that the demand function (15) monotonically increases in ω_t allows the inversion of this function. Hence, ω_t can be written as a function of k_t and m_t.

$$\omega_t = \omega_t(k_t, m_t) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 16$$

That ω_t can now be expressed as a function of observed variables k_t and m_t enables us to rewrite equation (14) as below:

$$y_t = \beta_1 l_t + \phi_t(k_t, m_t) + \eta_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 17$$

Where $\phi_t(k_t, m_t) = \beta_0 + \beta_k k_t + \beta_m m_t + \omega_t(k_t, m_t)$.

Estimation of $\hat{\beta}_1$ proceeds using OLS with a third-order polynomial approximation in k_t and m_t in place of $\phi_t(k_t, m_t)$. For any candidate of the first step estimates of ${\beta^*}_k$ and ${\beta^*}_m$, i can estimate $\widehat{\omega}_t$ as

$$\widehat{\omega}_t = \hat{\phi}_t - {\beta^*}_k k_t - {\beta^*}_k k_t - {\hat{\beta}^*}_m m_t \;\; where\; \hat{\phi}_t = y_t - \hat{\beta}_l l_t$$

If I assume that ω_t follows the first order Markovian process, then I get:

$$E[\omega_t \lceil \widehat{\omega}_{t-}] = \gamma_0 + \gamma_1 \omega_{t-1} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 18$$

Now, the original equation (13) can be re-written as:

$$\gamma_t - \beta_l l_t = \beta_0 + \beta_k k_t + \beta_m m_t + E\left[\omega_t \lceil \widehat{\omega}_{t-1}\right] + (\eta_t + \xi_t) \dots\dots\dots\dots\dots\dots\dots\dots\dots 19$$

Where $\xi_t = \omega_t - E\left[\omega_t \lceil \widehat{\omega}_{t-1}\right]$.

The residual in equation (19) can be computed as

$$\widehat{\eta_t} + \hat{\xi}_t = \gamma_t - \hat{\beta}_l l_t - \beta^*{}_k k_t - \beta^*{}_m l_t - E\left[\omega_t|\widehat{\omega}_{t-1}\right] \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 20$$

To estimate $\beta_k and\ \beta_m$, Levinsohn and Petrin (2003) use these two moment conditions.

$$E[(\eta_t + \xi_t)|k_t] = 0\ and\ E[(\eta_t + \xi_t)|m_{t-1}] = 0 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 21$$

Therefore, there are two instruments (k_t, m_{t-1}) for the estimaton of $\beta_k\ and\ \beta_m$. Over-identification moments are given by $E[(\eta_t + \xi_t)|l_{t-1}] = 0$ and $E[(\eta_t + \xi_t)|k_{t-1}] = 0$. These can be used to improve efficiency and test specification in the Generalised Method of Moments (GMM). The standard error is estimated using bootstrap method.

$$\min_{(\beta^*{}_k\beta^*{}_m)} \sum_h [\sum_t \widehat{(\eta_t} + \hat{\xi}_t)\boldsymbol{Z_{ht}}]^2\ where\ \boldsymbol{Z_t} = \left(k_{t,}m_{t-1,}l_{t-1,}k_{t-1}\right) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 22$$

4.6.3 Calculation of Technology Gap Using TFP

To calculate the TFP gap, a formula similar to equation (9) is used.

$$TFPGap_{ij} = \frac{TFP^*{}_j - Mean(TFP_{ijt})}{TFP^*{}_j} - \frac{k_l}{k_f} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 23$$

Where $Mean(TFP_{ijt}) = \frac{(TFP_{ij2009} + TFP_{ij2013})}{2}$. $TFP^*{}_j$ is the mean of $Mean(TFP_{ijt})$ of all foreign firm i in sector j. K_l is the technological knowledge stock of the leader (in most cases the foreign firm), while K_f is the technological knowledge stock of the follower (in most cases the domestic firms). Positive technology gap means the firm's productivity is below that of foreign firms. A negative technology gap means the opposite.

Table 4-9 in the appendix below presents the technology gap calculated by using labour productivity and TFP. Column 3 from the table shows the results of the technology gap measured by TFP while column 4 shows the results of technology gap measured by labour productivity. By comparing them, I find that labour productivity gap did not result in more sectors having higher technology than TFP gap. Using TFP, firms in the food and hotel &

restaurant sectors tend to have higher gaps than their foreign competitors. However, using labour productivity, firms in the wood and furniture sector have the negative gap.

4.7 Estimation Results

Similarly, in the case of using labour productivity gap in the previous section, TFP Gap is relatively very low with both proxies of absorptive capacity. The table 4-10 below in the appendix indicates the there is a weak linear relationship between the absorptive capacity used and a strong relationship between TFPgap and the absorptive capacity used in this research work.

The dependent variable in this segment of the analysis is total factor productivity (TFP). The purpose of calculating TFP is to identify changes in output that cannot be attributed to changes in input. Knowing that the objective is to analyse the effect of technology transfer on the productivity of domestic firms; I have estimated TFP in equation (12). I have in the earlier analysis in this chapter investigated labour turnover with a combination of horizontal and vertical spill-overs including both forward and backward spill-overs and also addressed the absorptive capacity of local firms.

Therefore, I now analyse technological spill-overs and absorptive capacity of a local firm from the standpoint of TFP. The mixed results of empirical studies have led economists to question the existence of specific factors conditioning FDI spill-overs (Lipsey and Sjoholm, 2005). This implies a potential non-linear effect on the mechanism of technology transfer. Typically, the observed negative effects for developing countries are explained by lack of adequate absorption capacity. Campos and Kinoshita (2002) argue that some European countries have the relatively backward technology, being far from the world technological frontier. However, they have a high potential of positive spill-overs mainly due to their skilled labour force.

The estimation results for equation (11) for the interaction terms between the technology gap and absorptive capacity and FDI, as well as the Hausmantest, are presented in the tables 4-11, 4-12 and 4-13 in the appendix below with asymptotic standard errors in square brackets. On two occasions the Hausman test strongly rejects the null hypothesis (HFDI and FFDI), and it accepts the null hypothesis on one occasion (BFDI). I found similar results to the previous ones based on labour productivity: only the interaction term with the technology gap is statistically significant.

For table 4-11, 4-12 and 4-13; I examined three different sub-model which are the restricted forms of the econometric model given in equation 13. In table 4-11, TFP is regressed on all forms of FDI which includes HFDI, BFDI and FFDI as well as other explanatory variables. Also, table 4-11 tests whether a country with higher technological distance to leaders can absorb more technological spill-overs from FDI. In table 4-12, I used training (TR) and human capital (H) to calculate TFP for all forms of FDI, i.e. including HFDI, BFDI and FFDI; as well as the TFPgap. In table 4-13, I dropped H*FDI and TR*FDI from the model to check whether the effect of FDI or TFPgap was robust to possible multicollinearity in the model. Multicollinearity can occur when two variables are interacted to generate a third variable where the interaction terms can highly correlate with one of the variables from which it has been created.

Table 4-11 presents the baseline result. I find a statistically significant positive effect from some of the forms of FDI on TFP in the first model, i.e. table 4-11. The table indicates that there a positive effect of HFDI and FFDI on TFP. This indicates that FDI is an important source of technological transfer. The positive findings on the effects of FDI contrast with the finding of Alfaro et al. (2004), Durham (2004) and Azman-Saini et al. (2010a, 2010b) who do not find any direct positive effect of FDI on growth. On the other hand, the results support the empirical findings of Liu and Liu (2005) and Woo (2009) which reveal positive effects from FDI on income and TFP growth, respectively.

The analysis of the advantage of relative backwardness supports the theoretical assumptions of Findlay (1978) and Wang and Blomstrom (1992). This is seen from the significant positive sign of the interaction of all forms of FDI with TFPgap in the table 4-11, 4-12 and 4-13. This suggests that the positive effect of FDI is important and significant only with larger technology gaps between a country and the technology leader.

The significance of the interaction term is not due to multicollinearity as suggested by Table 4-13. Notably, both the size and significance increase when I drop H*FDI and TR*FDI. One can interpret the model in table 4-13 as a “catching-up” process taking place through the adoption of FDI technologies, although direct autonomous catching-up is also present (as suggested 1% level of the significant positive sign of TFPgap). When I drop the interaction terms, HFDI and FFDI are still positively significant at 1% level.

TFPgap is positive and significant in all the models, i.e. table 4-11 to 4-13, which is consistent with the findings of the convergence literature. The coefficient of autonomous technology gap is -0.08 for HFDI, -0.096 for BFDI and -0.067 for FFDI and significant at 1% in table 3-11. Thiscan be compared to the findings of Griffith et al. (2004) who reported an estimate of 0.08 on TFPgap with annual data. Regarding other control variables, I find training to be positive but statistically insignificant for all forms of FDI. The sign of human capital variable is negative although insignificant. Thissuggests that human capital measured as the average years of schooling for the population over 25 years of age does not affect TFP growth. However, when I looked at the relationship of H*HFDI on TFP, it was negative but statistically significant at 5% level; and the same is the situation with TR*HFDI on TFP.

I also used the Hausman test to differentiate between fixed effect model and random effect model. In some cases, the random effect model is preferred due to higher efficiency while in other cases the fixed effect model is preferred due to consistency.

The theoretical literature emphasises the role of firm heterogeneity in international trade (Helpman, Melitz & Yeaple, 2004) and studies that investigate technology transfer are becoming increasingly interested in catalyst factors for spill-overs. It is assumed that domestic firms need a minimum level of absorptive capacity to reap positive spill-overs (Blomstrom & Kokko, 1998; Glass & Saggi, 1998; Nicolini & Resmini, 2010). Most of these studies focus on the characteristics of domestic firms, although there are exceptions that analyse the characteristics of foreign investors as well (Javorcik & Spatareanu, 2008). Thus, in this analysis, I consider the absorptive capacity of local firms given by human capacity, training and technology gap.

The role of human capital as an absorptive capacity was initially stated by Borensztein et al. (1998), in the context of FDI growth effects. Plant level studies are often constrained by the lack of information on skill levels and thus can rarely consider this aspect of the absorptive capacity. Exceptions such as Blalock and Gertler (2009) and Gorodnichenko, Svejnar and Terrell (2007) use specific survey datasets[8] and proxy human capital by the share of employees with higher education. They find that firms with highly educated employees adopt more foreign technology than others.

The third measure I used for absorptive capacity is the technology gap. There are studies that show that the ability of domestic firms to reap positive spill-overs is higher if the

[8] The World Bank Enterprise survey does contain information on the skills structure of employments. However, for most developing countries, it does not allow a panel format as different firms are surveyed each year.

technological gap concerning foreign firms is not too large (Girma, 2005; Kolassa, 2008; Nicolini & Resmini, 2010). Other studies, on the contrary, argue that a high gap leaves rooms for significant improvements and pressure firms to restructure. Thus, the larger the gap, the more likely is the firm to benefit from positive spill-overs (Blalock & Gertler, 2009; Campos & Kinoshita, 2002; Griffith, Huergo, Mairesse & Peters, 2004). An additional argument in investigating the role of the technological gap in the transmission of spill-overs is that it has rarely been studied at the inter-industry level, most studies focusing on its capacity to overcome horizontal competitive pressure.

For each domestic firm,I compute the technological gap using equation (23). In doing so, I assume that the most productive foreign firms operate on the production possibilities frontier and the gap proxies the distance of domestic firms towards this frontier.

I introduce all the three measures of absorptive capacity in the estimation of the equation (11) together with interaction terms with spill-over variables. Results are presented in Tables 4-11 to 4-13 in the appendix. Human capital proves to be a significant determinant of TFP as expected. I also note that vertical technology transfer is not affected by human capital; none of the two interaction terms is significant. The only type of spill-overs that depends on human capital is the Horizontal one. However, unlike the sign I would expect (positive), I obtain a negative coefficient for the variable H*HFDI.

Training does not significantly influence the productivity of local firms. This result is probably explained by very low values of training performed by local firms. Concerning its influence on the spill-over channels, the only significant interaction is the horizontal spill-overs. At the labour productivity estimation, it is only significant at the Horizontal level.

In what follows if I turn to the third conditioning factor, namely the technological gap. I am interested to see whether the more advanced local firms benefit more from FDI induced spill-overs, or whether it is the back-warded firms that reap most of the benefits. The results following the introduction of the technological gap and its interactions with spill-over variables are presented in Tables 4-11 to 4-13 in the appendix. As a general remark, a large technological gap is associated with lower productivity. Instead, all interaction variables are positive and significant, which means that technology transfer is facilitated by a large technological gap.

From equation 11 and estimation results in tables 4-11, 4-12, and 4-13 in the appendix, there was not any effect of Training on vertical spill-overs, as indicated in the estimation. However, firms with an important technological gap enjoyed positive and significant spill-over effect, following with foreign firms in the same sector. Looking at the levels of technology, local downstream firms were negatively affected by linkages with foreign suppliers (negative sign of TFPgap*FFDI). Nevertheless, low technological levels mitigated this negative spill-over (the effects become positive from the FE estimation). The backward variable, on the other hand, remains positive, and its interaction with technology-gap is also positive and significant. FDI is actively involved in the technological upgrading of their suppliers, to help them fulfil quality standards and later benefit from better inputs.

From this estimation in tables 4-11 to 4-13, I see that human capital does not have an absorptive role. Moreover, it generates negative horizontal effects due to the losses of the best employees in favour of foreign firms. Training activities have a limited role as well as facilitating technology transfer only at intra-industry level. Thus, the absorptive capacity hypothesis is not valid for vertical transfers (at least for the variables I considered). Regarding firm technological level, a large gap seems to favour both horizontal and vertical spill-overs.

The results confirm previous studies on direct technology transfer, in the sense that horizontal and vertical spill-overs are strongly confirmed. Additionally, the vertical transfer is also much less sensitive to the presence of absorptive factors. Being in the supplier position brings in significant productivity gains, foreign companies being directly interested in the quality of supplied input. Moreover, the benefits associated with backward spill-overs are more important for domestic suppliers than other foreign suppliers, probably due to the higher technological gap. For clients in downstream sectors, instead, the situation appears less favourable. The complexity of new inputs, combined with higher prices, frequently generates efficiency losses in downstream sectors. The magnitude of negative forward spill-overs is not higher than that of positive backward spill-overs. Therefore, local clients who buy their inputs from the same suppliers as FDI are, in the end, not affected by a second order negative spill-over. The free-rider hypothesis is thus validated for the Nigerian economy.

Technological gap favours positive spill-overs at all level. The less advanced a firm's current technology, the more likely it is for the firm to gain by engaging in trade with FDI. Since foreign firms deliberately transfer technology and know-how to their suppliers, local producers are particularly favoured by the important gap. The results also show that the benefits associated with upstream technology cannot be exploited by other downstream firms besides the FDI.

The presence of foreign firms can influence a local business environment in many ways; it may either increase competition or introduce new know-how, thereby contributing to productivity spillovers. The presence of foreign firms will be beneficial for the local economic environment provided that the productivity gains be larger than the competition losses. If the competition losses outweigh the productivity gains, then the host company's productivity will be negatively affected (Wei, Liu, and Wang 2008). Whereas the debate first focused mainly on the existence of productivity spillover effects, it now also includes the mechanisms through which these effects occur (Zámborský 2012a). The literaturehas defined several spillover mechanisms through which productivity spillovers can occur. The mechanisms most commonly discussed in the literature are labour mobility/skills acquisition (Ben Hamida 2011; Blomström & Kokko 1998; Fosfuri, Motta & Rønde 2001; Girma, Greenaway & Wakelin 2001; Görg & Greenaway 2004; Halpern & Muraközy 2007; Smeets 2008; Wang & Yu 2007), demonstration/imitation effects (Görg & Greenaway 2004; Smeets 2008; Zahra & George 2002; Zhang et al. 2010), competition effects (Aitken & Harrison 1999; Barrios & Strobl 2002; Görg & Greenaway 2004; Halpern & Muraközy 2007; Tian 2007), and backward/forward linkages (Blomström & Kokko 1998; Ferragina & Mazzotta 2014; Javorcik 2004; Smeets 2008).

4.8 Conclusion

It is acknowledged in the literature that the technical capabilities of both local and foreign firms play an important role in the strength of productivity spillovers (Wei & Liu, 2006). Often, the research examines the technology gap between foreign and local firms to discuss the extent of productivity spillovers. The technology gap is defined as the difference between the technology in an industry's local and foreign firms (Gerschenkron 1962); in the case of developing economies, it is assumed that the foreign firms possess the more advanced technology. That said, there are two opposing views of how the technology gap affects productivity spillovers and, therefore, the extent to which firms can adopt new knowledge and technologies. The first stream believes that potential gains from technology spillovers are negatively related to the technology gap between local and foreign firms (Lapan & Bardhan, 1973), which in turn, is closely related to absorptive capacity. This argument assumes that the degree to which outside knowledge can be exploited by local firms depends on both their level of absorptive capacity and the complexity of their external knowledge. If the technology possessed by local and foreign firms is too different, or if the technology possessed by the foreign firm is too advanced, it is quite possible that local firms cannot adopt the foreign technology because it is too difficult for them to comprehend (Sinani & Meyer, 2004). Also, it is believed that if there is a technology gap, lower-quality technology is transferred because that is all that the local firms can comprehend, resulting in a lower potential for positive spillover effects (Glass & Saggi, 1998). In short, the first stream believes that productivity spillovers are more likely when the technology gap between foreign and local firms is relatively small (Franco & Kozovska, 2011).

The second stream is driven by Findlay (1978) and is known as the catching-up hypothesis. Unlike the first stream, this stream argues that a larger technology gap between local and foreign firms is more beneficial for productivity spillovers. These scholars believe that technology transfer will be quicker when foreign firms rapidly create their downstream and upstream networks, thus, not only enabling the local firms that are part of these distribution and supply networks to access the new technology, but also facilitating technology diffusion (Findlay 1978). In other words, the catching-up hypothesis predicts that a relatively larger technology gap between foreign and local firms is more likely to stimulate spillover effects (Franco & Kozovska, 2011). However, Schools and van der Tol (2002) argue that in the presence of a large technology gap, productivity effects will only take place when human capital is well developed. Again, absorptive capacity proves to be an important element of productivity spillovers.

This chapter aimed at studying the effects of horizontal and vertical productivity spill-over from FDI to domestic firms. By using the data of 580 firms in the enterprise survey of the World Bank conducted in 2014 and regression analysis of the random effect and fixed effect models, the study lends support to findings of existing studies on the effects of the technology gap on productivity spill-over. The estimation results show that FDI leads to productivity spill-over only under the condition of a positive technology gap. Only a few existing studies examine this effect in the contexts of both horizontal and vertical FDI. This study finds that technology gap has positive effects on productivity spill-over from horizontal and vertical FDI to domestic firms, as confirmed in the works of Keller and Yeaple (2009), Bai (2012), Dutse (2012), Ferragina and Mazzotta (2014), Sanchez-Sellero et al (2014), and Pittiglio et al (2016).The results add more evidence to a scarce literature on the effect of the technology gap in the context of vertical FDI. On the other hand, this study could not find the significant effect of education and training on productivity spill-over.

In this chapter, I have studied the impact of FDI stock on Nigeria's TFP growth and found FDI to be an important factor of technological transfer. The positive results of FDI are in line with the empirical findings of Li and Liu (2005) and Woo (2009). I have also tested whether the technology gap can enhance the positive role of FDI in TFP growth. I also find evidence for this, which is indicated by statistically significant positive effects from the interaction of the FDI variable with technology gap. With this finding, I confirm the theoretical proposals of Findlay (1978) and Wang and Blomstrom (1992). The works of Li and Liu (2005) report that large technological gaps decreasea country's ability to absorb technology from multinationals; however, research work by Blalock and Gertler (2009) supports the findings in this chapter that larger technology gaps do improve productivity spillovers.

However, the results, as well as Li and Liu's, should be interpreted with caution. These two different findings might very likely be due to different measures of the dependent variable, estimation methods, a sample of the country as well as the measure of FDI. For example, results might differ whether FDI stock or flow is used. While Li and Liu (2005) use FDI flows in GDP, the positive results come from the measure of FDI stock in GDP. It is quite possible that initial competition from incoming FDI flows would see some domestic firms lose market share and efficiency. Some inefficient firms might even be forced out of the market or have to invest in learning and new technologies to compete with FDI firms, which would result in some decline in output (Liu, 2008). Hence, I would expect FDI flow to reduce the output growth in Nigeria. On the other hand, FDI stock is a measure of all the inflows accumulated over time and, although it increases when new firms arrive, a large amount of stock will be already available from established firms. So the domestic companies that lag behind the multinationals would be able to learn a great deal from them.

The policy implication of the analysis is straightforward: multinational firms should be welcomed as they do not cause negative externalities in the form of productivity reduction in the economy. They can, in fact, improve the countries' technology adoption through this channel and Nigeria is likely to benefit more. Although I report a positive effect from FDI, some future work may be necessary to advance the FDI growth literature to the next level.

The result of the effect of the technology gap provides a significant policy implication for the Nigerian government. Similarly, to most developing countries, domestic firms in Nigeria still have a technology gap when compared to foreign competitors. The gap indicates the need for domestic firms to improve their productivity. In their position as competitors, buyers or suppliers of domestic firms, FDI can help domestic firms directly or indirectly to overcome this technology gap and thus lead to improvement in the domestic firm's productivity. Therefore, with the existence of the technology gap, the Nigerian government should aim at policies that attract both horizontal and vertical FDI.

The strength of this approach is simply the inclusion of vertical spill-overs through the robust construction of the I-O table for Nigeria. The I-O table helps us to specifically capture vertical spill-overs across all the industrial sectors that were represented in the World Bank enterprise survey. The approach also provides a distinctive way to capture technology gaps through the inclusion of knowledge stock data. Also, I have included both the labour productivity estimate using a value-added approach, and the results are consistent with that of the TFP estimate.

To produce a better estimation result, future research should focus on two things. Firstly, this study analyses the productivity spill-over by pooling firms across sectors due to the problems of small sample size. The finding can be enriched by using a large sample, which enables the estimation of the production function for each sector separately, as done in the works of Akulava and Vakitova (2010), Du et al. (2011) and Javorcik and Spatareanu (2010). At the micro-level, the hypothesis of the advantage of the technology gap can be tested under a consistent framework. Studies carried out so far use the share of FDI firm sales in total sales, or FDI employment share as the level of foreign penetration in the industry, neither of which takes into account how long the FDI firm has been operating in the industry. Future firm-level studies should incorporate the length of FDI existence into FDI penetration measures.

Secondly, this research uses a simple method of fixed effect model to deal with endogeneity issues. One limiting factor of this method is that it works well only with unobservable variables that are invariant across time. Therefore, future studies, should take care of the unobservable variables that are time-variant. An alternative method proposed by Blundell and Bond (2000) and Bond (2002) should be used if it is possible. Finally, since deflators for each sector are not available, the study uses the overall consumer price index (CPI) to deflate relevant variables. Although deflating with overall CPI may at least give better-estimated coefficients than those without deflating, future studies should use deflators for each sector.

To further understand the issues of productivity, the next chapter will look at the innovative outcomes of domestic firms as it leads to productivity and performance. In order to do so, extensive definition and description will be provided as it relates to investment in knowledge capital. Also, emphasis will be placed on innovative outcomes on employment.

Appendix

Table 4-1 Distribution of Domestic and Foreign Firms in Each Sector

Name of Sector	N	N1	FOR	DOC	FOR%	DOC%
Food	544	134	10	124	7.463	92.537
Garments	94	24	2	22	8.333	91.667
Wood	114	25	2	23	8.000	92.000
Paper	14	9	1	8	11.111	88.889
Publishing, Printing and Media	328	47	7	40	14.894	85.106
Non-Metallic mineral products	364	113	4	109	3.540	96.460
Basic Metals	84	10	2	8	20.000	80.000
Fabricated Metal Products	304	52	1	51	1.923	98.077
Machinery and Equipment	42	4	2	2	50.000	50.000
Furniture	382	105	4	101	3.810	96.190
Construction	104	5	3	2	60.000	40.000
Services of motor vehicles	360	5	2	3	40.000	60.000
Retail	902	33	2	31	6.061	93.939
Hotel and Restaurants	494	14	2	12	14.286	85.714

Note: DOC: number of domestic firms; FOR: number of foreign firms; N: original sample; N1: sample after removing observation with the missing value.
Source: Author's calculation based on the World Bank Enterprise Survey (2013).

Table 4-2 Horizontal FDI, Backward FDI and Forward FDI Indexes by Sector

Name of Sector	HFDI2013	BFDI2013	FFDI2013
Food	0.040	0.019	0.003
Garments	0.024	0.001	0.002
Wood	0.027	0.001	0.002
Paper	0.000	0.000	0.000
Publishing, Printing and Media	0.399	0.009	0.016
Non-Metallic mineral products	0.002	0.000	0.000
Basic Metals	0.001	0.000	0.000
Fabricated Metal Products	0.010	0.000	0.000
Machinery and Equipment	1.000	0.040	0.081
Furniture	0.027	0.001	0.002
Construction	0.107	0.000	0.012
Services of motor vehicles	0.993	0.000	0.034
Retail	0.371	0.199	0.123
Hotel and Restaurants	0.291	0.004	0.053

Table 4-3 Means of Two Proxies of Absorptive Capacity and Labour Productivity Gap

Name of Sector	Number of Firms	Training (TR)	Human Capital (H)	TGap
Food	134	0.269	0.630	2.626
Garments	24	0.500	0.677	0.658
Wood	25	0.000	0.522	-0.480
Paper	9	0.667	0.271	1.707
Publishing, Printing and Media	47	0.234	0.670	1.626
Non-Metallic mineral products	113	0.248	0.467	1.502
Basic Metals	10	0.300	0.414	0.579
Fabricated Metal Products	52	0.327	0.668	1.275
Machinery and Equipment	4	0.000	0.450	1.386
Furniture	105	0.276	0.570	-0.031
Construction	5	1.000	0.760	1.566
Services of motor vehicles	5	0.400	0.402	1.476
Retail	33	0.515	0.385	0.927
Hotel and Restaurants	14	0.286	0.496	1.380

Table 4-4 Correlation among Horizontal FDI, Backward FDI and Forward FDI

	HFDI	BFDI	FFDI
HFDI	1		
BFDI	0.455	1	
FFDI	0.658	0.933	1

Table 4-5 Correlation among Proxies of Absorptive Capacity and Technology Gap

	Training	Human	TGap
Training	1		
Human	-0.161	1	
TGap	0.632	0.6921	1

Table 4-6 Effect of FDI on Labour Productivity of Domestic Firms

	(1) Horizontal FDI				(2) Backward FDI				(3) Forward FDI		
Independent Variables	Log (Sale/Labour)			Independent Variables	Log (Sale/Labour)			Independent Variables	Log (Sale/Labour)		
	OLS	RE	FE		OLS	RE	FE		OLS	RE	FE
Constant	8.029***	7.99***	-10.562***	Constant	8.328***	8.289***	-10.271***	Constant	8.046***	8.04***	-11.092***
	(0.288)	(0.333)	(3.064)		(0.29)	(0.346)	(3.179)		(0.296)	(0.36)	(3.002)
Ln L	0.112**	0.103*	1.466***	Ln L	0.167***	0.142**	1.475***	Ln L	0.146***	0.12*	1.486***
	(0.054)	(0.06)	(0.293)		(0.054)	(0.063)	(0.301)		(0.056)	(0.065)	(0.292)
Ln (K/L)	0.02	0.02	0.05	Ln (K/L)	0.01	0.01	0.06	Ln (K/L)	0.01	0.01	0.06
	(0.02)	(0.02)	(0.06)		(0.02)	(0.03)	(0.06)		(0.02)	(0.03)	(0.06)
Ln (M/L)	0.223***	0.233***	1.918***	Ln (M/L)	0.186***	0.199***	1.927***	Ln (M/L)	0.214***	0.227***	1.967***
	(0.024)	(0.028)	(0.229)		(0.025)	(0.029)	(0.236)		(0.025)	(0.03)	(0.224)
Ln (E/L)	0.173***	0.205***		Ln (E/L)	0.184***	0.22***		Ln (E/L)	0.177***	0.221***	
	(0.034)	(0.04)			(0.035)	(0.041)			(0.036)	(0.043)	
HFDI	2.762***	2.811***	2.506*	BFDI	2.948	3.529	1.494	FFDI	16.743***	11.604**	3.812
	(0.562)	(0.625)	(1.492)		(2.645)	(2.842)	(4.299)		(4.633)	(5.277)	(10.147)
H	-0.275	-0.338		H	-0.452**	-0.554**		H	-0.237	-0.38*	
	(0.192)	(0.219)			(0.184)	(0.216)			(0.183)	(0.22)	
TR	0.136	0.253		TR	0.214	0.356**		TR	0.238*	0.351**	
	(0.143)	(0.164)			(0.142)	(0.167)			(0.14)	(0.17)	

R&D	0.009	0.113		R&D	-0.054	-0.165		R&D	-0.051	-0.163	
	(0.041)	(0.162)			(0.039)	(0.104)			(0.038)	(0.194)	
TGap	-0.139***	-0.148***		Tgap	-0.16***	-0.166***		Tgap	-0.077***	-0.08***	
	(0.021)	(0.025)			(0.02)	(0.024)			(0.019)	(0.022)	
H*HFDI	-2.024**	-1.604	-1.464	H*BFDI	-1.392	1.155	0.087	H*FFDI	-13.097**	-5.753	5.535
	(0.927)	(1.003)	(1.902)		(3.402)	(3.65)	(5.832)		(6.031)	(6.773)	(13.12)
TR*HFDI	1.726**	1.199	-2.184*	TR*BFDI	4.312	1.766	-3.538	TR*FFDI	1.132	0.611	-12.507
	(0.700)	(0.749)	(1.31)		(2.719)	(2.911)	(4.636)		(4.632)	(5.186)	(10.015)
R&D*HFDI	-0.163	-1.724	-1.661	R&D*BFDI	0.488	1.995	2.002	R&D*FFDI	1.232	2.112	1.039
	(0.132)	(0.653)	(0.772)		(0.564)	(0.775)	(1.712)		(1.159)	(3.099)	(2.067)
Tgap*HFDI	0.679***	0.726***	0.88**	Tgap*BFDI	1.643***	1.708***	3.659**	Tgap*FFDI	5.72***	5.987***	11.161**
	(0.109)	(0.125)	(0.39)		(0.211)	(0.254)	(1.831)		(1.501)	(1.768)	(4.867)
R2	0.518		0.304	R2	0.494		0.297	R2	0.471		0.306
N	580	580	580	N	580	580	580	N	580	580	580
Hausman test of RE against FE				Hausman test of RE against FE				Hausman test of RE against FE			
Chi-squared	76.3			Chi-squared	66.2			Chi-squared	85.1		
P-value	0			P-value	0			P-value	0		

Note: 1) In OLS sectors and time dummies are included while in RE and FE time dummy and firm fixed effect are taken into account. 2) *, **, ***: significant at 10, 5 and 1%; ( ): standard error. 3) Hausman test with null hypothesis H0: RE gives a consistent estimator.

Table 4-7 Effect of FDI on Labour Productivity of Domestic Firms Using Value-Added Per Worker

	(1) Horizontal FDI				(2) Backward FDI				(3) Forward FDI		
Independent Variables	Log (Value added/Labour)			Independent Variables	Log (Value added/Labour)			Independent Variables	Log (Value added/Labour)		
	OLS	RE	FE		OLS	RE	FE		OLS	RE	FE
Constant	10.94***	11.463***	13.784***	Constant	10.89***	11.467***	14.347***	Constant	10.837***	11.548***	13.926***
	(0.257)	(0.28)	(0.645)		(0.247)	(0.269)	(0.779)		(0.261)	(0.288)	(0.637)
Ln L	0.145**	0.112	-0.403*	Ln L	0.214**	0.17**	-0.415*	Ln L	0.181**	0.131	-0.458**
	(0.072)	(0.081)	(0.219)		(0.071)	(0.08)	(0.219)		(0.074)	(0.085)	(0.224)
HFDI	2.516***	2.702***	4.322**	BFDI	4.285	5.615	7.928	FFDI	19.757***	14.497**	2.913
	(0.756)	(0.841)	(2.129)		(3.439)	(3.707)	(6.07)		(6.101)	(6.89)	(14.669)
H	0.05	0.059		H	-0.124	-0.167		H	0.188	0.135	
	(0.257)	(0.292)			(0.236)	(0.272)			(0.237)	(0.279)	
TR	0.106	0.233		TR	0.105	0.276		TR	0.157	0.289	
	(0.194)	(0.221)			(0.184)	(0.212)			(0.185)	(0.218)	
R&D	0.045	0.192		R&D	0.011	0.145		R&D	0.015	0.199	
	(0.05)	(0.112)			(0.010)	(0.161)			(0.050)	(0.111)	
TGap	-0.185***	-0.202***		TGap	-0.223***	-0.238***		TGap	-0.11***	-0.117***	

	(0.029)	(0.033)			(0.025)	(0.03)			(0.025)	(0.029)	
H*HFDI	-1.605	-1.23	-2.322	H*BFDI	-2.254	0.618	2.992	H*FFDI	-16.95**	-9.466	11.653
	(1.249)	(1.351)	(2.724)		(4.42)	(4.754)	(8.225)		(7.947)	(8.867)	(18.941)
TR*HFDI	1.615*	1.259	-2.812	TR*BFDI	7.27**	4.292	-10.728	TR*FFDI	2.946	3.111	-16.868
	(0.939)	(1.009)	(1.872)		(3.524)	(3.787)	(6.519)		(6.111)	(6.801)	(14.466)
R&D*HFDI	0.058	1.441	0.565	R&D*BFDI	0.700	1.220	1.120	R&D*FFDI	1.890	1.998	1.897
	(0.176)	(1.881)	(0.872)		(0.730)	(1.205)	(1.001)		(1.510)	(1.002)	(0.128)
Tgap*HFDI	0.892***	0.974***	1.654**	Tgap*BFDI	2.269***	2.423***	6.094**	Tgap*FFDI	8.008***	8.518***	17.563**
	(0.146)	(0.167)	(0.549)		(0.27)	(0.317)	(2.582)		(1.973)	(2.288)	(7.007)
R2	0.248		0.068	R2	0.269		0.078	R2	0.213		0.053
N	575	575	575	N	575	575	575	N	575	575	575
Hausman test of RE against FE				Hausman test of RE against FE				Hausman test of RE against FE			
Chi-squared	11.9			Chi-squared	15.4			Chi-squared	18.5		
P-value	0.029			P-value	0			P-value	0.001		

Notes: 1) In OLS the dummy for sectors and time are included while in RE and FE, time dummy and firm fixed effect are taken into account. 2) *, **, ***: significant at 10, 5 and 1%; ( ): standard error. 3) Hausman test with null hypothesis H0: RE is a consistent estimator. 4) The variable TR denotes a dummy variable which indicates whether or not firms offer training to their workers. The variable H denotes the percentage of workers with lower secondary education (grade 7th or higher). 5) The number of observations is 560 because eight observations have negative value added.

Table 4-8 Some Coefficients of Input-Output Table

Sector	Food	Garments	Wood	Paper	Publishing	Non-metallic Mineral	Basic Metal	Fabricated Metal	Machinery & Equip	Furniture	Retail	Hotel & Restaurant	Services of Motor Vehicles	Construction
Food	0.1878	0.0000	0.0026	0.0268	0.0065	0.0090	0.0001	0.0000	0.0000	0.0000	0.2796	0.1549	0.0000	0.0001
Garments	0.0000	0.7005	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0445	0.0031	0.0000	0.0000
Wood	0.0001	0.0000	0.0245	0.0125	0.0001	0.0024	0.0086	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0212
Paper	0.0000	0.0000	0.0032	0.0347	0.0218	0.0151	0.0298	0.0000	0.0000	0.0000	0.0022	0.0003	0.0000	0.0002
Publishing	0.0000	0.0000	0.0000	0.0000	0.0105	0.0000	0.0000	0.0213	0.0000	0.0000	0.0006	0.0001	0.0000	0.0000
Non-metallic Mineral	0.0010	0.0000	0.0056	0.0000	0.0000	0.0466	0.0992	0.0000	0.0000	0.0000	0.0027	0.0000	0.0000	0.0503
Basic Metal	0.0000	0.0000	0.0084	0.0004	0.0000	0.0024	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0099
Fabricated Metal	0.0000	0.0000	0.0015	0.0000	0.0000	0.0037	0.0001	0.0000	0.0004	0.0000	0.0000	0.0000	0.0000	0.0050
Machinery & Equip	0.0001	0.0000	0.0033	0.0000	0.0001	0.0003	0.0350	0.0000	0.0025	0.0000	0.0000	0.0000	0.0000	0.0013
Furniture	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0358	0.8115	0.0000	0.0000	0.0000	0.0000
Retail	0.0624	0.0732	0.0286	0.0451	0.0060	0.0426	0.0758	0.0000	0.0446	0.0772	0.0587	0.0231	0.0340	0.0244
Hotel & Restaurant	0.0000	0.0002	0.0024	0.0012	0.0062	0.0005	0.0014	0.0000	0.0000	0.0000	0.0006	0.0075	0.0000	0.0015
Services of Motor Vehicles	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Construction	0.0000	0.0000	0.0010	0.0000	0.0004	0.0008	0.0000	0.0000	0.0000	0.0000	0.0000	0.0006	0.0000	0.4880

Table 4-9 Comparing Technology Gap Using TFP and Labour Productivity

Name of Sector	Number of Firms	TFP Gap	Labour Productivity Gap
Food	134	-0.166	2.626
Garments	24	0.321	0.658
Wood	25	1.004	-0.480
Paper	9	2.578	1.707
Publishing, Printing and Media	47	2.507	1.626
Non-Metallic mineral products	113	2.775	1.502
Basic Metals	10	1.764	0.579
Fabricated Metal Products	52	0.374	1.275
Machinery and Equipment	4	2.500	1.386
Furniture	105	2.764	-0.031
Construction	5	2.579	1.566
Services of motor vehicles	5	2.494	1.476
Retail	33	2.094	0.927
Hotel and Restaurants	14	-3.503	1.380

Table 4-10 Correlation among Proxies of Absorptive Capacity and TFP Gap

	Training	Human	TFPgap
Training	1		
Human	-0.161	1	
TFPgap	0.371	0.51	1

Table 4-11 Effect of FDI on Total Factor Productivity

	(1) Horizontal FDI				(2) Backward FDI				(3) Forward FDI		
Independent Variables	Ln(TFP)			Independent Variables	Ln(TFP)			Independent Variables	Ln(TFP)		
	OLS	RE	FE		OLS	RE	FE		OLS	RE	FE
Constant	9.046	8.742	8.961	Constant	9.249	8.966	9.014	Constant	9.131	8.837	8.939
	(0.138)	(0.142)***	(0.095)***		(0.138)	(0.142)***	(0.074)***		(0.136)	(0.139)***	(0.081)***
	[0.149]	[0.156]***	[0.13]***		[0.147]	[0.121]***	[0.117]***		[0.151]	[0.124]***	[0.092]***
HFDI	2.665	2.444	1.97	BFDI	1.888	1.118	0.057	FFDI	11.58	11.725	6.905
	(0.559)	(0.603)***	(1.659)		(2.655)	(2.792)	(4.788)		(4.607)	(4.971)**	(11.002)
	[1.353]	[1.036]**	[1.647]		[3.355]	[2.999]	[5.001]		[6.506]	[7.768]	[11.285]
H	-0.036	-0.062		H	-0.219	-0.21		H	-0.155	-0.183	
	(0.186)	(0.203)			(0.179)	(0.198)			(0.174)	(0.192)	
	[0.184]	[0.221]			[0.211]	[0.19]			[0.185]	[0.177]	
TR	0.087	0.108		TR	0.162	0.161		TR	0.219	0.223	
	(0.142)	(0.155)			(0.139)	(0.154)			(0.135)	(0.149)	
	[0.154]	[0.164]			[0.158]	[0.165]			[0.135]	[0.149]	
R&D	0.025	0.021		R&D	-0.052	-0.048		R&D	-0.042	-0.039	
	(0.039)	(0.142)			(0.039)	(0.081)			(0.037)	(0.071)	

	[0.455]	[0.179]			[0.079]	[0.102]			[0.089]	[0.110]	
TFPGap	-0.072	-0.08		TFPGap	-0.093	-0.096		TFPGap	-0.063	-0.067	
	(0.013)	(0.013)***			(0.013)	(0.013)***			(0.01)	(0.011)***	
	[0.033]	[0.033]**			[0.031]	[0.068]			[0.032]	[0.046]	
H*HFDI	-2.538	-2.495	-2.223	H*BFDI	-3.137	-4.115	-3.576	H*FFDI	-6.166	-6.289	1.181
	(0.916)	(0.974)**	(2.114)		(3.395)	(3.563)	(6.236)		(5.868)	(6.284)	(13.367)
	[1.429]	[1.257]**	[1.396]		[4.043]	[3.871]	[7.67]		[6.644]	[7.872]	[13.134]
TR*HFDI	1.673	1.442	-2.106	TR*BFDI	4.421	4.51	-1.893	TR*FFDI	1.636	0.9	-11.665
	(0.689)	(0.73)**	(1.41)		(2.716)	(2.847)	(5.073)		(4.535)	(4.857)	(10.606)
	[1.147]	[1.146]	[1.256]*		[2.648]	[2.664]*	[6.047]		[5.719]	[7.32]	[12.11]
R&D*HFDI	-0.259	-0.241	-1.291	R&D*BFDI	0.308	0.212	0.179	R&D*HFDI	0.344	0.212	0.110
	(0.130)	(0.771)	(1.451)		(0.563)	(0.651)	(0.111)		(1.120)	(1.511)	(1.002)
	[0.221]	[0.991]	[1.972]		[0.872]	[0.917]	[0.432]		[1.225]	[1.781]	[1.220]
TFPgap*HFDI	0.043	0.103	0.246	TFPgap*BFDI	0.472	0.503	0.435	TFPgap*FFDI	-0.397	-0.019	2.803
	(0.079)	(0.08)	(0.104)**		(0.192)	(0.186)***	(0.227)*		(0.59)	(0.639)	(1.361)**
	[0.211]	[0.215]	[0.443]		[0.914]	[1.064]	[3.252]		[1.121]	[1.35]	[3.859]
R2	0.237		0.031	R2	0.191		0.021	R2	0.203		0.021
N	580	580	580	N	580	580	580	N	580	580	580

Hausman test of RE against FE		Hausman test of RE against FE		Hausman test of RE against FE	
Chi-squared boot	17.009	Chi-squared boot	4.27	Chi-squared boot	11.87
P-value boot	0.02	P-value boot	0.16	P-value boot	0.009
Chi-squared	23.69	Chi-squared	5.37	Chi-squared	13.23
P-value	0	P-value	0.251	P-value	0.01

Note: 1) In OLS sectors and time dummies are included while in RE and FE time dummy and firm fixed effect are taken into account. 2) * p<0.10; **p<0.05;*p<0.01. 3) ( ): asymptotic standard errors, [ ]: bootstrap standard errors.**

Table 4-12 Effect of FDI on Total Factor Productivity (TR and H Used in TFP Calculation)

	(1) Horizontal FDI				(2) Backward FDI				(3) Forward FDI		
Independent Variables	Ln(TFP)			Independent Variables	Ln(TFP)			Independent Variables	Ln(TFP)		
	OLS	RE	FE		OLS	RE	FE		OLS	RE	FE
Constant	9.035	8.751	8.971	Constant	9.158	8.904	9.012	Constant	9.095	8.816	8.95
	(0.081)	(0.069)***	(0.093)***		(0.081)	(0.069)***	(0.073)***		(0.081)	(0.067)***	(0.079)***
	[0.09]	[0.078]***	[0.128]***		[0.086]	[0.071]***	[0.091]***		[0.067]	[0.054]***	[0.102]***
HFDI	2.391	2.209	2.069	BFDI	1.879	1.157	0.201	FFDI	10.405	10.715	7.995
	(0.498)	(0.539)***	(1.628)		(2.394)	(2.533)	(4.707)		(4.234)	(4.582)**	(10.794)
	[1.139]	[0.885]**	[1.659]		[3.043]	[2.345]	[5.31]		[7.59]	[8.816]	[13.935]
TFPGap	-0.067	-0.074		TFPGap	-0.084	-0.087		TFPGap	-0.059	-0.063	
	(0.011)	(0.012)***			(0.011)	(0.012)***			(0.009)	(0.01)***	
	[0.026]	[0.044]*			[0.019]	[0.024]***			[0.036]	[0.032]**	
H*HFDI	-1.745	-1.814	-2.212	H*BFDI	-2.515	-3.317	-2.234	H*FFDI	-4.555	-5.027	-0.156
	(0.736)	(0.793)**	(2.074)		(2.942)	(3.121)	(6.133)		(5.215)	(5.61)	(13.083)
	[1.257]	[1.055]*	[1.76]		[3.435]	[2.918]	[7.112]		[7.826]	[9.857]	[14.159]
TR*HFDI	1.308	1.147	-2.112	TR*BFDI	4.149	4.19	-1.681	TR*FFDI	2.813	2.035	-11.098
	(0.563)	(0.604)*	(1.386)		(2.365)	(2.501)*	(4.996)		(4.086)	(4.393)	(10.455)

	[0.942]	[0.8]	[1.427]		[2.151]	[1.89]**	[5.714]		[6.612]	[7.916]	[12.876]
TFPgap*HFDI	0.036	0.092	0.243	TFPgap*BFDI	0.433	0.46	0.441	TFPgap*FFDI	-0.405	-0.06	2.704
	(0.074)	(0.074)	(0.097)**		(0.183)	(0.176)***	(0.213)**		(0.543)	(0.588)	(1.262)**
	[0.171]	[0.131]	[0.272]		[0.711]	[0.615]	[2.966]		[0.782]	[1.204]	[4.604]
R2	0.213		0.033	R2	0.167		0.02	R2	0.181		0.021
N	580	580	580	N	580	580	580	N	580	580	580
Hausman test of RE against FE				Hausman test of RE against FE				Hausman test of RE against FE			
Chi-squared boot	9.32			Chi-squared boot	7.2			Chi-squared boot	5.76		
P-value boot	0.22			P-value boot	0.4			P-value boot	0.109		
Chi-squared	4.7			Chi-squared	7.21			Chi-squared	11.9		
P-value	0.003			P-value	0.05			P-value	0		

Note:1) In OLS sectors and time dummies are included while in RE and FE time dummy and firm fixed effect are taken into account. 2) * p<0.10; **p<0.05;*p<0.01. 3)( ): asymptotic standard errors, [ ]: bootstrap standard errors.**

Table 4-13 Effect of FDI on Total Factor Productivity with H*FDI and TR*FDI Dropped (H and TR Used in TFP Calculation)

	(1) Horizontal FDI				(2) Backward FDI				(3) Forward FDI		
Independent Variables	Ln(TFP)			Independent Variables	Ln(TFP)			Independent Variables	Ln(TFP)		
	OLS	RE	FE		OLS	RE	FE		OLS	RE	FE
Constant	9.025	8.742	9.016	Constant	9.158	8.897	9.01	Constant	9.092	8.812	8.971
	(0.081)	(0.07)***	(0.09)***		(0.081)	(0.07)***	(0.072)***		(0.081)	(0.067)***	(0.077)***
	[0.082]	[0.075]***	[0.113]***		[0.073]	[0.084]***	[0.082]***		[0.07]	[0.055]***	[0.096]***
HFDI	1.969	1.676	-0.323	BFDI	2.4	1.174	-1.56	FFDI	9.669	9.334	1.466
	(0.311)	(0.332)***	(0.69)		(1.254)	(1.306)	(2.264)		(2.127)	(2.279)***	(4.85)
	[0.645]	[0.613]***	[0.825]		[1.328]	[1.184]	[1.988]		[2.515]	[2.907]***	[5.52]
TFPGap	-0.066	-0.074		TFPGap	-0.084	-0.087		TFPGap	-0.059	-0.063	
	(0.011)	(0.012)***			(0.011)	(0.012)***			(0.009)	(0.01)***	
	[0.028]	[0.044]*			[0.026]	[0.028]***			[0.035]	[0.042]	
TFPgap*HFDI	0.025	0.085	0.22	TFPgap*BFDI	0.438	0.464	0.433	TFPgap*FFDI	-0.452	-0.12	2.563
	(0.074)	(0.074)	(0.096)**		(0.183)	(0.176)***	(0.211)**		(0.528)	(0.574)	(1.242)**
	[0.302]	[0.25]	[0.468]		[0.965]	[1.054]	[2.33]		[1.267]	[1.2]	[3.696]
R2	0.202		0.021	R2	0.159		0.019	R2	0.179		0.016
N	610	610	610	N	610	610	610	N	610	610	610

Hausman test of RE against FE		Hausman test of RE against FE		Hausman test of RE against FE	
Chi-squared boot	13	Chi-squared boot	6.6	Chi-squared boot	11.2
P-value boot	0.4	P-value boot	0.06	P-value boot	0.15
Chi-squared	6.3	Chi-squared	7.21	Chi-squared	5
P-value	0.003	P-value	0.05	P-value	0.215

Note:1) In OLS sectors and time dummies are included while in RE and FE time dummy and firm fixed effect are considered. 2) * p<0.10; **p<0.05;*p<0.01. 3)( ): asymptotic standard errors, [ ]: bootstrap standard errors.**

CHAPTER 5: Innovation Outcomes on Productivity

5.1 Introduction

Globally, foreign direct investment (FDI) is sought for the potentials it holds in facilitating technology transfers, increasing domestic production, providing employment opportunities and international market networks amongst other things. There has been a steady rise in FDI with increased integration across countries of the world in the last twenty years driven by the dynamic and speedy advances in technological change. According to the 2011 World Investment Report, global FDI flows have been rising even though not at the same rate as the pre-global crisis periods. Specifically, it rose to $1.24 trillion in 2010 about 15% below the pre-crisis average. On the other hand, global industrial output and trade have returned to the pre-crisis levels. While FDI inflows to developed countries continue to nosedive phenomenally, developing and transition economies together attracted more than half of global FDI flows, with their outward FDI (mostly directed towards other countries in the south) also rising to heights (Gachino, 2007; UNCTAD, 2011).

Innovation is the outcome of firms' investments in knowledge capital and management decisions. The ultimate objective of these investments is to produce innovations that positively impacts on firms' performance by increasing productivity, employment, sales, profits, market shares, or mark-ups. However, there is uncertainty regarding the extent to which firms can convert knowledge capital investments into innovation outcomes and furthermore, whether these innovation outcomes are likely to impact on firm performance. Innovation is risky since it is almost impossible to determine, ex-ante, whether the introduction of a new product, process, or organisational change will lead to an increase in sales or productivity.

In general, most of the evidence of the impact of innovation on productivity and firm-level performance has been focused on developed countries. Regarding the connection to employment, the case study literature has emphasised the possibility that innovation acts as a mechanism to reduce employment, and, as a force for skill bias, as it increases the relative demand for skilled labour. While this is very important, this argument suffers from a real deficit of evidence, especially regarding developing countries and firm-level information. In a recent survey of the literature, Vivarelli (2012) suggests that the more recent micro-econometric literature tends to support a positive link between technology, proxied as R&D and product innovation, and employment, especially when focusing on high-tech sectors.

Vivarelli (2012) also finds significant evidence in favour of the skill-biased hypothesis across different OECD countries, different economic sectors, and different types of innovation.

In one of the few existing micro-econometric studies, Harrison et al. (2008) study the impact of innovation on employment using a comparable dataset of firms from France, Germany, Spain, and the UK. The authors find that product innovation has a positive impact on employment, but that process innovation has a displacing effect on employment. However, the positive impact of product innovation generating employment is larger than the displacement effect of process innovation and the net effect of innovation on employment tends to be positive. Using a similar methodology, Hall, Lotti and Mairesse (2009) find a low but positive effect of product innovation on employment in Italy and no displacement effect from process innovation. Thus, the limited evidence in existence suggests an overall positive impact of innovation on employment, but more research is needed to understand if these results also hold for firms in developing countries that are further away from the technological frontier.

In relation to the impact of innovation on productivity, Hall (2011) provides a comprehensive survey of the empirical work. The survey mainly focuses on 16 existing empirical studies using the workhorse empirical model, the Crepon-Douget-Mairesse (CDM) model (Crepon, Duguet & Mairesse, 1998), implemented using firm-level data in OECD countries and a few emerging markets. Hall's (2011) main finding is that, in general, most studies find a positive correlation between product innovation and productivity, but the impact of process innovation is ambiguous. According to Hall (2011), the problem with process innovation is that it cannot be measured in the surveys beyond the dichotomous variable of whether or not the firm implements process innovations. In general, these studies suggest that innovation has a positive impact on productivity.

The evidence for developing countries, however, is scarce. One relevant study is Goedhuys et al. (2008), which examines the main drivers of productivity in Tanzania. The authors do not find any link between R&D, product and process innovations, licensing of technology, or training of employees and productivity. The results suggest that Tanzanian firms are struggling to convert knowledge inputs into productivity improvements due to the weakenabling environment for business, which is the main constraint on productivity according to their empirical results.

Also, there are indications that in developing countries, investments in knowledge capital are smaller than in developed countries. For example, Goni and Maloney (2014) demonstrate that investments in R&D as a share of GDP are smaller in developing countries than in developed countries. One plausible explanation for this is the absence of complementary factors to enable R&D, such as education, the quality of scientific infrastructure, and the private sector, which is weaker in countries far away from the technological frontier.

A related strand of the literature has empirically analysed some of these complementary factors. Polder et al. (2010) find significant complementarities between different knowledge inputs and innovation outcomes in the Netherlands. The authors find that:(i) ICT investment and usage are important drivers of innovation; (ii)there is a positive effect on theproductivity of product and process innovation when combined with organisational innovation; and (iii) there is evidence that organisational innovation is complementary to process innovation. Miravete and Pernias (2006) find evidence of complementarity between product and process innovation in Spain's tile industry, and Cassiman and Veugelers (2006) find important complementarities between internal R&D and external knowledge acquisitions.

A final element is the lack of an enabling business environment in many developing countries and existing market failures in the supply of technical infrastructure, human capital or technology, as well as recent evidence of low management quality in firms in developing countries (Bloom et al., 2012). This raises questions about the efficiency of transformation of knowledge inputs by firms into innovation outcomes, and further, into improvements in firm performance.

To boost productivity, there is aneed for broad-based innovation and investment in knowledge capital. Innovation is the engine of the 'creative destruction' process that spurs economic dynamism and transformation and is at the centre of the development process (Schumpeter 1942). Innovation contributes to the twin goals of shared prosperity and poverty reduction by generating productivity gains that increase employment, raise wages, and improve access for the poor to products and services. Investing in innovation increases the capabilities of firms, enabling them to integrate into global value chains and compete in international markets while facilitating the adoption of new technologies that improve labour productivity (Aghion and Howit, 1992; Klette & Kortum, 2004; Romer, 1986; Solow, 1957).

This chapter aims to provide a rich description of the nature of firm-level innovation and investments in knowledge capital in Nigeria, and the link between innovation activities and productivity.

The chapter is structured as follows. Following this introduction, section 5.2 describes Nigeria's policy framework for innovation. Section 5.3 defines the different measures of innovation and describes the datasets used in the analysis. Section 5.4 provides the methodology of the firm level innovation landscape in Nigeria. Section 5.5 analyses the main determinants of innovation in the manufacturing and services sectors as well as the relationship between innovation and firm performance. The last section provides conclusions and policy recommendations regarding firm-level innovation in Nigeria.

5.2 FDI and Innovation Policy in Nigeria

Most developing African countries are dependent on FDI as a source of foreign capital for development and employment. For instance, the government of Nigeria works hard to make the environment conducive for FDI by providing a growing infrastructural base, facilitatingthe development of human capital, openness to trade and other forms of regional cooperation, providing a viable financial infrastructure and a liberalised economy without exchange or price controls. According to the 2007 ranking of competitiveness, Nigeria was placed 10th over 29 African countries. Even though the country is still characterisedas a factor-driven economy, with high dependence on commodity prices and world economic cycles it is fast being transformed into an innovation-driven economy. In Nigeria, skilled labour is playing a greater role in the economy than in the past. The financial sector is also becoming more and more innovative. It is worthy of note that Nigeria's skill mix and human resource base makes Nigeria a repository necessary for the achievement of its development agenda. Nigeria's private sector has increased its ability to harness existing technologies required for its transition to be an innovation-driven economy. Business sophistication, increased goods and labour market efficiency which is Nigeria's experience is driven by its increased financial sector sophistication (African Development Bank,2008).

Nigeria's Vision 20:2020 documents the essence of raising the productivity of the manufacturing industry by encouraging increased involvement of foreign and domestic investment in the economy:

> *"An analysis of the Nigerian manufacturing industry indicates that large firms are responsible for the bulk of non-oil, value-added exports. However, small and medium firms make up the bulk of the manufacturing and processing firms. Most of these firms are so small that they are unable to participate in foreign markets significantly. Increasing the volume of value-added exports can only be achieved by targeting investment in key sub-sectors and creating large firms focused solely on value-added exports. In the light of this, actions will be taken to increase the number of large manufacturing firms in the industry. This will be achieved by creating an enabling environment so that small/medium firms can grow and prosper through increasing direct investment – both domestic and FDI - in the manufacturing industry." (National Planning Commission, NPC, 2009, p.10)*

The fundamental objectives of the Nigerian economic transformation agenda include the achievement of economic diversification, transformation of the structure of exports from primary commodities to processed and manufactured goods and the attainment of high levels of efficiency and productivity, to be globally competitive. Process innovation in the manufacturing industries may be labour-saving and job-displacing based on the complexity of the relationship. In a drive to build capacity and innovation, the Nigerian economic transformation blueprint recognises that capacity building needs to be based on clear and dynamic strategies and policy measures that would foster innovation and entrepreneurship, facilitate the diffusion of Information and Communication Technology (ICT), foster the development of Research and Development and promote worker education and training, inter alia.The promotion of business and technology innovation is being driven by the development of incubators. Also, effective linkages formed with local universities and research institutions are forged to encourage innovation and promote indigenous research and development.

To engender a favourable policy environment, the Nigerian Investment Promotion Commission (NIPC) serves in removing unnecessary controls and creating an atmosphere of trust and transparency to encourage innovation and entrepreneurship of businessmen, industrialists and traders; all of which should facilitate the development of Nigeria as a global hub for manufacturing, trading and services. The Commission seeks out and nurturesspecial focus areas which would generate additional employment opportunities. Also,promoting sustainable development and application of acceptable and profitable technologies through strategic investments in biotechnology research and development to support innovation and economic development is one of the strategies of the NIPC.

In its incentive policy for investment, the NIPC4 seeks to promote micro, small and medium scale enterprise (MSMEs) utilisation of modern and appropriate technology and innovations from research and development institutions. This would increase the capacity and diversity of the private sector by providing opportunities for international and local investors and contractors in public infrastructure, encouraging efficiency, innovation, and flexibility at minimum cost. An impact evaluation of such programmes engaged by the government to drive these policies will enable NIPC through investment promotion to create more jobs in the economy. The timing of this study is therefore apt as it will, in a substantial measure, provide a basis for evaluating the performance of the existing policies on innovation in Nigeria and the effectiveness of the frameworks for achieving their current national plans.

5.3 Data Description and Measurement of Innovation

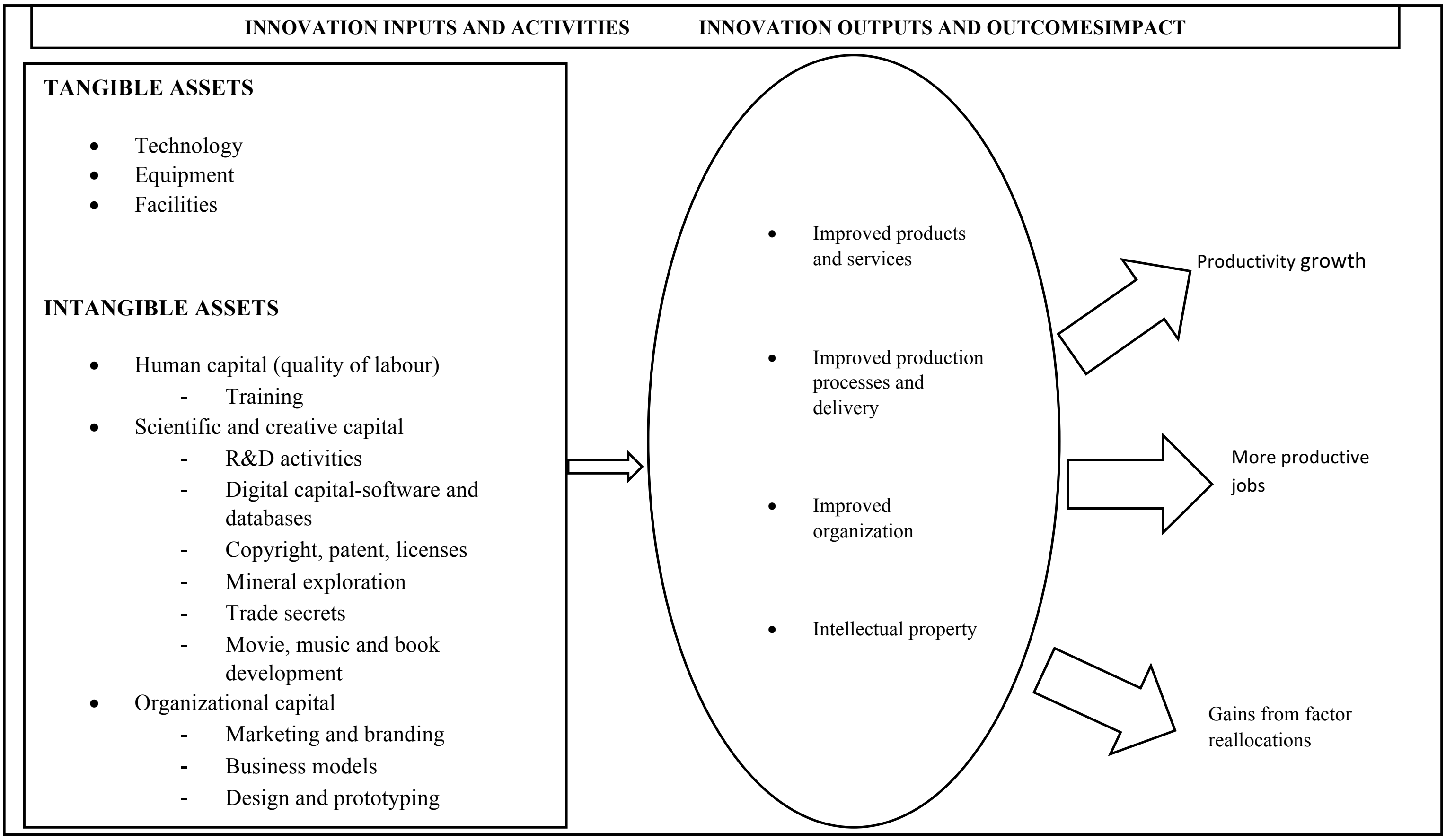
To examine the innovative behaviour of firms in Nigeria, I use the World Bank 2014 Enterprise Survey (ES) and its linked innovation module. This is the most comprehensive survey on innovation information carried out in Nigeria to date. It complements the first national innovation survey conducted by the NBS in 2012 involving 300 firms, as well as a pilot innovation survey conducted in 2013 involving 310 establishments, mainly in the services sector. The 2014 ES, which corresponded to the period of analysis 2007-2014, covered information regarding innovation activities and outcomes for 1853 firms, but only 905 were used for the main econometric analysis; including micro firms and those in the services sectors. Table 5-10 shows the distribution of firms by sector and size. The survey uses a stratified sampling strategy, where firms are stratified by industry, size, and location. Despite its small sample size, the 2014 ES improves on the previous one of 2007, which was less sector representative. Furthermore, it is the largest and most representative survey available, as it includes innovation information. An additional advantage is that the survey collects substantial balance sheet data and other information regarding the investment climate, which enables the linkage of innovation efforts to performance and potential obstacles.The sample selection for this chapter is based on the completed available data from the Enterprise survey database developed by the World Bank. The enterprise survey includes an innovation survey that captures various industrial sectors using the ISIC classification. Therefore, the samples used in this chapter are based on the complete informational data available.

5.3.1 Measuring Innovation

Innovation requires the transformation of knowledge capital or innovation inputs, both tangible and intangible—such as training, equipment, R&D or intellectual property acquisitionsinto innovation outcomes such as the introduction of new and improved products, new production processes, or organisational changes. Firms invest in knowledge capital inputs to increase their capabilities and produce innovative outcomes. As well as requiring tangible assets such as technology, equipment, and the physical production facilities, innovation needs intangible assets such as human capital, scientific and creative capital, and organisational capital. In turn, these inputs require specific innovation activities. Firms invest in training to increase the available human capital. Also, firms invest in R&D, software, and digitalisation or copyrights, patents and licenses to increase their scientific or innovative capital. In the case of the creative industries, innovation involves investment into developing these creative assets. Finally, innovation also requires organisational capital through investments in marketing and branding, adoption of new business models, design and prototyping, or corporate alliances and networks.

As illustrated in Figure 5-1, the combination of these inputs yield innovation outcomes in the form of new or improved products and services, production and delivery processes, business organisation, and patented intellectual property. However, achieving the outcomes is heavily dependent on the ability of the firm in question, on the specific sector and country context, and on the enabling environment and policy framework in place.

Figure 5-1. **Innovation Function**



(Source: Author's adaptation)

The innovation outcomes can impact on firm performance in different ways. Successful innovations are likely to increase firm-level productivity by improving the capacity to transform factors of production into more and better quality products, and by more efficiently creating products of higher value. Second, the increase in productivity is expected to increase the marginal productivity of labour, and as a result, increase the quality of jobs, i.e., more productive jobs. Third, more productive firms are expected to push less productive firms out of the market, thereby increasing the overall efficiency of the economy. This will improve allocative efficiency. All this, however, depends on the quality of the innovation and the ability of firms to translate innovation outcomes into improved performance.

To measure innovation, one can focus on both measuring inputs and innovation activities, and measuring innovation outcomes. The early innovation measurement literature focused on a specific set of innovation inputs that were easier to quantify, for instance, R&D, or the intensity of the technology used. These early efforts were followed by the implementation of the Oslo Manual type of surveys, which mainly focus on measuring innovation outcomes such as product/process improvements or patents at the firm level. The third generation of synthetic innovation indicators, such as the OECD STI scoreboard, were developed later. These indicators combine innovation inputs and outputs/outcomes to facilitate cross-country benchmarking and comparisons.

Innovation input indicators are often calculated at the aggregate level using different sources such as national accounts or by aggregating firm-level or sector information. On the other hand, innovation outcomes are mainly gauged by using firm-level innovation surveys.

A challenge of measuring innovation outcomes is the subjective nature of many of the questions used in the surveys. The Oslo Manual, which is the main reference for these types of surveys, defines innovation as "…the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations." Most surveys use this definition to identify innovations by directly asking firm managers and owners whether they have implemented "new" or "significant" changes or improvements in the last three years. This is problematic since "significant" is a highly subjective term, and is also self-reported. It is therefore important to supplement analysis of innovation outcomes with some measures of revealed expenditure on innovation inputs.

Several authors have advocated a focus on knowledge capital assets as a better measure of innovation, and in recent years there has been a renewed effort to better measure and capture investments in intangible assets using data from different sources (Corrado, Hulten & Sichel, 2006). While this approach offers a clearer and broader measure of firms' capabilities, it faces the challenge of being unable to obtain the information required from existing innovation surveys. Moreover, it is important to highlight that this measure of innovation assets is not equivalent to innovation outcomes; inputs can be efficiently used, and therefore, there is some uncertainty about the type and extent of innovation outcomes that can be produced by firms using these knowledge assets.

In general, any sound analysis of innovation activity should combine a focus on both knowledge capital inputs and innovation outcomes. Although the ES innovation survey does not provide enough information on some of these intangible assets, it provides information on various sources of knowledge capital and innovation outcomes

5.4 Methodology

To estimate the impact of innovation activity on performance, the authorfollows a logical framework, which is the basis of the CDM model (Crepon et al., 1998). The framework holds that firms invest in knowledge inputs that can be transformed into innovation outcomes according to the efficiency of their innovation function. At a later stage, these innovation outcomes impact productivity which is contingent on the capacity of firms to transform innovation outcomes into improvements in product quality and efficiency. As a result, the CDM model requires the estimation of three main components: the knowledge function; the innovation equation; and the productivity equation.

When estimating these components, there are two critical choices that need to be considered. The first is to define the scope of the knowledge inputs and innovation outcomes to be included in the analysis. This is often related to the availability of data in the innovation surveys. In most CDM applications, data is restricted to the use of R&D for knowledge activities; for innovation outcomes, either product and process innovation dummies, or the number of patents and the revenue associated to new products, are used. This chapter extends the traditional CDM model to include R&D as well as two other main knowledge activities:

(i) the acquisition of equipment for innovation, and

(ii) the training of workers for innovation activities.

Regarding innovation outcomes, in addition to product and process innovations, the chapter focuses on organisational innovations, since as was seen earlier, some of the literature suggests important complementarities with process innovations.

The second choice when examining these three innovation components relates to how the model is solved. Decisions regarding knowledge inputs and innovation outcomes can be made simultaneouslyand there can be feedback effects, especially on innovation outcomes and productivity. There are two main approaches in the literature on how to solve the model. Crepon et al. (1998) suggest solving the model simultaneously using Asymptotic Least Squares. Meanwhile, Griffith et al. (2006) assume that there are no feedback effects and solve the model sequentially, instrumenting knowledge activities in the innovation equation, and innovation outcomes in the productivity equation, to avoid endogeneity.

The approach in this chapter is closer to the one advocated by Griffith et al. (2006), and solves the model sequentially, although for robustness I also estimate the model using a similar method to the original CDM approach. There are,however, two main assumptions that this chapter follows when solving the model: (i) firms first determine the intensity of input choices; and (ii) choices about the different types of innovation outcomes (product, process, or organisation) are made simultaneously.

5.4.1 The knowledge function

The first step of the model is to specify the choice of knowledge capital investment intensity. To this end, I extend the CDM model in two main directions. First, when measuring knowledge intensity, I also include other knowledge capital investments in addition to R&D, such as equipment and training for innovation. Second and differently from Griffith et al. (2006), who only used data on R&D activities for innovators, the enterprise survey asks the question of knowledge activities to all firms. As a result, in the dataset zero research intensity is an important outcome of knowledge capital investments that I need to incorporate this into the model. Therefore, rather than using a generalised Tobit model, often implemented in CDM model, I use a generalised Poisson estimator to better cater for the number of zeroes in the data.

Specifically, I estimate the following model

$$\ln\{E(k_i)\} = x_i\beta, k{\sim}Poisson \qquad (1)$$

Where k_i is knowledge intensity for firm i; x_i is a vector of determinants of knowledge intensity and β is a vector of estimated coefficients. I follow the literature on the determinants of knowledge activities in the Schumpeterian tradition and use as determinants variables to represent market share, diversification and demand conditions, and firm level characteristics such a size and technological opportunities. To avoid simultaneity between knowledge activities and market share I use firm's market share before the introduction of any innovation activities from three years ago. For diversification and demand conditions I use whether domestic or external demand is decreasing for the firm and whether the firm is a two-way trader, exporter and importer. Technological opportunities are captured by ISIS 2 digits sector dummies. In addition, I control for firm size, age and whether the firm is foreign owned. Finally, and more importantly, I extend the model and introduce variables that represent the perceptions about the business environment for the firm. Specifically, I use indices reflecting firms' perceptions on how much of an obstacle is presented by lack of finance, trade costs, telecommunications and government policies and regulations.

5.4.2 The innovation function

The second step is to determine the innovation equation. One crucial element in the decision to innovate is that firms decide simultaneously what innovation outcomes to produce based on existing knowledge capital investments. As a result, one should expect some correlation between the decisions to carry out product and process innovations, and perhaps organisational innovations. To incorporate these correlations in the empirical estimation, I use a multivariate Probit framework, which allows the author to estimate the decision to innovate in the different areas simultaneously and, therefore, correcting for potential correlation in these decisions.

Specifically, I estimate m Probit equations for the probability of innovating, where m equals 3 when considering the three types of innovation.

$$i^*_{im} = \beta'_m X_{im} + \varepsilon_{im}, m = 1,..3 \quad (2)$$

$$Iim = 1 \; if \; i^* \; im > 0 \; and \; 0 \; otherwise \quad (3)$$

Where the log-likelihood function can be expressed as:

$$L = \sum_{i=1}^{n} w_i \, log\phi_3(\mu_i; \Omega)$$

$$\mu_i = (K_{i1}\beta_1^{'}X_{i1}, K_{i2}\beta_2^{'}X_{i2}, K_{i3}\beta_3^{'}X_{i3})(4)$$

Moreover, allowing for correlation in the errors across equations, matrix Ω elements are:

$$\Omega_{kk} = 1, k = 1, \dots 3$$

$$\Omega_{21} = \Omega_{12} = K_{i1}K_{i2}\rho_{21}$$

$$\Omega_{31} = \Omega_{13} = K_{i3}K_{i3}\rho_{31}$$

$$\Omega_{32} = \Omega_{23} = K_{i3}K_{i2}\rho_{32} \qquad (5)$$

The likelihood function depends on the multivariate standard normal distribution (Capperlari and Jenkins, 2003). As a determinant for the innovation equations,I follow the literature and control for size and capital intensity, proxied by the ratio of capital to labour. One important input of the innovation function is the number of technical staff in the establishment that can facilitate the transformation of knowledge inputs into innovation outcomes. Given that the data on skilled labour is uncompleted,I proxy skilled labour by an index of how much of an obstacle is presented by an inadequately trained labour force.

Finally, given the potential endogeneity of knowledge capital investments in the innovation outcomes, Iuse the predicted values from the Poisson process in the first stage to instrument knowledge activities, for both R&D intensity and total research intensity.

5.4.3 The productivity Equation

The final stage to estimate the impact of innovation on firm performance is to derive the productivity equation. I approximate productivity using a Cobb-Douglas function where sales (Y) are a function of capital (K), labour (L) and innovation outcomes (H).

$$Y = f(H, K, L)$$

$$Y_i = H_i K_i^{\alpha} L_i^{\beta}$$

$$\frac{_i}{L_i} = \frac{H_i K_i^{\alpha} L_i^{\beta}}{L_i} \frac{L_i^{\alpha}}{Y L_i^{\alpha}} \quad (6)$$

Transforming equation 6 in logarithm form and adding sector controls (Xi) we have:

$$\log\left(\frac{Y_i}{L_i}\right) = \delta_0 + \delta_1 log(H_i) + \alpha log\left(\frac{K}{L_i}\right) + (\beta + \alpha - 1) log(L_i) + \delta_2 X_i + \varepsilon_i \quad (7)$$

Equation (7) can be estimated by OLS. However, given the potential simultaneity between innovation outcomes and performance, I use the predicted values of the innovation outcomes as instruments and correct the standard errors by removing the mean squared error from the VCE of the second stage (Greene, 2012). Specifically, we estimate by OLS the following equation:

$$\log\left(\frac{Y_i}{L_i}\right) = \delta_0 + \delta_1 Prod_i + \delta_2 Proc_i + \delta_3 organ_i + \delta_4 log\left(\frac{K}{L_i}\right) + \delta_5 log(L_i) + \delta_2 X_1 + \varepsilon_i \ (8)$$

Robustness

The set of equations (1), (4) and (8) above are solved sequentially and instrumented at each stage following Griffith et al. (2006). This, however, assumes no major feedback effects from productivity to innovation and from innovation to knowledge capital investment. As a robustness test, I re-estimate the second and third stages, innovation functions and productivity, simultaneously by maximum likelihood and compare the results with the sequential method.

5.5 Estimation Result

In the context of developing countries innovation has been described as a process by which firms master and implement the design and production of goods and services which are new to them, irrespective of whether they are new to their competitors, their countries or the world (Mytelka, 2000). Hence, innovation takes place when products and processes that are new to a country or an individual enterprise are commercially introduced, whether or not they are new to the world (UNCTAD, 2007). In this respect, a wider set of changes in products, processes, organisation and marketing, including the purchase of new machinery and equipment as well as recent licensing-in of technology, are accepted as activities directly geared towards innovation. The obvious conclusion is that minor and incremental changes, including innovative approaches to organisation and marketing, constitute the bulk of what is called innovation in developing countries. In particular, marketing and organisational innovations are of major importance for firms in this context. A very extensive discussion of this can be found in Annex A of the Oslo Manual (OECD, 2005).

One of the main sources of the differences between firms in developed and developing countries is the costly nature of innovation. In backward economies, firms find it much more difficult to muster sufficient financial and knowledge resources for innovation (Schmitz, 1982). In the specific case of Nigeria, Biggs et al. (1995) noted that the context for manufacturing is of a harsh economic and institutional nature. One specific way by which firms substitute for their resource deficiencies is through networking. In a Nigerian case study, it was found that, among the many sources of information that was available to the firm, the ad-hocsectoral network institution created by the firms themselves particularly supported technological learning and innovativeness (Egbetokun et al., 2010). In Tanzania, the evidence presented by Goedhuys (2007a) showed that collaboration could support innovation in local firms in developing countries, even when they are seen to invest less in new machinery and to engage less in training and research, development and design activities than their larger or foreign counterparts, probably due to more severe financial constraints.In particular, these firms prove to be more embedded in the domestic industrial structure and also source information from the internet. Furthermore, in a comparative study of two enterprise clusters in Nigeria, Oyelaran-Oyeyinka (2005) reported that collaboration, largely in the form of informal ties, among enterprises, grew over time, induced mainly by competitive forces and that these ties were in the face of common threats.

Economists agree that innovation is a source of a large share of productivity growth. There is much less consensus, however, relevant to determinants of decision firms to innovate andinvest in research and development of new ideas.

Business R&D expenditures were, for a long time,considered to be crucial and direct determinants of a firm's innovation activity and its ability to absorb external knowledge which on the company level increases productivity and profit (Cohen and Levinthal, 1989). R&D spending was expected to increase productivity by reducing the cost of production of existing goods (process innovation) or expanding the choice of products (product innovation). Also, R&D isa relatively well defined and measurable variable and earlier studies actually considered expenditures for R&D to be a substitute for measuring firm innovation activity (Griliches, 1986). Later, however, it has been acknowledged that R&D spending is an innovation input that cannot be used as adirect measure of innovation output as not all R&D investment leads to successful innovation. Moreover, it is not easy to measure innovation output. Innovation activity started to be analysed as a process starting decision on R&D investment, followed by innovation output and productivity growth.

Factors influencing innovation activity include firm age, the firm's size, and strategic features such as being a member of a group or orientation on foreign markets, barriers to finance innovation, level of market competition, the economic situation of a country, R&D *etc*. Variables that are expected to determine different components of the innovation process are so numerous that the selection (and omission) of variables is very likely to influence results of empirical studies.

5.5.1The determinants of investing in Knowledge input in Nigeria

Table 5-1(see Appendix) shows the results of the first stage, the determinants of the intensity of knowledge capital investments. As shown in the methodology above, I use a Poisson estimator to account for the number of firms with zero investments. Columns (1) and (2) show the results for R&D intensity and research (sum of R&D, training and equipment) intensity.

Regarding R&D intensity (column 1), two-way traders and firms that face shrinking demand domestically or internationally have larger R&D intensity. Also, firms with greater perceptions of being financially constrained invest less on knowledge inputs. This suggests that international competition and pressure for diversification are important predictors of R&D intensity, while access to finance is likely to be an important inhibitor of these investments. Interestingly, firms with foreign ownership tend to invest less on R&D, while in line with some of the literature size does not appear to matter for these investments. Finally, neither market power position nor none of the obstacles explored; telecommunications, trade or government obstacles appear to have an impact on knowledge capital investments intensity. Thisemphasises the role of external demand factors in explaining R&D intensity.

According to theresults, foreign ownership decreases theprobability of innovation decision, probably due to direct transfer of knowledge and technology from the mother firm as R&D in multinational companies is generallycentralised in headquarters (Cantwell & Zayas, 2003). This result is in line with the analysis of Srholec (2005) who used data from the third Community Innovation Survey (CIS) and found that foreign affiliates tended to engage less in internal R&D compared with domestically owned firms. Also, Zemplinerova (2010) showed that there exists a negative relationship between foreign ownership of the firm and numbers of R&D employees - in comparison to domestic firms, foreign firms have fewer R&D employees. I find that intuitively consistent; economic factors such as lack of finance for innovations are negatively correlated with innovation investment.

An examination of column (2), with a broader measure of knowledge-capital investments, including equipment and training, reveals very similar results to the ones on R&D, but with only two differences. First, lack of finance does not have a significant role in explaining knowledge intensity investments when broadening the definition; so it appears less binding when including machinery, equipment and training. Second, foreign-owned firms appear to invest more in knowledge inputs when considering machinery, equipment and training, which is likely the result of the fact that they carry out R&D abroad or in related firms.

Columns (3) and (4) estimate the same specifications for robustness as (1) and (2), but this time looking at the decision (not the intensity) to invest. Thus, I use a Probit model to estimate the probability that firms incur any R&D (3) or R&D, machinery, equipment and training (4) investments.

In the case of R&D, the only variables that appear to explain the decision to invest are having a decreasing domestic or international demand, larger market share at the beginning of the period in 2008(t-3), the perception of greater incidence of government obstacles and the perception of how important is access to finance as an obstacle. Firms that claim to be more financially constrained are less likely to engage in R&D, while firms that have larger sector market shares and that have more incentive to diversify due to contracting demand are more likely to implement R&D. The coefficient of government obstacles is, however, puzzling. Firms which perceive government regulations to be more of an obstacle are also more likely to engage in R&D, which could be explained by the potential endogeneity of these perceptions to firm performance.

The existing literature suggests that developing countries should invest very heavily in research and development (R&D). The estimates of the return to Research and Development expenditure (R&D) for advanced countries have been argued to be so high as to justify levels of investment multiples of those found (Jones & Williams, 1998). The case is arguably even stronger for poor countries where a long literature argues that R&D is essential to the absorptive" or national learning" capacity required to exploit technological advance in the advanced countries.

Empirically, Griffith et al. (2004) for the OECD demonstrate that the estimated returns to R&D, in fact, rise with distance from the technological frontier and increasingly reflect the greater gains from catch-up afforded to follower countries. Extrapolating their estimates out of sample to even middle-income countries, the implied returns are truly large and suggest a much larger effort in R&D is justified in developing countries than found in the advanced.

In the advanced countries, roughly 65% of R&D is undertaken by the productive sector while in poorer countries this share falls to 30%. With government undertaking or subsidisinga large share of R&D that is not economically justified, the country-wide return falls below that of private R&D alone. Young (1992), for instance, argues that alarge component of R&D

investment in Singapore constituted high tech white elephants. Such investment is completely wasted,and by drawing resources away from other competing demands or by raising taxes in the private sector, it may cause returns to become negative. This result has precedent in the literature on the level and composition of fiscal spending. Devarajan, Swaroop and Zhou (1996), for instance, found a negative impact with an increased share of government spending devoted to capital expenditures, arguing that when such spending became excessive the marginal return became negative. Alesina et al. (2003), more recently, found negative impacts of government spending due to crowding out through higher wages, etc. These may be exacerbated in LDCs where the benefit of R&D spending to the private sector, as I document, is low, but the competition for very scarce resources may be more intense.

According to panel data methodology used in the work of Goni and Maloney (2014), their work confirms that despite presumed gains from Schumpeterian backwardness, developing countries tend to conductvery little R&D. They document that global returns to R&D across the whole sample are consistent with those found earlier, although they do fall with the introduction of internal and external instruments.

Their findings are consistent with a countervailing effect of increasingly scarce complements to R&D spending with distance from the frontier that eventually offsets the gains from Schumpeterian backwardness. Developing countries lack thehigh-level human capital, research infrastructure, and a sophisticated private sector that could both exploit knowledge transfer and provide feedback to the R&D process, as well as weaker investment climates that depress overall profitability.

Their results suggest that for middle-income countries, a great window of opportunity exists, and a strong effort to lift the quality and magnitude of R&D spending is merited. However, with poorer countries, focus on R&D spending alone is likely to yield poor results. Though it is difficult to document empirically, the findings, along with a substantial literature, suggests that complementary efforts in improving the quality of human capital, strengthening research institutions, ordering the national innovation system, and raising the sophistication of the private sector are necessary complements to increased spending on R&D. China and India's spectacular growth in R&D may be justified by the fact that multinationals do most of the patentable R&D and hence provide the necessary complementary factors.

Finally, the results for the expanded decision to invest in knowledge activities in general (column (4)) show large heterogeneity when trying to explain the investment decision, since the model only captures that larger firms and two-way traders are more likely to engage in these investments. Also, there are indications that in developing countries, investments in knowledge capital are smaller than in developed countries. For example, Goni and Maloney (2014) demonstrate that investments in R&D as a share of GDP are smaller in developing countries than in developed countries. One potential explanation for this is the absence of complementary factors to enable R&D, such as education, the quality of scientific infrastructure, and the private sector, which is weaker in countries far away from the technological frontier.

A related strand in the literature has empirically analysed some of these complementary factors. Polder et al. (2010) find significant complementarities between different knowledge inputs and innovation outcomes in the Netherlands. The authors find that:(i) ICT investment and usage are important drivers of innovation; (ii)there is a positive effect on the productivity of product and process innovation when combined with organisational innovation; and(iii) there is evidence that organisational innovation is complementary to process innovation. Miravete and Pernias (2006) found evidence of complementarity between product and process innovation in Spain's tile industry and Cassiman and Veugelers (2006) found important complementarities between internal R&D and external knowledge acquisitions.

A final element is the lack of an enabling business environment in many developing countries and existing market failures in the supply of technical infrastructure, human capital or technology, as well as recent evidence of low management quality in firms in developing countries (Bloom et al., 2012). This raises questions about the efficiency of transformation of knowledge inputs by firms into innovation outcomes, and further, into improvements in firm performance.

5.5.2 Innovation Function

Sveiby and Lloyd (1987) were the first to define knowledge capital as a micro-level concept by categorising it into human capital (the education and experience of workers), structural capital (ability to organise) and relationship capital (stakeholder relations). This definition of knowledge capital is followed by, for example, Antola, Kujansivu and Lönnqvist (2005), Black and Lynch (2005), Edvinsson and Malone (1997), Nurmi (1998), and Piekkola (2011). Pulic (2000) uses the term intellectual capital but also divides it into human and structural capital.

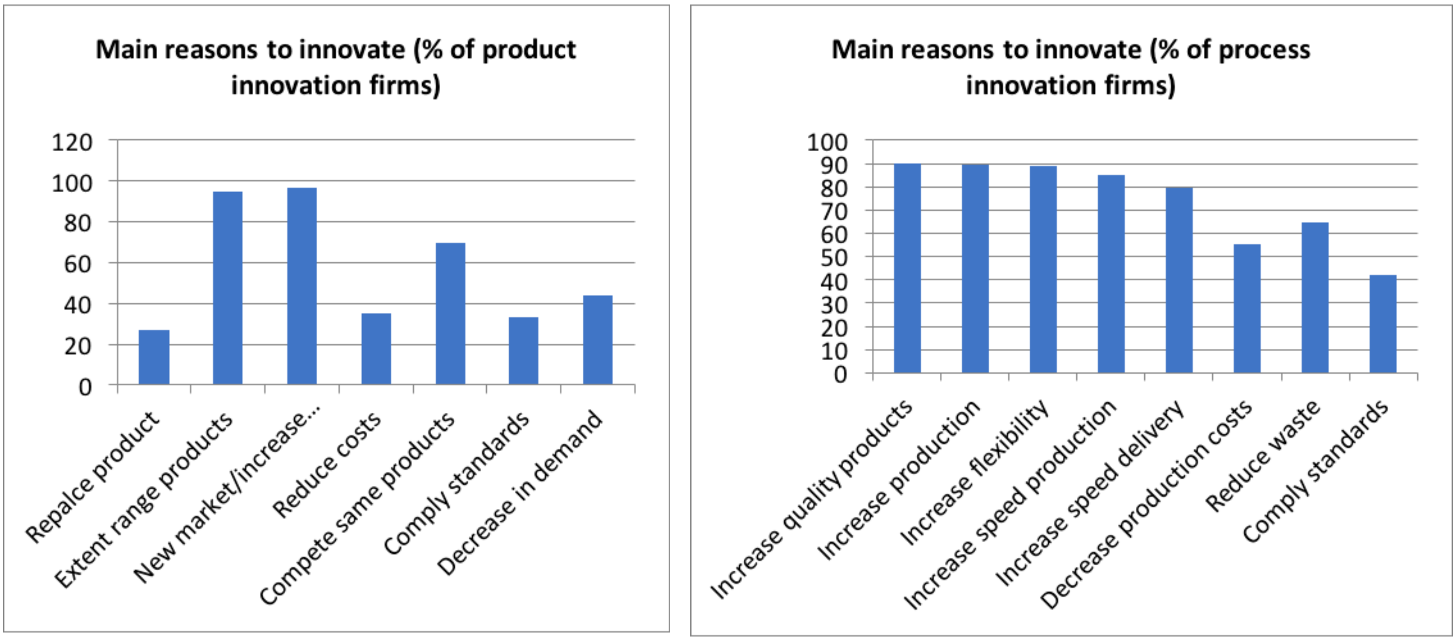
Lev (2001) uses the term intangibles dividing it into discovery, organisational practices and human resources. Corrado, Hulten and Sichel (2005) write about knowledge companies, but mostly use the term intangibles dividing it into three categories: computerised information (software and databases), innovative property or discovery (patents, copyrights, designs, trademarks), and economic competencies (brand equity, networks of people and institutions, firm-specific human know-how, etc.).

Kaplan and Norton (2004) divide intangible capital into human capital, knowledge capital and organisational capital. The Meritum-workgroup (2001) recommended using the term intellectual capital, which is divided between human capital and internal and external structural capital. Piekkola (2011) refers to capital created within a firm as the company's intellectual capital as opposed to intellectual capital purchased from external sources. He divides the intellectual capital of a firm into three fields: knowledge capital and communication technology capital, research capital and development capital, and organisational capital. In the same research report, Piekkola also uses the term human capital when referring to the knowledge of workers.

As suggested in 5.5.1, although firms invest in knowledge, there is uncertainty as to whether these investments will result in specific innovations. Therefore, the second stage of understanding the relationship between innovation and performance is to determine the role that knowledge capital investments play in producing innovation outcomes.

It is important to start by analysing the subjective reasons to innovate, as stated in the survey by the firms' managers. Figure 4-2 shows the main reasons for the product (panel (a)) and process (panel (b)) innovation. For product innovations, the main reasons given are to diversify existing products via increasing market share or improving their quality, rather than replacing existing products. For process innovations, the main reasons are very much related to increasing the quality attributes of the product and production processes.

Figure 5-2. **Reasons to introduce product innovations**



(Source: Enterprise survey (2014))

To measure the impact of knowledge capital investments on innovation, I estimate the probability of introducing an innovation, as expressly defined in equation (4) above. Table 5.2 in the appendix shows different estimates of equation (4). The first six columns estimate individual Probit equations for product, process and organisation innovations and using observed R&D and research and equipment intensity. Columns (7) to (10) show the bivariate Probit estimates allowing for correlation between product and process innovation decisions, and instrumenting knowledge intensity with the predicted values of the previous stage. Finally, columns (11) to (16) implement the multivariate framework to also include organisation innovation.

In general, the individual equations without instruments show very little predictive value of the model. Knowledge capital investments do not appear to impact on the probability of introducing innovations; I only find a negative sign associated with R&D and organisational innovation. However, these estimates are likely to be biased given the potential endogeneity between knowledge capital investments and innovation outcomes.

To correct for this endogeneity, I instrument knowledge intensity with the predicted values estimated in the previous stage. Also, I allow for simultaneity in the decision to innovate for the different types of innovation allowing for correlation of the error terms. Estimates of equations (7) to (10) that consider only product and process innovations show a negative and statistically significant correlation between the two equations, which suggest simultaneity between product and process innovation decisions and the need to control for this correlation.

The estimates also indicate that firms that are more capital intensive are more likely to introduce product or process innovations. Larger firms are more likely to introduce product innovations, while firms with a largerperceived obstacle in theeducation of the labour force are less likely to introduce process innovations. The most surprising result is thefact that similarly to the non-instrumented results, investment in knowledge activities, both R&D and broad knowledge inputs, are not statistically significant in increasing the probability of product and process innovation.

Columns (11) to (16) replicate the estimations but add organisational innovation to the simultaneous equations. Adding organisational innovation implies a loss of observations since the organisational module was only implemented to firms considered medium and large in the sampling frame. The decision to introduce product and process innovations are still correlated, but the correlations with the residuals of the organisational innovation equation are not statistically significant, which suggests that organisational innovation decisions are made independently from product and process innovations. The results again suggest the importance of large firms and capital intensity, although only for product innovation and education of the labour force as an obstacle for both product and process innovation. Medium-sized firms appear to be more likely to implement organisational innovations. Again, I do not find evidence that investments in knowledge capital are statistically significant in affecting the probability of innovation, except for a marginally significant coefficient of R&D on organisation innovation.

Given these reasons for innovation, a key question surrounds the extent to which firms invest in R&D, equipment, and training to increase these quality attributes. Table 5.2 in the appendix shows that in Nigeria, the percentage of product, process, andorganisation innovators is larger in firms that have some investment in R&D or research in general, than firms that do not have any investments. However, a significant number of firms still carry out innovations without any knowledge capital investments stated. For example, table 5.3 in the appendix shows that 28% of firms not performing knowledge capital investments are product or process innovators. For these firms, the results raise questions about the degree to which some of these innovations surpass very simple imitation when there are no investments in knowledge capabilities to develop them. The works of Goedhuys (2006) validates the findings on the impact of knowledge capital on investment. In her work, R&D and innovation output measures turn out to be insignificant.

Overall, the results of the innovation equation suggest that in the case of Nigerian firms' investments in knowledge and acquisition of capabilities in the form of R&D, equipment and training do not necessarily translate into firm-level innovations. This result is not surprising for R&D since it is likely that the type of small incremental innovations do not require significant acquisition of capabilities via R&D, but is more surprising for total knowledge capital investments, since even imitations tend to require some degree of acquisition of machinery and training of workers.

5.5.3 Innovation and Productivity

The final stage to determine the impact of innovation on performance is to estimate equation (8). As productivity measure, I use two proxies of labour productivity: the logarithm of sales per worker and the logarithm of value added per worker. Although value added per worker is a better measure of labour productivity, the existence of missing observations for material inputs in some firms reduces the sample significantly when using this variable. To control for potential endogeneity of innovation decisions to firm performance when trying to estimate causality in equation (8), I instrument the different type of innovations using the predicted values of the multivariate framework described in the previous section and correct the standard errors of the regression as proposed in Greene (2012). Table 5.4 shows the results of the OLS estimates without instrumenting for comparison and Table 5.5 shows the instrumental variables estimates using the logarithm of sales per workers. Columns (1) to (4) in Table 5.5 show the results when using R&D intensity as knowledge input to predict innovation, while columns (4) to (8) uses the instruments of innovation estimated using research, training and equipment for innovation intensity to explain innovation.

The main result that emerges from the table is that innovation is not statistically significant in increasing productivity for the sample of Nigerian firms, with or without instrumenting. Only column (6) in table 5.4 show statistically significant signs for a positive impact innovation on value added per worker. However, these results are likely to be biased given the endogeneity problems discussed above. When I introduce instruments, and correct the standard errors in Tables 5.5 and Table 5.6, these increase significantly, and only capital intensity appear to be statistically significant in the sales per worker specifications using R&D to predict innovation.

Also, I introduce interactive innovation dummies to capture complementarities between different types of innovation. However, the coefficients are not statistically significant.

As proposed in the previous section, as a robustness test I estimate stages 2 and 3 simultaneously as a system of equations by maximum likelihood and allowing for correlations in the innovation decisions. Table 5.7 shows the results for sales per worker. The results confirm the lack of statistically significant impact of innovation on productivity. One difference, however, is that when estimating the innovation equation and the productivity equation jointly, the knowledge intensity coefficients are statistically significant in explaining innovation outcomes. The estimates using research, equipment and training investment intensity also show a positive and statistically significant impact of knowledge capital investments on innovation outcomes, but no impact of innovation on productivity. There is limited evidence from developing countries; however, the works of Goedhuys (2007a) indicated that there was no link between R&D, product and process innovations and productivity.

Ensuring sustained economic growth and creating productive capacities to reduce poverty and foster employment is still the major concern in development economics and development policy. As a majority of developing countries open up their economies, manufacturing firms in these countries are facing the tough competitive conditions that today govern the global economy. The process of globalisation, heavily criticised in the industrialised world,is seen as both a challenge and an opportunity in the developing economies. Depending on their competitiveness they may catch-up faster or fall behind even further. Global competitiveness increasingly depends on the ability to assimilate, master and improve technologies to produce high-quality products for international markets. While the importance of knowledge is recognisedfor high- or medium-tech industries, it has long been neglected for low-tech industries (von Tunzelmann and Acha, 2005).

Empirically, it remains an open question as to how important different sources of knowledge acquisition are for firm performance and what explains the heterogeneity of productivity of firms in developing countries. The conditions for technological learning may differ across countries, industries and firms. Countrywise, firms are part of a system in which institutions and other organisations play a major role in the process of learning and competence building.

As such, the level of development of financial markets, supportive innovation policies, regulatory and administrative burdens but also more subtle habits and practices and trust within the local business community may affect the learning process (Mytelka, 2000). Competencies are also very much industry-specific (Fai and Tunzelmann, 2001) and the drivers of innovation and technological change are equally so (Malerba, 2004, 2006; Pavitt, 1984). Malerba (2006) refers to sectoral systems of innovation to indicate the differences across sectors in the organisation of innovative activities, actors and characteristics involved.

Overall, the evidence emerging from the literature suggests a positive impact of innovation on firms' performance measured as either profit or employment growth. However, recent studies on the role of innovation in firms' productivity found a much weaker impact. Goedhuys et al. (2008, 2014) focused on the importance of various sources of productivity in developing countries. In Tanzania, they found that firm productivity was not enhanced by R& D or by product or process innovation, but business environment seemed to play a more relevant role. Those conclusions suggest that the relationship between R & D, innovation, and productivity is weaker in developing than in developed countries.

Thus, to explain productivity differences in Nigerian firms only a limited number of technology variables turn out to be significant. Some of the more traditional measures of know-how and innovation – research and development, product and process innovation, technology licensing, skills and training – do not produce any measurable impact on the productivity of the firm, in contrast to what could be expected from the mainstream literature often based on case studies.

Fagerberg et al. (2010) review the literature and provide strong and ample evidence on how worldwide countries that are more active in innovation have higher productivity and income than the less-innovative ones. Many scholars have argued that in developed economies the growth of firms depends on their ability to learn about their environment, linking their strategies to the changing environment (Geroski, 1989; Klepper, 1996). This is even more relevant in low-income countries, where infrastructure is often poor, markets tend to be underdeveloped, and potential local customers have limited disposable income. In such an environment micro, small, and medium-size firms - many of them working in the informal sector - are particularly vulnerable because of the limited absorptive capacity and restricted access to financial and knowledge resources. Those firms in low-income countries that can successfully undertake innovation activities survive and the innovating firms that can make the best use of the resources available have the potential to lead the market.

One needs to interpret these results with caution, given the low number of observations and the lack of panel structure of the dataset. However, overall, the main result of the estimates is that firm-level productivity appears to be largely unexplained and there is no statistically significant impact of innovation on productivity.

5.5.4 Innovation and employment

A final important element to analyse when looking at the impact of innovation on performance is employment. As suggested above, most of the evidence regarding the impact of innovation on employment in OECD countries suggests that: (i) although process innovation can have a negative effect on firm-level employment, the positive impact of product innovation more than offsets this potential negative effect, which makes the overall effect positive; and, (ii) innovation is skill-biased and tends to increase the demand for skilled labour relatively more than the demand for unskilled labour.

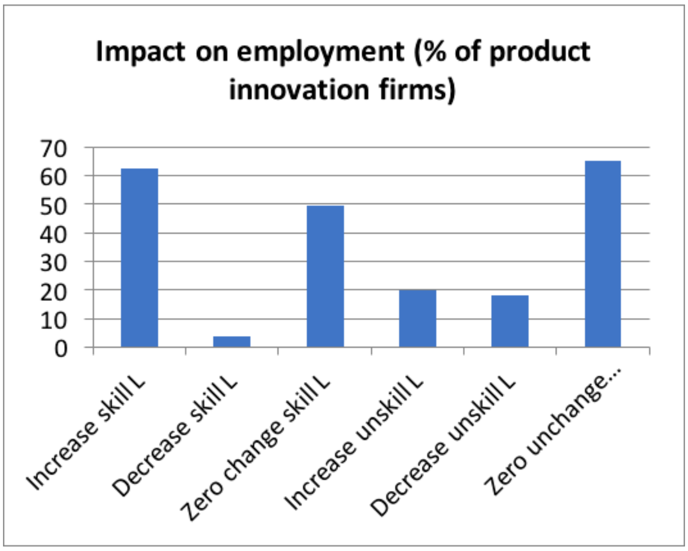
The author is not very conversant with the employment dynamics associated with innovation in developing countries. Therefore, it is important to analyse the impact of innovation on employment in Nigeria. This is particularly important, given the need for the country to absorb a large number of people entering the labour market every year.

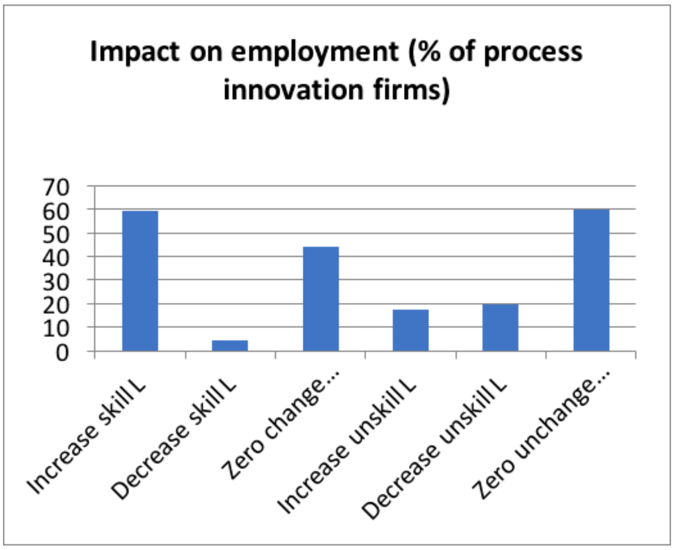
Before starting the analysis, it is important to stress that the overall impact of innovation on employment cannot be measured only by using firm-level data. Firm-level surveys allow the capture of direct impacts of innovation on the employment levels in the firm. However, there are other general equilibrium effects of innovation on employment, such as potentially changing markets shares, competition, and prices that affect the demand for labour and that can be very difficult to identify and quantify.

The Enterprise Survey allows the exploration of the hypothesis of skill-biased labour growth based on the responses from firm managers to questions about the impact of innovation. Specifically, for product and process innovations, the questionnaire asks about the impact each innovation type has had on skilled and unskilled workers. One caveat for the analysis is that the respondents only report whether employment has increased or decreased, rather than the numbers of workers, so the author cannot precisely gauge the total level of employment generated or destroyed as a result of the innovation.

Changes in labour associated with product and process innovation are remarkably similar. The results are summarised in Figure 5-3. The first three bars represent the share among innovators about changes in skilled workers associated with the particular innovation, and the last three bars are related to unskilled labour. The percentages are remarkably similar when comparing labour changes associated with product and process innovations.

***Figure 5-3*. Impact of Innovation on Skilled/Unskilled Employment**





(Source: Enterprise Survey (2014)

Innovation increases skilled labour. Starting with product innovations, half of the product innovators (62.5%) increased the number of skilled workers, while only 3.7% reduced the number of skilled workers, and 49.4% did not change skilled labour.

The impact of innovation on unskilled labour is small in size and uncertain in sign. Regarding unskilled labour, 19.8% of product innovators increased the number of unskilled workers, while 18% decreased the number, and 65.2% did not change unskilled employment. The percentages for process innovation are very similar; with perhaps slightly more firms showing a decrease in the number of unskilled workers (19.6%) as a result of process innovation.

Although it is not possible to know the precise number of workers, if I assume relatively similar size in the variation in increases or decreases of employment, the results suggest three important findings: (i) the numbers of skilled labourers seems to increase as a result of innovation; (ii) the numbers of unskilled labourers appear to remain the same for product innovation and perhaps decrease for process innovation; and (iii) there is clear skill-bias arising from innovation in the demand for employment.

To further understand the potential differentiated impact on employment of both product and process innovation, I focus the analysis on those firms that introduced both types of innovation during the period and examine what happened to net employment. Although this group represents 25.14% of firms in the innovation survey, it allows us to compare the impacts of product and process innovations simultaneously.

Table 5.8 in the appendix tabulates the number of firms introducing both product and process innovations, and the impact on skilled workers (upper part of the tables) and unskilled workers (middle part of the table). The cells in blue denote firms where there has been an increase in employees, either because the effects of product and process innovations are positive at least in one case or because they remained the same in the other case. The red cells indicate where there has been no impact on employment, according to the manager. Finally, the cells in yellow indicate firms where employment levels have decreased. Firms, where there are increases in one type of innovation and decreases in another, are classified as uncertain. The last column summarises the net impact on employment.

The impact on skilled workers is largely positive, and only in 6.57% of firms has there been an unambiguously negative impact on skilled workers. Although I do not know the size of this employment reduction, it is unlikely that the decrease in 6.57% of firms is larger than the increase in 66.3% of firms. Therefore, it is plausible to conclude that innovation increases skilled employment for product and process innovators.

Looking at unskilled labour changes reveals that the pattern changes somehow. Employment stays the same for most firms, and the percentage of firms where unskilled labour increased and decreased is similar to 30% vs 27.5%. Assuming similar trends in the increases and decreases would imply a slight increase in unskilled employment associated with innovation, but this is not comparable to the positive change in skilled labour.

Finally, at the bottom of the table,I add the impacts on skilled and unskilled workers. The 'uncertain effect' category is much larger now (36.1%), and this is likely because firms show a simultaneous increase and decrease in labour, when examining skilled and unskilled labour changes, for both product and process innovations. Most firms (40%) experience an increase in net employment, while in 24% of cases, employment levels remained the same, and in 8% of cases, firms experienced an unambiguous negative reduction in employment. Unless the firms in the uncertain effect category experienced a large employment reduction, it is likely that the net impact of product and process innovations on employment is positive.

As a further check for the impact of innovation on employment, I use the retrospective information in the survey on full-time employment and sales and estimate a model of employment growth. I follow Harrison et al. (2008) and decompose sales growth into the share linked to new products and the share linked to old products using the share of sales attributed to product innovation. I assume that this share accounts for the growth of the entire three years period in the estimate equation (9) below, where the change in permanent employment is determined by the growth in sales of old products and product innovation (new), process innovations; and a set of controls X that include region to control for labour market conditions, whether the firm is a two-way trader, the size of the firm, the age and sector dummies.

$$\Delta L_i = \alpha_0 + \alpha_1 old_i + \alpha_2 new_i + \alpha_3 process_i + \beta X_i + e_i (9)$$

Table 4.9 shows the OLS estimates of equation (9). I start estimating in column (1) the specification considering only sales growth and province and sector dummies. Surprisingly, I found that the coefficient on sales growth was not statistically significant in affecting employment growth in the period. In columns (2) I add a specification with more controls: including firm characteristics such as ownership, trading status, age and size, to better capture the impact of sales growth. However, the coefficient is still not statistically significant. Equations (3) and (4) apply the decomposition of sales growth between old and new products and also introduce process innovation, but the coefficients associated with innovations remain statistically non-significant.

5.6 Conclusion

Central to the attainment of this goal is increasing knowledge capital investments and innovation activity. This chapter has provided a snapshot of the degree of firm-level innovation in Nigeria as well as its links to economic performance for the period 2007-2014 to more accurately measure how Nigerian firms in the manufacturing and services sectors can contribute to achieving this objective.The result of this chapter points out the importance of the institutional setup in explaining productivity differences among manufacturing and services firms in a developing country like Nigeria, and the lack of importance attached to direct innovation factors.

Although the absence of panel structure in the dataset and the small sample do not facilitate the estimation of very robust statistical effects, this chapter provides some important findings. The main conclusion of this chapter is that firm-level innovation activity in Nigeria appears to be high and even larger than in similar countries, but the extent of innovativeness is low or very incremental. While it is expected that innovations in countries far from the technology frontier are not radical innovations, the question is to what extent these incremental innovations contribute to productivity growth as compared to innovations in OECD countries. The answer that I found in the empirical analysis is that the innovations do not have a statistically significant impact on productivity. Therefore, the positive causal chain, by which knowledge inputs are translated into innovation outcomes and then into productivity, breaks down in the case of Nigerian firms. This suggests that in contrast with OECD countries, some of the innovations implemented are so minor, or are based on imitation, to the extent that they do not have a significant impact on productivity (survival innovation). Although similar results have been found in other developing countries, more research is needed to better understand the nature of this incremental innovation.

It is difficult to identify the main obstacle that hinders a positive linkage to productivity, but the empirical analysis in this chapter has some important suggestions. First, innovation outcomes in Nigeria are more common than in other countries with similar GDP per capita, but investments in knowledge inputs are like that of other countries. This suggests a mismatch in relative terms between inputs and outcomes, and the need for greater investment in knowledge inputs to make innovation outcomes more innovative and transformational. Second, and related to the first point, the empirical analysis suggests that a lack of access to finance significantly holds back investment in R&D. Third, there is an over-reliance by Nigerian firms, at least when comparing them to other countries, on internal sources for knowledge capital investments and innovation sources, which may indicate the absence of solid research and knowledge infrastructure, as well as a lack of cooperation with other firms and institutions. Forth, the inadequate educational levels of the labour force affect the capacity of firms to transform knowledge inputs into innovation outcomes, which reinforces the complementary role of skilled labour for innovation, and the need to support appropriate technical skillsets in the labour force.

Regarding the impact of innovation on employment, the analysis of the qualitative information regarding labour changes associated with innovations suggests the likelihood that innovation activities have increased employment levels. However, the results differ significantly between skilled and unskilled workers. While there is a clear increase in the demand for skilled labour resulting from product and process innovations, the impact on unskilled labour is still likely to be positive, but less so and more uncertain. This suggests two levels on which innovation policy should be focused.

At the firm level, it is important to:

- Enhance the capacity to convert innovation outcomes into productivity gains. Information failures and asymmetries where firms lack resources and understanding to gather the required information, resources and know how to innovate, increase the uncertainty to innovate due to potential failure and also affect the quality of innovations. Thisis exacerbated by coordination failures where the individual costs of improvements are very high, especially for SMEs since the supply of services is insufficient and tends to target large firms. This requires support programs that target productivity and innovation by improving firms' information, capabilities and management skills. Technology extension services can address these market failures and help to realise improved organisational, managerial, and technological changes. These services provide information on managerial and production practices and how to adopt them, to increase productivity and competitiveness.

- Enhance R&D financing and cooperation among firms and academic institutions. In the presence of financial failures to fund innovation, R&D support is likely to be required to boost knowledge investments. The international experience suggests that gradual partial subsidies to high-quality projects are more effective than indirect support by tax exemptions. Supporting these high-quality projects, in conjunction with firms and university projects (see below) can have a positive impact on the amount and quality of R&D. Support should be provided to enhance cooperation between firms, encourage private sector-university linkages and remove coordination failures by providing subsidies to high-quality innovation projects that involve several firms and academic institutions.

At the sector level, it is imperative to:

- Improve the quality of the physical and human capital infrastructure for innovation, including research labs, as a means of improving the availability and quality of innovation services for firms. Enhance the supply of skilled labour, especially in areas such as STEMS, which are highly complementary to the introduction of innovations.

Appendix

Table 5-1 Knowledge Function

	Column 1	Column 2	Column 3	Column 4
	R&D per worker[a]	Researchc per worker[a]	R&D[b]	Research[b]
Two-way traders	2.2068***	1.6164***	-0.3313	0.6213*
	(0.5308)	(0.6021)	(0.2957)	(0.3506)
Demand (-)	1.1358**	0.6906**	0.4990**	0.3860
	(0.4602)	(0.2687)	(0.2168)	(0.2512)
Share(t-3)	0.0816	0.1294	0.1121**	-0.0300
	(0.1789)	(0.0822)	(0.0509)	(0.0509)
Lack finance	-1.0077***	-0.2799	-0.2169***	-0.0800
	(0.2323)	(0.2384)	(0.0839)	(0.1020)
Telecom_obstacle	0.1638	-0.1330	-0.0596	0.0611
	(0.1788)	(0.1375)	(0.0738)	(0.0770)
Government_obstacle	0.0519	-0.1024	0.2279***	0.1143
	(0.2125)	(0.1670)	(0.0833)	(0.0909)
Trade cost-obstacle	0.0741	0.2695	0.0706	-0.0382
	(0.1894)	(0.1703)	(0.0861)	(0.0928)
Foreign	-2.6251**	1.4251**	0.0153	0.2597
	(1.0939)	(0.6933)	(0.3457)	(0.4803)
Age	0.0223*	0.0056	0.0041	-0.0004
	(0.0124)	(0.0073)	(0.0058)	(0.0062)
Medium	-0.6479	0.3018	-0.1275	0.4967**
	(0.6092)	(0.4088)	(0.2450)	(0.2505)
Large	0.9423*	0.8550	-0.0415	1.0750***
	(0.5720)	(0.5436)	(0.3259)	(0.3833)
Constant	9.5586***	12.0140***	0.4488	-0.4120
	(1.0723)	(0.8891)	(0.5277)	(0.5885)
Observations	388	347	427	339
ISIC-2 digits dummies	YES	YES	YES	YES

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
[a] Poisson non-linear model estimator on the level of expenditure
[b] Probit model on the decision to invest in R&D or research and equipment
[c] Research and equipment defined as expenditure for knowledge activities including R&D, both intramural and extramural, training and equipment for innovation activities

Table 5-2 Innovation Function

	Individual regressions						Bivariate probit				Multivariate probit					
	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9	Col 10	Col 11	Col 12	Col 13	Col 14	Col 15	Col 16
	product- R&D	process- R&D	organ- R&D	product- Research	process- Research	organ- Research	product- R&D	process- R&D	product- Research	process- Research	product- R&D	process- R&D	organ- R&D	product- Research	process- Research	organ- Research
Log(K/L)	0.52***	1.63	0.11	0.01	0.43	1.01	0.11**	0.17***	0.17***	0.14***	0.16	0.02**	1.08	0.25	1.15**	1.77
	(0.21)	(0.57)	(0.19)	(0.35)	(0.17)	(0.58)	(0.43)	(1.11)	(2.71)	(1.05)	(1.41)	(0.11)	(0.16)	(1.99)	(1.91)	(1.76)
Educ_obstacle	-0.17	-0.23	-0.98	-0.32	-0.15***	-0.24	-0.05	-0.91**	0.03	-0.08***	-0.02**	-0.19**	-0.17	-0.01***	-0.29	-0.12
	(0.29)	(1.65)	(0.38)	(0.02)	(0.01)	(0.01)	(1.02)	(0.12)	(1.14)	(0.15)	(0.02)	(0.19)	(0.08)	(0.05)	(0.17)	(0.54)
Medium	1.71	1.01	0.94***	2.05	1.99	2.09***	1.7**	0.22*	0.34	0.31	0.32	0.93	0.27*	0.35	0.03	0.11**
	(0.82)	(1.09)	(2.11)	(1.55)	(1.98)	(1.77)	(1.17)	(0.73)	(0.01)	(0.02)	(0.02)	(1.96)	(0.11)	(0.02)	(0.11)	(0.13)
Large	1.08	0.23	1.15	-2.61	1.99**	-1.66	2.01**	0.81	0.12**	0.17	0.14***	1.94	0.14	0.11**	0.11	0.14
	(0.16)	(1.01)	(1.91)	(0.12)	(1.72)	(2.11)	(3.75)	(0.23)	(0.2)	(0.03)	(0.12)	(0.65)	(0.12)	(0.04)	(0.16)	(0.12)
R&D	0.02	0.01	-0.12**													
	(0.02)	(1.19)	(0.09)													
Research				0.25	0.11	-0.91	1.03	0.82			2.14	1.51***	-1.89			
				(1.72)	(2.54)	(0.02)	(0.76)	(0.49)			(1.11)	(0.34)	(0.83)			
R&D_hat									0.31** *	0.17***				0.12***	0.25**	1.43**
									(0.12)	(0.22)				(1.61)	(1.34)	(0.89)
Research_hat									0.32	0.15				0.21	0.69	0.09
									(0.02)	(0.01)				(0.53)	(0.26)	(0.82)

Constant	2.17**	6.32**	3.27**	2.87*	6.85***	2.43**	3.71**	1.99***	9.21*	3.72***	1.92*	6.85***	2.43**	9.71***	4.03**	4.42**
	(1.33)	(0.97)	(1.44)	(0.91)	(6.18)	(2.12)	(2.02)	(0.65)	(1.11)	(1.62)	(1.88)	(6.18)	(2.12)	(1.06)	(1.22)	(0.33)
Observation	904	904	904	904	904	904	904	904	904	904	904	904	904	904	904	904
ISIC-2digits dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses *** p<0.001, ** p<0.01, * p<0.05

Table 5-3 Percentage of firms engaging in knowledge capital investments by innovator group

	Product innovators	Process innovators	Organization	Product/process
No R&D	21.76%	14%	9.32%	34.60%
R&D	66%	42.90%	59%	73.43%
No knowledge inputs	17.31%	20.90%	18.40%	27.54%
At least one knowledge input	55.10%	47%	46%	70.33%
All knowledge inputs	45.21%	36.29%	29.98%	83.40%

Source: Author's own elaboration from the Enterprise Surveys R&D, training and equipment

Table 5-4 Productivity Equation- No Instruments

	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8
	sales per worker- R&D	sales per worker- R&D	sales per worker- R&D	sales per worker- R&D	sales per worker- Research	sales per worker- Research	sales per worker- Research	sales per worker- Research
Log(K/L)	0.23*	0.72**	0.07**	0.17**	0.19**	0.03*	0.11*	0.14**
	(0.41)	(0.18)	(0.11)	(0.29)	(0.82)	(0.62)	(0.12)	(0.04)
Log(L)	0.33***	0.18***	0.02**	1.71**	2.11**	0.64**	0.19**	1.88**
	(0.12)	(0.81)	(0.11)	(0.82)	(0.77)	(0.13)	(0.19)	(0.32)
Prod inno	1.08***	1.94***	1.95**	1.08*	1.33**	1.79*	0.93*	1.11**
	(1.05)	(0.65)	(0.99)	(0.16)	(1.06)	(1.44)	(1.96)	(0.33)
Process_inno	0.23***	0.15***	-0.11	0.12***	-1.06	-1.12	-0.56	1.17
	(0.69)	(0.11)	(0.12)	(0.18)	(1.11)	(1.75)	(1.76)	(1.12)
Organinno			0.66*	0.02**			0.23*	0.18***
			(1.75)	(0.11)			(0.12)	(4.33)
Prod*process		1.09***		0.19**		0.14**		1.21*
		(0.99)		(0.19)		(0.04)		(0.29)
Prod*organ				0.93*				1.09*

				(1.96)				(0.03)
Process*org				1.94***				0.23***
				(0.65)				(0.39)
Prod*proc*org				1.11**				1.94***
				(0.33)				(0.65)
Constant	3.16**	5.34**	4.05**	7.12**	1.05**	3.26***	1.11**	3.22**
	(0.93)	(1.62)	(0.02)	(0.06)	(0.03)	(0.05)	(9.22)	(1.62)
Observations	904	904	904	904	904	904	904	904
R-squared	0.07	0.42	0.11	0.21	0.58	0.19	0.09	0.22

Corrected standard errors in parentheses ***p<0.01, **p<0.05, *p<0.1

Table 5-5 Productivity Equation – Instrumented (Sales Per Worker)

	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8
	sales per worker-R&D	sales per worker-R&D	sales per worker-R&D	sales per worker-R&D	sales per worker-Research	sales per worker-Research	sales per worker-Research	sales per worker-Research
Log (K/L)	0.14**	0.23***	0.17**	0.12***	0.27*	0.11***	0.003**	0.11
	(0.34)	(0.21)	(0.13)	(0.16)	(0.11)	(0.18)	(0.11)	(0.13)
Log (L)	0.17	0.11	0.18	0.11	0.12	0.17	0.14	0.16
	(0.54)	(0.59)	(1.27)	(0.43)	(0.09)	(2.71)	(1.05)	(1.41)
Prod inno	0.35	0.34	0.31	0.32	0.15	0.24	0.12	0.14
	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)	(1.95)	(1.11)
Process_inno	-0.52	-1.19	-1.13	2.19	-1.83	-0.18	-1.03	1.72
	(1.13)	(2.44)	(1.12)	(3.11)	(1.12)	(1.42)	(1.95)	(1.93)
Organ inno			1.03	0.23		0.11		0.17
			(0.78)	(0.54)		(2.77)		(0.11)
Prod*process		0.27		0.93			2.13	0.07
		(1.22)		(0.17)			(0.09)	(0.14)
Prod*organ				0.01				0.12
				(0.15)				(0.17)
Process*org				0.02				0.18

				(0.34)				(0.19)
Prod*proc*org				0.17				0.08
				(1.66)				(1.01)
Constant	3.11**	1.71**	4.59**	2.15**	6.87***	1.21**	3.16**	5.34
	(0.71)	(1.28)	(1.84)	(0.11)	(0.92)	(1.11)	(0.93)	(1.62)
Observations	722	722	722	722	722	722	722	722
R-squared	0.21	0.26	0.34	0.24	0.72	0.58	0.19	0.94

Corrected standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 5-6 Productivity Equation- Instrumented (Value Added Per Worker)

	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8
	sales per worker- R&D	sales per worker- R&D	sales per worker- R&D	sales per worker- R&D	sales per worker- Research	sales per worker- Research	sales per worker- Research	sales per worker- Research
Log (K/L)	0.15	0.93	0.21	0.38	0.13	0.72	0.92	0.19
	(0.51)	(0.78)	(0.17)	(0.18)	(0.56)	(0.16)	(0.18)	(1.39)
Log (L)	1.23	-0.98	-0.52	1.63	-0.11	-0.01	-0.43	1.01
	(0.26)	(0.38)	(0.21)	(0.57)	(0.19)	(0.35)	(0.17)	(0.58)
Prod inno	1.78	0.94	2.05	1.99	2.09	1.7	3.03	1.72
	(1.05)	(2.11)	(1.55)	(1.98)	(1.77)	(1.17)	(0.06)	(1.43)
Process_inno	-0.63	-1.15	-2.61	-1.99	-1.66	-2.01	-0.94	2.12
	(0.65)	(1.91)	(0.12)	(1.72)	(2.11)	(3.75)	(1.45)	(1.09)
Organ inno			0.61	0.09		0.16		0.23
			(1.02)	(1.34)		(0.09)		(1.65)
Prod*process		0.34		0.28			0.72	1.01
		(1.45)		(1.21)			(1.12)	(1.09)
Prod*organ				0.11				0.23
				(1.82)				(1.01)

Process*org				0.07				0.01
				(1.99)				(1.19)
Prod*proc*org				1.72				0.99
				(1.32)				(0.73)
Constant	1.22***	4.14*	1.73***	6.85***	2.43**	3.61**	3.26***	1.11**
	(1.18)	(2.09)	(1.42)	(6.18)	(2.12)	(1.34)	(0.05)	(9.22)
Observations	701	701	701	701	701	701	701	701
R-squared	0.18	0.21	0.54	0.64	0.12	0.28	0.25	0.74

Corrected standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 5-7 Structural Modelling- Innovation and Productivity

	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8
	lsales_l	prod_inno	process_ inno	organ_ inno	lsales_l	prod_inno	process_ inno	organ_ inno
Log (K/L)	0.05**	0.01	0.03	0.08	0.02**	0.60	0.17	0.51
	(1.02)	(0.05)	(1.14)	(0.15)	(0.02)	(0.13)	(0.08)	(0.29)
Log (L)	0.08				0.16			
	(0.14)				(0.36)			
Prod inno	0.52				0.18			
	(0.35)				(4.33)			
Process_inno	1.47				1.21			
	(1.01)				(0.29)			
Organ inno					1.09*			
					0.03			
Prod*process	0.12				0.23			
	(0.99)				(0.39)			
Prod*organ					0.67			
					(0.06)			
Process*org					0.39			
					(0.21)			
Prod*proc*org					0.39			
					(0.15)			
R&D_hat		1.12***	1.53***	1.39***		0.12***	0.25**	1.43**
		(1.05)	(0.99)	(0.11)		(1.61)	(1.34)	(0.89)
Education-obstacle		0.54	1.08	0.06		1.42	0.94	0.05
		(1.23)	(0.99)	(0.32)		(2.02)	(1.64)	(1.78)
Medium		-0.21***	0.69***	-0.09***		-0.06***	0.62***	0.80***
		(0.53)	(0.26)	(0.82)		(1.02)	(1.17)	(0.15)

Large		0.34**	0.76**	0.21***		0.18**	0.51**	0.22**
		(0.15)	(0.27)	(0.83)		(0.19)	(0.07)	(0.23)
Constant	4.05**	7.12**	1.05**	8.05*	1.07***	6.12**	2.04*	4.05**
	(0.02)	(0.06)	(0.03)	(0.05)	(0.02)	(0.05)	(0.02)	(0.06)
Observations	722	722	722	722	722	722	722	722

Corrected standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 5-8 Distribution of changes in skilled and unskilled employment for product and process innovators (number of firms)

Skilled workers				
As a result of product/process innovation	**Increased**	**Remained the same**	**Decreased**	**Net impact (% of firms)**
Increased	**81**	**12**	5	66.3%
Remained the same	**11**	55	5	40.1%
Decreased	0	6	3	6.57%
Uncertain effect				1.32%
Unskilled workers				
As a result of product/process innovation				
Increased	**33**	**6**	11	30.0%
Remained the same	**5**	65	6	55.2%
Decreased	0	7	22	27.45%
Uncertain effect				6.65%
All skilled and unskilled workers				
Increased				40%
Remained the same				24.2%
Decreased				8%
Uncertain effect				36.1%

Source: Author's own elaboration from Enterprise survey (2014)

Table 5-9 Employment and Innovation

	Column 1	Column 2	Column 3	Column 4
Sales growth	0.0018	0.0015		
	(0.0013)	(0.0012)		
Sales growth old			0.0015	0.0009
			(0.0020)	(0.0019)
Sales growth new			0.0013	0.0011
			(0.0027)	(0.0024)
Process_inno2			0.0504	0.0419
			(0.0453)	(0.0474)
Age		- 0.0024**		-0.0035***
		(0.0010)		(0.0013)
Two-way traders		0.0356		0.0163
		(0.0679)		(0.0778)
Foreign		0.1326		0.1022
		(0.0834)		(0.0946)
East Region	0.3046***	0.2998***	0.2677***	0.2561***
	(0.1008)	(0.1061)	(0.0940)	(0.0974)
Lagos & South	0.1393***	0.1310**	0.1310**	0.1194*
	(0.0522)	(0.0576)	(0.0571)	(0.0608)
North Region	0.1766***	0.1649***	0.1693***	0.1576**
	(0.0525)	(0.0590)	(0.0603)	(0.0655)
Medium		-0.0172		-0.0290
		(0.0532)		(0.0604)
Large		0.0064		0.0446
		(0.0574)		(0.0661)
Constant	0.0002	0.0547	-0.0117	0.0747
	(0.0395)	(0.0512)	(0.0441)	(0.0539)
Observations	722	722	722	722
R-squared	0.0856	0.0981	0.0984	0.1164

Robust standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Dependent variable change in permanent employment in the last three years

Table 5-10 Distribution of Firms by Size, Sector and Region

		20-49	50-99	100-199	200-499	500 +	Total	East Region	Lagos and South Region	North Region	Total
Chemicals and paints	Number of firms	82	31	21	12	8	154	41	80	33	15
	Total employment	2409	2104	2726	3569	11138	21946	7452	11059	3435	421946
	Average nber of employees/firm	29.4	67.9	129.8	297.4	1392.3	142.5	181.8	138.2	104.1	142.5
	Standard deviation nber of empl.	7.9	13.3	26.7	67.5	491.9	321.1	404.9	333	103.3	321.1
Food and beverage ind.	Number of firms	218	60	40	48	32	398	136	124	138	398
	Total employment	6034	3792	5574	1570	47448	77418	16706	43536	17176	77418
	Average nber of employees/firm	27.7	63.2	139.4	303.5	1482.8	194.5	122.8	351.1	124.5	194.5
	Standard deviation nber of empl.	8	12.6	27	81.9	1185.3	513.8	264.7	790.4	320.8	513.8
Metal	Number of firms	142	42	27	19	1311	243	62	102	79	243
	Total employment	3979	2832	3753	5413	109	27086	7869	12628	6589	27086
	Average nber of employees/firm	28	67.4	139	284.9	854.5	111.5	126.9	123.8	83.4	111.5
	Standard deviation nber of empl.	8.1	12.7	31.6	66.8	549.6	228.1	341.3	189	151.1	228.1
Non-metal	Number of firms	78	14	12	13	4	121	27	32	62	121
	Total employment	2066	883	1670	3760	4657	13036	4199	3609	5228	13036
	Average nber of employees/firm	26.5	63.1	139.2	289.2	1164.3	107.7	155.5	112.8	84.3	107.7
	Standard deviation nber of empl.	6.7	12.3	28.9	89.1	567	233.1	373.9	144.7	187.4	233.1

Paper, printing, publish. ind.	Number of firms	94	36	17	12	6	165	32	98	35	165
	Total employment	2800	2355	2098	3454	4911	15618	2236	10742	2640	15618
	Average nber of employees/firm	29.8	65.4	123.4	287.8	818.5	94.7	69.9	109.6	75.4	94.7
	Standard deviation nber of empl.	7.7	13.9	23	67.7	324.9	168	88.4	206.6	75.3	168
Pharmaceuticals	Number of firms	17	13	5	5	3	43	6	28	9617	43
	Total employment	542	828	663 1	1476	2019	5528	279	4632	68.6	5528
	Average nber of employees/firm	31.9	63.7	32.6	295.2	673	128.6	46.5	165.4	100	128.6
	Standard deviation nber of empl.	10.9	12.5	22.8	82	295.3	185.7	16.3	220.9	49	185.7
Plastic	Number of firms	80	34	25	12	15	166	40	74	52	166
	Total employment	2588	2300	3477	3548	16144	28057	5008	16981	6068	28057
	Average nber of employees/firm	32.4	67.6	139.1	295.7	1076.3	169	125.2	229.5	116.7	169
	Standard deviation nber of empl.	8.3	14.5	28.9	65.5	522	333	127.6	460.2	183.2	333
Textile and leather ind.	Number of firms	236	39	31	22	24	352	88	155	109	352
	Total employment	6338	2559	4029	6138	38205	57269	4882	22580	29807	57269
	Average nber of employees/firm	26.9	65.6	130	279	1591.9	162.7	55.5	145.7	273.5	162.7
	Standard deviation nber of empl.	7.3	13.5	27.7	57.5	652.3	577.3	161.5	397.3	902.7	577.3
Wood industry	Number of firms	166	31	2	8	4	211	41	132	38	211
	Total employment	4600	1944	247 1	2220	3784	12795	1264	8872	2659	12795
	Average nber of employees/firm	27.7	62.7	23.5	277.5	946	60.6	30.8	67.2	70	60.6
	Standard deviation nber of empl.	7.2	15.1	30.4	66.6	-380.1	141.1	10	172.1	82.7	141.1

Total	Number of firms	1113	300	180	151	109	1853	473	825	555	1853
	Total employment	31356	19597	24237	44148	139415	258753	49895	134639	74219	258753
	Average nber of employees/firm	28.2	65.3	134.7	292.4	1279	139.6	105.5	163.2	133.7	139.6
	Standard deviation nber of empl.	7.8	13.4	27.8	72.1	1085.2	394.9	255.5	420.2	448.4	394.9

CHAPTER 6: Export-platform FDI on Backward Linkages

6.1 Introduction

Foreign direct investment (FDI) is often seen as an engine of economic growth and development, an assumption that has led many governments around the globe to try and attract multinationals by offering generous financial incentives. Giroud (2003) underlined the importance of backward linkages and noted that these linkages were of importance for host-developing countries as they provided opportunities for production and employment of domestic suppliers. Moreover, Giroud (2003) argued that backward linkages offered a direct channel for knowledge diffusion. Lall (1996) also mentioned the importance of backward linkages, as they involved greater interaction than normal market relations between anonymous buyers and sellers, e.g., transfer of information. The channels that include direct knowledge transfer from foreign affiliates to local suppliers are various (Javorcik, 2004). For instance, affiliates can transfer knowledge to local firms by offering technical assistance, by providing management training, by improving quality control, by assisting in the purchase of raw materials or by supporting in the organisation of production processes. Another channel arises through the higher requirements for product quality and on-time delivery to MNEs which forces domestic suppliers to upgrade management or technological capabilities and become more efficient. Also, the entry of MNEs increases the demand for intermediate products. As a result, local suppliers can reap economies of scale (Javorcik, 2004).

Over the last two decades, the number of trade agreements has grown at a high rate. About 85% of the 210 notifications in force today was concluded during this period (WTO, 2017). This increase in trade agreements has a significant impact on overseas operations of multinational firms (MNFs) leading to the appearance of a new foreign investment, namely Export-platform foreign direct investment (Export-platform FDI). It is defined as foreign investment in a host country to export most of the output to third countries. In 2000, exports to third countries as shares in total sales by American manufacturing affiliates accounted for 28%of exports. Particularly for affiliates located in Ireland, Holland, and Belgium, those shares respectively accounted for 71%, 60% and 57% (Ekholm, Forslid & Markusen 2007). According to Ito (2013), American firms in countries such as Luxembourg, Hong Kong, Singapore, Netherlands and Switzerland have high ratios of exports to third countries over the total sales in 2008, ranging from approximately 40% to 70%.

Export-platform FDI differs from traditional foreign investments of MNFs (that is, vertical and horizontal FDI) on some important aspects. On the one hand, the final destination of the goods produced is different from horizontal FDI. The output of Export-platform FDI mainly serves third countries, whereas the host country market is the target of horizontal FDI. On the other hand, Export-platform FDI differs from vertical FDI regarding the nature of goods produced. By using vertical FDI, MNFs produce intermediate goods to export back to the home country or other countries for the assembly of final goods. Conversely, by using Export-platform FDI, MNFs produce final goods to serve the final customers in third countries (Antrs and Yeaple, 2014).

There is a rich literature examining Export-platform FDI as a strategic behaviour of MNFs. To serve a free trade area, outsider MNFs may have three entry modes: exporting, tariff jumping, or Export-platform FDI. Export-platform FDI is used when intra-regional costs are low, and the common market size is sufficiently large (See for example Ekholm, Forslid & Markusen, 2007; Montout & Zitouna, 2005; Motta & Norman, 1996; Nguyen & Minda, 2012). Therefore, some MNFs, particularly from the United States, China and Japan, have located subsidiaries in a country of the European Union (EU) to export the output to other member countries (Kumar,1998; Blonigen et al., 2007; Neary 2008). The American MNFs also use their subsidiaries in Singapore and Brazil to export to sub-Saharan countries, respectively (Ito, 2013). Likewise, some outsider MNFs are implemented in Mexico to export production to the North American market after the formation of NAFTA (Hanson et al. 2001; Markusen 2004). Other factors influencing the location of Export-platform FDI are the similarities between the host and the third countries, skilled and unskilled labour endowments of the third countries and the low labour cost of the host countries (Baltagi, Egger & Pfaffermayr, 2007; Ekholm, Forslid & Markusen, 2007).

While Export-platform FDI is widely analysed as a strategic behaviour of MNFs in the literature, its impacts on the host country have been scantily studied, particularly in the case of developing countries. For instance, Geishecker, Pawlik and Nielsen (2008) and Omelanczuk (2013), by using Polish manufacturing industries data, argued that there was a significant effect of Export-platform FDI on export performance of local firms. Similarly, Ruane and Ugur (2006) also claimed the existence of that relationship in Singapore and

Ireland. However, the impact was higher for the Singaporean firms. The purpose of this chapter is to fill this gap by investigating impacts of Export-platform FDI on backward linkages. The author is particularly interested in such a relationship because it is one of the main channels through which foreign firms may affect the host country (UNCTAD 2001; Carluccio and Fally 2013).

The model belongs to the basic game-theory type models analysing impacts of FDI on backward linkages (Lin & Saggi, 2007). However, it differs from Lin and Saggi (2007) for three reasons. First, the model proposes a typology of competition effect and input demand creation effect. The former could lead to a net exit of domestic producers in the market as well as to a lower production of each of them. As for input demand creation one, it could be directly generated by the production of foreign producers in the host country. One may also be indirectly engendered by the greater total production of domestic ones. Second, the model underlines impact of input intensity of foreign producers' technology on backward linkages. Lastly, the model deals with a three-country model, instead of a two-country model, since the latter is not considering the economic integrations phenomenon.

The work of Lin and Saggi (2007) develops a simple model that explores FDI's effect onbackward linkages and that accommodates both preceding views. Their model considers the effects of a multinational's entry that enjoys market power and transfers technology to the local economy.

They argued that the degree to which FDI created linkages with the rest of the economy should be a function of the technology transferred by multinational firms. They explored the connection between technology transfer and linkages by focusing on a single industry with a two-tier production structure.

To deal with this question, I develop a three-country model which is, in turn, applied in the case of supporting industries in Nigeria. This chapter provides some interesting findings. From a theoretical point of view, Export-platform FDI improves backward linkages if and only if spill-overs exceed a critical threshold. Second, the local content requirement of the host country has an ambiguous effect on backward linkages, and there may be an optimal threshold maximising the level of backward linkages. The latter is also affected by the third country size and trade agreements. Turning to the case of Nigeria during the period 2007-2014, Export-platform FDI is proxied to foreign investments in export-oriented industries. The estimates suggest that the latter has a negative impact on backward linkages. On the contrary, the latter is positively impacted by trade agreements signed with other countries while impacts of third market size are ambiguous.

This chapter is organised as follows. In Section 6.2, I develop the three-country model to examine the different impacts of Export-platform FDI on backward linkages. In Section 6.3, I test the model on the Nigerian supporting industries. Section 6.4 describes the data, section 6.5 describes the empirical strategy used; and section 6.6 summarises the main findings and provides further implications of this chapter's findings.

6.2. The three-country model

I consider a three-country model including a host developing country L, a home country M and a third country A. Country L is less developed than the two other countries. Furthermore, countries L and A may sign a bilateral trade agreement (BTA), or else create a free trade area (FTA)[9]. I am interested in the consumption of a final good in country A. This good can be produced either by a representative domestic firm in country L (denoted by l) or by a representative MNF in country M (also called the foreign firm and denoted by firm m). Firm's l and m compete with another one in a Cournot fashion, that is, each firm chooses her output level by taking that of her competitor as given.

There are two main reasons impelling the researcher to use a Cournot model. On the one hand, such a model is much developed and becomes an interesting way to analyse the competition between firms in the FDI topic. This framework is initially used to study strategic behaviours of MNFs between export and horizontal FDI, as in the seminal work by Smith (1987) and a series of subsequent papers (Motta, 1992; Belderbos & Sleuwaegen, 1997; Qiu & Tao, 2001; Lahiri & Mesa, 2009 among other). It is then developed to study MNFs' strategies in a regional integration context in which Export-platform FDI appears (see

[9] The literature on export-platform FDI is based on the assumption of a FTA created by the host and the third countries. For this chapter, I extend this assumption by refereeing to a BTA. Therefore, the model can apply in a more general case and not specially in a FTA

for example Montout & Zitouna, 2005; Motta & Norman, 1996; Nguyen & Minda, 2012). On the other hand, using a Cournot model is helpful to study impacts of MNFs on backward linkages, as it is shown in Belderbos and Sleuwaegen (1997); Lin and Saggi (2007a) or Kadochnikov and Drapkin (2008).

I assume that for each unit of the final good produced, one unit of intermediate goods (also called inputs) and one unit of labour are required. Nevertheless, the inputs produced in country L (local inputs) are more expensive than those produced in country M. By contrast, labour is cheaper in country L than in country M. Let c_l be the price of inputs in country L and w_m be the labour cost in country M. The price of inputs in country M and the labour cost in country L are respectively represented as $\gamma c_l, \delta w_m (0 < \delta, \gamma < 1)$. Hence, δ (γ) can be considered as the comparative advantage of country L (M).

To establish a benchmark for this analysis, the model takes place in two moments. First, in an Export economy, there is no trade agreement between country L and country A. Firms l and m enter into the third country by exporting. Second, in an Export-platform economy, a BTA (or in this case, a FTA) is signed by the two countries, following a lower intra-regional export cost. Firm l continues to export while firm m uses Export-platform FDI as her entry mode into the third country.

The inverse demand function for final good in the third country is given by

$$p_A^R = S_A - b(q_l^R + q_m^R) \quad (1)$$

where

- S_A: third country size.
- R: Export economy (Exp) or Export-platform economy (Ep).
- p_A^R: price of final good in economy R.
- q_l^R (q_m^R): output level of firm l (m) in economy R

In what follows, I study the equilibria of the final good market in the third country (Section 6.2.1). Then, I deal with the impacts of Export-platform FDI on backward linkages and the role of different structural variables (Section 6.2.2).

6.2.1. Third market equilibria

Export economy

In the Export economy, there is no trade agreement between L and A. Firm m exports from country M and firm l exports from country L to serve country A. Let denote $\tau_l$and $\tau_m$the intra- and the extra-regional export costs, respectively. The profit function of each firm is given by:

$$\pi_m^{Exp} = \max_{p_m^{Exp} \geq 0} [p_A^{Exp}\, q_m^{Exp} - (\omega_m + \gamma c_l + \tau_m) q_m^{Exp}]$$

$$\pi_l^{Exp} = \max_{p_l^{Exp} \geq 0} [p_A^{Exp}\, q_l^{Exp} - (c_l + \delta\omega_m + \tau_l) q_l^{Exp}] \tag{2}$$

where π_l^{Exp} and $\pi_m^{Exp}$are profit of a firm $l$and firm m, respectively.

Each firm takes the output level of her rival as given, and maximises her profit by choosing the quantity of the final good to produce. The Cournot-Nash equilibrium under the Export economy is represented by

$$q_m^{Exp} = \frac{1}{3b}[S_A - 2(\omega_m + \gamma c_l + \tau_m) + (\delta\omega_m + c_l + \tau_l)]$$

$$q_l^{Exp} = \frac{1}{3b}[S_A - 2(\delta\omega_m + c_l + \tau_l) + (\omega_m + \gamma c_l + \tau_m)] \tag{3}$$

Proof. See Appendix A.1.

In this economy, local inputs are only required by firm l. Hence, the level of backward linkages is determined by

$$BK^{Exp} = q_l^{Exp} = \frac{1}{3b}[S_A - 2(\delta\omega_m + c_l + \tau_l) + (\omega_m + \gamma c_l + \tau_m)] \quad (4)$$

Export-platform economy

Under the Export-platform economy, the host country and the third country sign a BTA (or an FTA), followed by smaller intra-regional export cost. Let τdenote the new intra-regional cost, hence $\tau < \tau_l$. As aforementioned, firm m now applies an Export-platform FDI as her entry mode to country A while firm l continues to export.

An interesting discussion in the literature about the MNF location is the existence of local content requirement (LCR) imposed by the host countries, particularly the developing ones (Belderbos & Sleuwaegen, 1997; Lahiri & Mesa, 2009; Qiu & Tao, 2001). Indeed, to increase the local added value in the Global Value Chain, the government of those countries can impose such requirements on the production process of MNF as a condition allowing the latter to produce in their countries. However, to compensate for the high local inputs' cost eventually, MNF can benefit from low and zero tariff duty of imported inputs. In this model, LCR is measured by the degree of local inputs used by firm m. Assuming now that for each unit of final good produced in country L, firm m uses $\lambda\ \alpha$unit of local inputs ($0 \leq \lambda \leq 1$), the resting $(1 - \lambda)$ unit of inputs is imported abroad and/or from the home country (λ is given for the foreign firm). I suppose that the imported input cost remains γc_l.

Another important aspect in the FDI's topic is associated with FDI spill-overs generated by the MNF. Those spill-overs can be positive or negative depending on the development level of the host country (Blomstrom & Kokko. 1998; Görg, & Greenaway, 2004; Crespo & Fontoura, 2007). I suppose that the foreign production in country L generates some positive (negative) FDI spillovers reducing (increasing) the production costs of domestic firm. Let θ denote the degree of FDI spill-overs on each unit of final good produced by firm l. Hence, her unit access costs to country A becomes $c_l + \delta\omega_m - \theta + \tau$.

Remark 1. When $\theta > 0$, FDI spill-overs are positive and conversely, when $\theta < 0$, these spill-overs become negative.

Given the demand function in the third country (cf. Equation1), the profit function of each firm can be represented as:

$$\pi_m^{Exp} = \max_{p_m^{Exp} \geq 0} [p_A^{Exp}\, q_m^{Exp} - [\lambda c_l + (1-\lambda)\gamma c_l + \delta\omega_m + \tau]\, q_m^{Exp}]$$

$$\pi_l^{Exp} = \max_{p_l^{Exp} \geq 0} [p_A^{Exp}\, q_l^{Exp} - (c_l + \delta\omega_m - \theta + \tau_l) q_l^{Exp}] \tag{5}$$

where π_m^{Exp} is the profit of firm m and π_l^{Exp} is the profit of firm l.

The Cournot-Nash equilibrium in the third country under the Export-platform economy is determined by

$$q_m^{Ep} = \frac{1}{3b}[S_A - 2(\delta\omega_m + \lambda c_l + (1-\lambda)\gamma c_l - \theta + \tau) + (\delta\omega_m + c_l + \tau_l)]$$

$$q_l^{Ep} = \frac{1}{3b}[S_A - 2(\delta\omega_m + c_l - \theta + \tau) + (\delta\omega_m + \lambda c_l + (1-\lambda)\gamma c_l + \tau)](6)$$

Proof. See Appendix A.1.

Under this economy, local inputs are used by both firms' l and m. Therefore, the level of backward linkages is determined by

$$BK^{Ep} = q_l^{Ep} + \lambda q_m^{Ep} = \frac{(1+\lambda)S_A - (2-\lambda)(\delta\omega_m + c_l - \theta + \tau) + (1-2\lambda)(\delta\omega_m + \lambda c_l + (1-\lambda)\gamma c_l + \tau)}{3b}(7)$$

One can wonder about the reason preventing firm m from investing in country L before the BTA (FTA). Likewise, what reason forces this firm not to continue to export after the BTA (FTA). Proposition 1 gives the answer.

Proposition 1. The foreign firm exports in the Export economy, and invests in the host country in the Export-platform economy; if and only if the following condition is satisfied

$$\tau_l - \tau_m > (1-\delta)\omega_m - (1-\gamma)\lambda c_l > \tau - \tau_m(8)$$

Proof. See Appendix A.2.

It is noted that the term $(1-\delta)\omega_m$ in Condition (8) represents the gain (due to low labour cost) for firm m from producing in country L while $(1-\gamma)\,\lambda c_l$ measures the loss of this production, due to the existence of LCR. Furthermore, $\tau_l - \tau_m$ (respectively, $\tau_l - \tau_m$) indicates the difference in export cost of country L and country M before the BTA/FTA (respectively, after the BTA/FTA). Hence, Proposition 1 implies that in the Export economy (i.e., before the BTA/FTA), high export cost from country L to country A discourages firm $m$from investing in the developing country. Exporting (from the home country M) is therefore her entry mode to the third country A. Conversely, in the Export-platform economy (i.e., after the BTA/FTA), export cost between the two countries considerably falls driving the foreign firm to use an Export-platform FDI in the host country L.

I now consider the case where Condition (8) is fulfilled,and aninterior solution exists.[10]

6.2.2 Impacts of Export-platform FDI on backward linkages

The production of firm m in the host country may have opposite impacts on backward linkages. On the one hand, firm m sources inputs locally, thereby creating supplemental demand for inputs and increasing the level of backward linkages (direct demand effect). Moreover, such production may even increase the output level of firm l leading to higher demand for local inputs (indirect demand effect). On the other hand, foreign production may lower output level of firm l through competition effect that in turn results in smaller demand for local inputs.

Let denote $\Delta_{ql} = q_l^{Ep} - q_l^{Exp}$. Hence, there is a competition effect when $\Delta_{ql}< 0$ and inversely, an indirect demand occurs when $\Delta_{ql}> 0$. I state that

Proposition 2. There exists a threshold $\underline{\theta}$ such that $\Delta_{ql}> 0$ if and only if $\theta > \underline{\theta}$

where

$$\underline{\theta} \coloneqq \frac{1}{2}[(1-\delta)\omega_m - (1-\gamma)\lambda c_l - (\tau_l - \tau) - (\tau_l - \tau_m)]$$

Proof. Replacing θ by$\underline{\theta}$, I have $\Delta_{ql}= 0$.

Given Condition (8) and $\tau < \tau_l$, I have $\underline{\theta} < 0$. It follows that the foreign production in the developing country can generate negative spill-overs and once the latter are high enough, a competition occurs reducing the domestic firm's output level. An implication of Proposition

[10] See Appendix A.1.

2 is that although there are some negative spill-overs, an indirect demand effect can still be generated (i.e., $\Delta_{ql} > 0$) if the condition $\underline{\theta} < \theta < 0$ is fulfilled. In this case, this effect is only associated with the fall in export cost after the BTA/FTA. I have the following corollary.

Corollary 1. Without FDI spill-overs, there is no competition but a direct demand effect.

Let $\Delta BK = BK^{Ep} - BK^{Exp}$ denote the difference level of backward linkages between the Export-platform economy and the Export economy. Given Equations (4) and (7), I have

$$\Delta BK = \Delta_{ql} + \lambda q_m^{Ep} \tag{9}$$

I note that in Equation (9), λq_m^{Ep} indicates the direct demand effect while Δ_{ql} represents a competition or an indirect demand effect. It is straightforward that when $\Delta BK > 0$, Export-platform FDI has a positive impact on the level of backward linkages. This happens when there is (i) a high direct demand effect that dominates a low competition or (ii) no competition effect, but a direct and an indirect demand. In the opposite case, the impact becomes negative, owing to a strong competition effect that dominates a direct demand.

Since the competition effect is generated through negative FDI spill-overs, I have the following proposition.

Proposition 3. There exists a threshold $\overline{\theta}$ such that

(i) $\Delta BK > 0$ if and only if $\theta > \overline{\theta}$ where

$$\overline{\theta} := \frac{2\lambda^2(1-\gamma)c_l - \lambda(S_A + (2-3\gamma)c_l - \delta\omega_m - \tau) + [(1-\delta)\omega_m - (\tau_l - \tau) - (\tau_l - \tau_m)]}{2-\lambda}$$

(ii) $\overline{\theta}$ decreases in $S_A, \Delta_\tau := \tau_L - \tau$.

(iii) $\overline{\theta} < \theta$.

Proof. Point (i): Replacing θ by $\overline{\theta}$I have $\Delta BK = 0$. Hence, I have $\Delta BK > 0$ if and only if $\theta > \overline{\theta}$.

Point (ii): I have $\frac{\partial \theta}{\partial \gamma} > 0$, and $\frac{\partial \overline{\theta}}{\partial S_A}, \frac{\partial \overline{\theta}}{\partial \delta_\tau}, \frac{\partial \overline{\theta}}{\partial \delta} < 0$.

Point (iii): It is straightforward.

Proposition 3 shows that Export-platform FDI increases the level of backward linkages in the developing country if and only if FDI spill-overs exceed a threshold. Below it, the foreign production creates strong negative FDI spill-overs, and the competition effect becomes stronger than the direct demand one, following a smaller level of backward linkages.

However, it should be noted that such a threshold decreases with the third market size, and the power of the BTA/FTA measured by Δ_τ . Indeed, the higher the third market size, the higher the foreign firm's output level, generating thereby a stronger direct demand effect. Therefore, the latter can suffer a higher competition effect. Likewise, the higher the value of parameter Δ_τ , the more export cost between the host and the third counties fall after the BTA/FTA, leading to higher output level of the foreign firm. In addition, the higher theΔ_τ , the lower firm l's access costs to country A, following a fewer competition effect.

From Proposition 3, I have two consequences which can be formulated in the following corollary

Corollary 2. $\Delta BK > 0$ if and only if

(i) $S_A > \overline{S}_A$ where

$$\overline{S}_A \coloneqq 2\lambda(1-\gamma)c_l + (\delta\omega_m + \theta + \tau) - (2-3\gamma)c_l + \frac{(1-\delta)\omega_m + (\tau + \tau_m - 2\tau_l - 2\theta)}{\lambda}$$

(ii) or $\Delta_\tau > \Delta_{\overline{\tau}}$ where

$$\Delta_{\overline{\tau}} \coloneqq 2\lambda^2(1-\gamma)c_l - \lambda[S_A + (2-3\gamma)c_l - (\delta\omega_m + \theta + \tau)] + [(1-\delta)\omega_m - 2\theta - (\tau_l - \tau_m)].$$

Hence, Corollary 2 implies that Export-platform FDI improves the level of backward linkages if only if the third market size is high enough, or the power of BTA/FTA measured by parameter Δ_τ is strong enough.

Using Proposition 2 and Proposition 3, $\underline{\theta}$ and $\overline{\theta}$ can be re-written as

$$\underline{\theta} = \frac{1}{2}\Delta Z$$

$$\overline{\theta} = \frac{2\lambda^2(1-\gamma)c_l - \lambda(1-2\gamma)c_l - \delta\omega_m - \tau)}{2-\lambda} + \frac{\Delta Z}{2-\lambda}$$

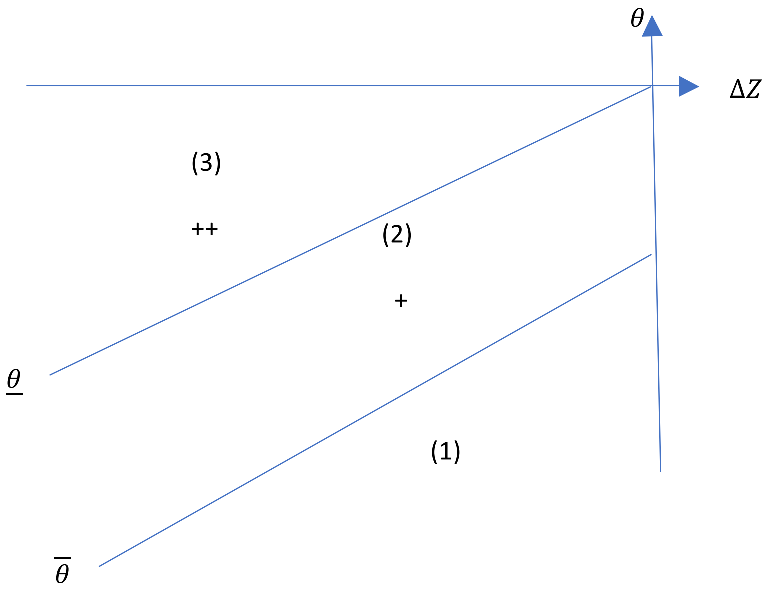
where $\Delta Z \coloneqq (1-\delta)\omega_m - (1-\gamma)\lambda c_l - \Delta_\tau - (\tau_l - \tau_m)$.

Hence, $\underline{\theta}$ and $\overline{\theta}$ can be represented in Figure 1, which allows us to examine different impacts of Export-platform FDI on the level of backward linkages.

Case 1. Export-platform FDI has no impact on backward linkages

In this case, there is a competition effect which is completely compensated for by the direct demand effect. I am on the line $\overline{\theta}$ of Figure 5-1. The foreign production in the host country replaces some parts of the domestic production, following a fall in the demand for inputs. However, this fall is fully offset by the direct demand effect. The total demand for inputs does not change and Export-platform FDI causes no impact on backward linkages.

Figure 6-1. Impacts of Export-platform FDI on backward linkages



This is the so-called 100% crowding-out effect discussed by Markusen and Venables (1999). In their framework, the authors mention that the multinational production may replace that of domestic firms in an exactly offsetting way. Consequently, there is no effect of FDI on the industry producing intermediate goods.

Case 2. If $\theta \ \leq \ \theta$, Export-platform FDI has an ambiguous impact on backward linkages

In this case, there is no indirect demand effect, but a competition effect. If the latter is stronger than the direct demand effect (that is $\theta \ \leq \ \overline{\theta}$), Export-platform FDI lowers the level of backward linkages (Area 1 of Figure1). This is the situation where the foreign production in the developing country generates strong negative FDI spill-overs such that the domestic firm's output level significantly falls. Therefore, the decline in demand for inputs by firm l is high and cannot be compensated for by the direct demand by firm m. Such negative impact on backward linkages can be also due to a weak power of BTA/FTA and/or a small third market size.

On the other hand, if the direct demand effect becomes stronger than the competition effect (that is $\theta \geq \theta \geq \overline{\theta}$), Export-platform FDI improves the level of backward linkages (Area 2 of Figure 6-1). In this situation, negative FDI spill-overs are at an intermediate level. Hence, the decline in demand for inputs by firm l is low and dominated by the direct demand effect.

Case 3. If $\theta > \underline{\theta}$, Export-platform FDI highly increases the level of backward linkages.

In this case, the foreign production in country L creates no competition effect, but an indirect demand one (Area 3 of Figure1). Indeed, under the Export-platform economy, the domestic firm gains from low export costs and strong positive FDI spill-overs. Therefore, the output level of this firm considerably improves, increasing her demand for inputs. Given the existence of the direct demand effect by the foreign firm, the level of backward linkages significantly increases.

This case is related to the host countries in which the output level of the domestic firm is small under the Export economy, due to high entry costs to the third country (either high production cost or high export cost). That leads to a small demand for inputs and so small level of backward linkages. By contrast, the domestic firm's entry cost significantly decreases under the Export-platform economy (thanks to the existence of positive FDI spill-overs and low export cost). That, in turn, leads to a high output level and so high demand for inputs. Given the demand for inputs by firm m, the level of backward linkages increases significantly.

This result seems to be consistent with Markusen and Venables (1999). In their framework, the authors also state the case where foreign production in the host country significantly increases the level of backward linkages. Consequently, FDI may be considered as a catalyst for industrial development.

In what follows, I examine how the LCR (λ) can affect the level of backward linkages.

Proposition 4. There exists an optimal level of λ maximising ΔBK if the following conditions are satisfied

I. $\delta\omega_m + \theta + \tau < S_A + (2 - 3\gamma)c_l$

II. $S_A < (2 - \gamma)c_l + \delta\omega_m + \theta + \tau$

III. $\tau - \tau_m < (1 - \delta)\omega_m - \frac{S_A+(2-3\gamma)c_l-(\delta\omega_m+\theta+\tau)}{4} < \tau_l - \tau_m$

In this case, the optimal level of λ is

$$\lambda^* = \frac{S_A + (2 - 3\gamma)c_l - (\delta\omega_m + \theta + \tau)}{4(1-\gamma)c_l}$$

Proof. See Appendix A.3.

Proposition 4 implies that an increase in λ has an ambiguous impact on ΔBK and so on the level of backward linkages under the Export-platform economy. Indeed, this increase influences the backward linkages by two opposite ways. On one hand, it leads to a greater output level of firm l and so, demand for inputs. On the other hand, it shrinks the output level of firm m and thereby lowers the demand for inputs. If the threshold λ^* exists, then below this threshold, the higher the LCR, the greater the level of backward linkages. Conversely, above this threshold, the higher that LCR, the smaller level of backward linkages.

In summary, the framework above shows an ambiguous impact of Export-platform FDI on the level of backward linkages. Positive impact occurs when FDI spill-overs exceed a critical threshold. Likewise, the beneficial impactis associated with large third market size andstrong power of the BTA/FTA. Besides, there is an optimal level of LCR that maximises the level of backward linkages. In Section 6.3 following, I examine the framework in the case of Nigerian supporting industries.

6.3 Evidence from Nigeria supporting industries

Building on the framework above, I develop an empirical study in the case of Nigeria from 2007-2014 to search for any backward linkages created by Export-platform FDI. The country is a very interesting case-study because during the analysed period, the inflow and outflow of investment increased; and the Nigerian government signed different improved trade agreements with its trade partners. First, the improved BTA with the United States in 2012 from which Nigeria faced non-tariff barriers or got tariff reductions for its exporting goods to the American market. Second, there are several economic and trade agreements between Nigeria and the European Community, particularly the economic partnership agreement in 2014 on market access and cooperation. More improved trade agreements have been signed with countries such as India, China and Australia in the time-period mentioned above. Nigeria has been a member of the WTO since January 1995, thereby received the most favoured nation status with the other members. Also, in 2009, Nigeria signed an agreement of tariff reduction by at least 20% on some 70% of goods exported during the Global System of Trade Preference (GTSP) meeting. GTSP has been a framework of the United Nations Conference on Trade and Development and an affiliate of the WTO.

6.4 Data Description

The official data on Export-platform FDI is not available in Nigeria. Hence, the database used in this study is identified, checked and matched from two major sources: The World Bank enterprise surveys and the National Bureau of Statistics.

The enterprise's surveys began in 2007 and were conducted periodically by the World Bank, with help through the Nigerian Bureau of Statistics. The surveys refer to all business entities existing at the end of the surveyed year and cover annual data on their commercial activities (for example, standard industrial classification, labour, capital, wage, asset, debt, production value, profit, investment, corporate tax, and so forth). Up until 2014, seven surveys had been conducted covering firm-level annual data from 2000 to 2012.

Based on these surveys, I first selected the export-oriented industries in which foreign investments were used to identify Export-platform FDI. According to the Foreign Investment Law (the decree No. 24 of July 31, 2000), the industry is considered as export-oriented whenever most of its production (that is, more than 50%) is for exporting. I matched all domestic firms (foreign firms) to calculate domestic production value (foreign production value). Then, I obtained the total domestic and foreign demands for a given input by using the Input-Output Matrix calculated in the earlier chapter of this work. Second, I selected the supporting industries that supplied those export-oriented industries. After examining the raw data and deleting firms with missing key information, I had a database including 1136 year-industry observations. The database included different variables such as the number of foreign firms, labour force, capital stock, production value, investment, wage, and so forth.

To search for the role of third-country size, I use the GDP of the principal trade partners of Nigeria. According to National Bureau of Statistics, these countries include China, United States, United Kingdom, the members of the EU and ECOWAS. During the period studied, the exporting of Nigerian manufacturing products to these countries always covered more than 80 percent of the total export value. Using the World Bank database, I obtained the GDP of those countries (at a constant price) from 2007 to 2014. Then, I matched them with the initial database (Table 5-1 in Appendix).

6.5 Empirical strategy and testable hypotheses

6.5.1 Empirical strategy

The dependent variable, denoted by $Y_{i,t}$, is the production value of a supporting industry i in year t. This variable is calculated by$Y_{i,t} = \sum y_{ik,t}$ where $y_{ik,t}$ represents the production value of a typical firm k located in industry i during year t. The benchmark regression is given by:

$$ln\, Y_{it} = \alpha + \beta_1' \, ln\, DBL_{it} + \gamma X_{it} + \varepsilon_{it} \qquad (10)$$

Moreover; to examine the impacts of Export-platform FDI, I have the following regression

$$ln\, Y_{it} = \alpha + \beta_1 \, ln\, DBL_{it} + \beta_2 \, ln\, FBL_{it} + \gamma X_{it} + \varepsilon_{it} \qquad (11)$$

The index represents supporting industry i in year t and $\varepsilon_{i,t}$ is the error term. The vector $X_{i,t}$ regroups control variables, including industrial investment level (denoted by $indus\_invest_{i,t}$), industry size (denoted by $indus\_size_{i,t}$) and labor qualification (denoted by $w_{i,t}$). These covariates are calculated as:

$$indus\_invest_{i,t} = \sum_{k=1} inves_{kit} \tag{12}$$

$$indus\_size_{i,t} = \frac{\sum_{k=1} L_{kit}}{\sum_{i-1}\sum_{k=1} L_{kit}} \tag{13}$$

$$w_{i,t} = \frac{\sum wage_{kit}}{\sum L_{kit}} \tag{14}$$

Where the indices k_{it} respectively represents firm k located in supporting industry i during year t. The investment level and labor force of a given firm are denoted by $invest_{kit}$ and L_{kit}, respectively. In this chapter, wage was used the as a proxy to indicate labour qualification. All things being equal, an increase in wage can be considered as an improvement in labour qualification (Liu et al. 2000; Nguyen-Huu 2016; Todo et al.2009).

The domestic and foreign demand (respectively denoted by DBL_{it} and FBL_{it}) are calculated as:

$$DBL_{it} = \sum_{j=1} a_{ij}\, DP_{jt} \tag{15}$$

$$FBL_{it} = \sum_{j=1} a_{ij}\, FP_{jt} \tag{16}$$

where

- DP_{jt} (FP_{jt}): the total domestic (foreign) production of an export-oriented industry j throughout year t.
- a_{ij}: the proportion of output level of a typical supporting industry i's that supplies an export-oriented industry j. The parameter a_{ij} is taken from the Input - Output Matrix by excluding all export-oriented industries which supply themselves or supply other export-oriented industries.

The estimate of β_2 identifies the power of direct demand effect. Hence, the parameter is estimated to be positive ($\beta_2 > 0$). Otherwise, parameters β_1 and β_1' represent the extent of domestic demand for inputs.

To examine the role of different structural variables, I use the following regression

$$ln\, Y_{it} = \alpha + \beta SV_t + \gamma X_{it} + \varepsilon_{it} \tag{17}$$

Where SV_t is a vector of structural variables. It first includes improved trade agreements signed between Nigeria and other countries during the period studied. This means the BTA with the United States (denoted by usa_t,usa_t= 0 if t < 2012 and usa = 1 if not), and, the GSTP (WTO) agreement with Nigeria (denoted by wto_t, wto_t= 0 if t < 2009 and wtot = 1 if not). Second, parameter dbf 2 (dbf 2: = log FBL $*$ log FBL) is used to identify impacts of LCR. Indeed, information about LCR is not available in the database. Therefore, the calculated Input-Output matrix can be useful because the parameter a_{ij} in this matrix reports the proportion of output level of a given supporting industry i that supplies an export-oriented industry j including foreign production. Third, SV_talso contains the size of the United States, China and the EU&UK, the principal export destination of Nigeria (respectively denoted by ussizet, apecsizet and eusizet). These variables are measured and presented in Appendix A.4.

The estimate of β in Equation (17) is interpreted as the impact of the structural variables mentioned above on the production value of a typical supporting industry (that is the level of backward linkages).

It should be noted that over the roles of Export-platform FDI and structural variables (as the third market size, the power of BTA, or LCR), the production value of a typical supporting industry (the dependent variable) can be affected by different observed characteristics which can create endogeneity if they are not controlled for. Hence, to deal with this problem, labour qualification, industry investment, and industrial size were added in Regressions (10), (11), and (17). Also, there might exist unobserved factors being different across industries, but time-invariant within industries such as sophisticated, nature of the produced inputs, etc. If these factors are correlated with the regressors, the fixed effects model capturing unobserved industrial effects is used to estimate the three regressions mentioned above. Hence, the problem with omitted variables' bias is solved. However, once industrial characteristics are not corrected with the regressors, the fixed-effects model become unsuitable. In this case, random effects may become relevant (Green, 2012).

6.5.2 Testable hypotheses

Based on the framework developed in Section 5.2, Itested the following hypothesis

Hypothesis 1. Foreign investments in export-oriented industries have an ambiguous impact on the production of a supporting industry in Nigeria.

Using Equations (10) and (11), I can determine the net impact of Export-platform FDI on backward linkages. I consider three cases:

I. $\beta_1 > \beta_1'$. There exists an indirect demand and no competition effect. The location of FDI in export-oriented industries significantly increases the production of supporting industries (Area 3 of Figure 1).

II. $\beta_1 < \beta_1' < \beta_1 + \beta_2$. There is a competition effect. However, its impact is low and dominated by the direct demand effect. The net impact of Export FDI on backward linkages is positive (Area 2 of Figure 1).

III. $\beta_1 + \beta_2 < \beta_1'$. There exists a strong competition effect such that it dominates the direct demand effect. Export FDI has a net negative impact on backward linkages (Area 1 of Figure 1).

Hypothesis 2. LCR has an ambiguous impact on the production of a supporting industry.

Given Regression (17), if the associated parameter of variable $fbl2$takes a positive value, then the higher the LCR, the higher the production value of the typical supporting industry. Conversely, if it is negative, then the higher the LCR, the smaller the considered production value.

Hypothesis 3. Trade agreement between Nigeria and a third country positively impacts the production of a typical industry if and only if the power of this agreement is sufficiently strong.

I note that if the estimated parameter for variable usa (wto) is negative, then the power of this agreement is weak leading to a negative impact on the production value of a supporting industry. Inversely, if the estimated value is positive, the related agreement improves the production value.

Hypothesis 4. Third country size has a positive impact on the production value of a supporting industry if and only if it is sufficiently high.

If the estimated value of variable $ussize$ $(chinasize, eusize)$ is negative, the size of the related market is small and negatively impacts on the production value of a supporting industry. By contrast, if it is positive, third country size has a positive impact on such production.

6.6 Empirical results

The conventional binary categorisation of FDI into horizontal and vertical FDI is attributed toHelpman and Krugman (1985). Horizontal FDI is a substitute for trade in the conventional mode of FDI (Markusen (2002); however, Bergstrand and Egger (2007) constructed a model where horizontal FDI coexisted with trade between same countries. Yeaple (2003) constructed a model where a firm might engage both in horizontal and vertical FDI for a medium range of trade costs.

Motta and Norman (1996) is presumably the first theoretical work on the export-platform type FDI. By constructing an oligopoly model of one-stage (final-product) production, they succeeded in explaining why a significant amount of FDI takes place between countries within regional trading blocs. Ekholm, Forslid & Markusen (2007) also explained this by constructing a partial equilibrium oligopoly model that consisted of two production stages (intermediate and final-product) and in which the export-platform FDI was driven by a trade-off between the lower production costs of the South and trade costs. The empirical part of their paper showed that US firms in Europe had higher shares of third-country exports when compared with those of US firms in other regions. Although all of the above models assumed identical firms, Grossman et al. (2006), were motivated by the observation that various modes of supply coexisted within the same industry (Hanson et al. (2001) and Feinberg and Keane (2003)developed a model wherein firms faced a richer array of modes of supply, by allowing for firm heterogeneity and by incorporating several types of complementarities, first pointed out by Yeaple (2003). Neary (2009) developed a model based on the "proximity–concentration" trade-off. Mrázová and Neary (2010) constructed a general model of how a firm would choose to serve a group of foreign markets through exports or FDI, and how many foreign plants it would want to establish, using the Super-modularity concept. Similar to Mrázová and Neary (2010) in its question, Ito (2012) constructed a model in which a multinational enterprise (MNE) determined the spatial extension of operations (number of FDI destinations) and the intensity of production (volume of sales), in which the export-platform type FDI emerged. Ito (2013), on which this chapter draws for its theoretical prediction, constructed a model that nested five types of supply modes, that is, export, the conventional horizontal FDI, the conventional vertical FDI, the horizontal export-platform FDI, and the vertical export-platform FDI. Baldwin and Okubo (2012) proposed a new method to organise the FDI types, i.e., by looking at sales and sourcing patterns of FDI affiliates. They showed that the majority ofFDIs did not fit neatly into the existing categorisation.

With export-platform FDI as a critical input in the global production process, multinationals are often reluctant to cooperate with local partners in order not to jeopardise the global production circle. However, Moran (2001) shows in some case studies that the parent-affiliates relationships become more integrated, especially within export orientated firms. Besides purely looking for low-cost assembly sites, affiliates in developing countries are increasingly treated as an important part of the supply network[11],although Moran (2001) does recognise that the number of linkages is still relatively small when foreign affiliates are a part of an international network. The reliance on imported input is still larger than input from the local markets. Hirschman (1958) warned that due to the lack of linkages, FDI might have limited impact on the economic growth of the host country.

Developing a two-country model, some authors such as, Lin and Saggi (2005, 2007) Markusen and Venables (1999) and Rodriguez-Clare (1996)argued that the impacts of FDI on backward linkages could be examined through a competition effect and demand for inputs effect. On the one hand, the entry of MNCs in the host country lowered the degree of backward linkages by shrinking the output level of domestic producers that led to a decline in demand for inputs (competition effect). On the other hand, such entry also sourced theinput locally and thereby created an additional demand for inputs (demand effect). Therefore, the net impact of FDI on local input production is ambiguous (Lin and Saggi, 2005, 2007). For Rodriguez-Clare (1996), it will be positive upon the condition that MNEs are intensive in intermediate goods, that communication costs between the headquarter and the production plant are high and that the home country and the host country are not too different regarding the variety of intermediate goods produced. When these conditions are not fulfilled, the opposite happens: the entry of MNCs in the host country reduces the degree of backward linkages. In the same analyses line, Lin and Saggi (2005, 2007) suggested that the net effect of FDI on the level of backward linkages depended on the technological gap between MNEs and domestic producers, whenever this gap reached a critical threshold. In this case, MNEs

[11]Examples, International electronics companies change their Asian production supply chain with the latest products development in the home market (Borus, Ernst, and Haggard (2000). General Motors equipped their high-performance export affiliates in Hungary with special cylinder head equipment that can adapt to the ongoing development without rebuilding the production line. Regarding the assistances of the affiliates, Ford has facilities in Hermosillo (Mexico) where managers are trained in quality control techniques (Womack, Jones, and Roos (1991).

improved the level of backward linkages because the demand effect was stronger than the competition effect. In the opposite case, if this condition was reversed, the entry of MNEs made the local market more competitive whereas the demand effect was weak. Hence, the level of backward linkages fell.

To examine the impacts of Export-platform FDI on backward linkages over the period 2007-2014, I used the fixed effects (FE) model and the random effects (RE) model. The empirical study is in the line of the econometric analysis of panel data which is largely developed on the topic of the impacts of MNE on the host country (e.g. Kejzar, 2006; Biterza et al. 2008). However, it differs from other studies by focusing on the production level instead of the productivity. Indeed, the main reason is that an improvement in productivity could not be associated with a greater production level. That is the case where the presence of MNEs in host-country incited domestic firms to become more efficient while their output level declined because some parts of their market shares were involved by these multinationals (Aitken and Harrison, 1999).

6.6.1 Foreign investments in export-oriented industries and production of supporting industries

I relied on Benchmark regression (10) and Regression (11) to investigate the impacts offoreign investment in export-oriented industries on the production of supporting industries. The estimates for these regressions are represented in Table 6-2 below. Export FDI column from the table shows the estimations for Regression (10) using the RE and the FE models, respectively. Those of Equation (11) are in the production of supporting industries column, using the RE and FE models, respectively.

The table 6-2 gives ratios F statistically significant at the 5% & 1% levels respectively. Hence, the individual effects are justified, and the FE model is more efficient than the grouped regression model. Similarly, the Lagrange multipliers (LM), is higher than the chi-square of 3.84 ($\chi2(1) = 3.84$) and justifies the relevance of the RE model over the OLS model.

I state that over the period 2007-2014, all control variables are significant and have a positive influence on the production of supporting industries. Using the RE model (FE model), if the size of a given industry increases by 10%, its production will grow by 1.9% (1.1%). The same 10% increase in investment of the considered industry leads to an increase of 1.4% in its production.

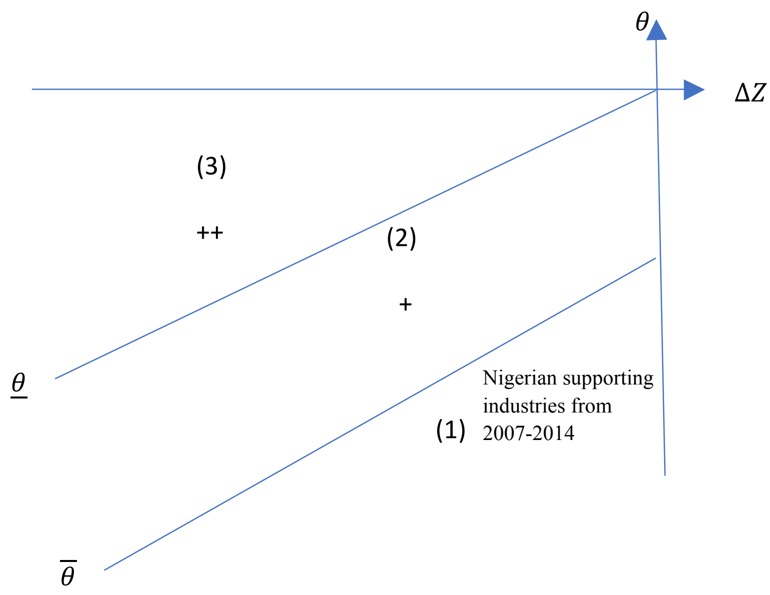
Table 6-2 also shows that estimated coefficient of FBL (presented in the production of supporting industry column), considered as a direct demand effect, and is positive and statistically significant in both modules. Using the RE method (FE method), if foreign firms in export-oriented industries increase their demand for a given input by 1%, the production of this input will increase up to 0.07% (0.12%). However, variable DBL is statically non-significant. On the other hand, in the absence of foreign production, the domestic demand for inputs becomes statically significant for both the FE and RE models (cf. estimates in export FDI column). It follows that 1% increase of domestic demand for a given input leads to an increase of 0.15% (by the RE model) or 0.19% (by the FE model) in the production of this input. Such an increase is even higher than that generated by foreign demand (cf. 0.07% for the RE model and 0.12% for the FE model). Also, the workof Doan (2010) supports this hypothesis that the evidence for Export-Platform FDI is ambiguous.

The results validate Hypothesis 1 and indicate that:

I. During the period 2007-2014, backward linkages were created by foreign firms rather than by domestic ones.
II. There is a strong competition effect so that it highly dominates the direct demand one.

Hence, the Nigerian supporting industries are in Area 1 of Figure 1 (Figure 6-2 below).

Figure 6-2. **Impacts of Export-Platform FDI on Nigerian supporting Industries**



Using the analysis developed in Section 5.2, it follows that the foreign production in export-oriented industries creates strong negative FDI spill-overs. Therefore, the competition effect becomes very strong and dominates the direct demand effect that reduces the production value of supporting industries.

Consequently, Export-platform FDI has no impact on backward linkages. Hence, the result seems to be similar to that of Markusen and Venables (1999), since these authors also observed the crowding-out effect of FDI on local industries.

Competition effect, resulting from competition between foreign and domestic producers in downstream industries, could lead to a lower production of domestic producers or a net exit of them from the third market. Therefore, competition effect hurts backward linkages. On the other hand, demand creation implies a direct and indirect input demand created by the location of MNEs on the host country. Direct demand creation is caused by the production of MNE whereas indirect demand creation is generated whenever more domestic firms are in the third market or whenever each of them has a greater production. When competition effect is stronger than demand creation effect, Export-platform FDI has a negative impact on backward linkages. Conversely, if the former is weaker than the other, this investment improves backward linkages.

Furthermore, if MNE and domestic firms are heterogeneous (they do not have the same production technology), then impacts of Export-platform FDI on backward linkages also depend upon input intensity of the technology used by MNE. Whenever this intensity does not reach a smallest or exceed the highest level, impacts appear to be negative. Inversely, between these two thresholds, this investment improves backward linkages in the host country. Also, the model showed that there is an optimal intensity of MNE production's technology which maximises backward linkages. Below this threshold, the more technology of MNE is intensive in theinput, the greater benefits obtained from this investment are. Conversely, above this threshold, the higher this intensity is, the less the host country could benefit from Export-platform FDI.

6.6.2 Impacts of trade agreements, LCR and third country size

I now examine the impacts of trade agreements, LCR and third country size on the production value of supporting industries, by using Regression (17). The estimate results are shown in Table 6-3 below.

Impacts of LCR:

Local content policies to increase backward linkages can address either the supply or the demand for intermediate products and services. The first type aims to increase the quantity, quality and variety of inputs available for use in production. Such policies can target specific products and services (e.g. specific tax incentives) or operate affecting the general context and enable the operation of these sectors (e.g. infrastructure). Policies affecting the demand for goods and services aim to make existing sectors more compatible with the sectors to develop as well as to reorient demand toward the domestic market (e.g. domestic buy-in schemes).

These policies operate under the premise that increasing domestic content is a desirable objective. Increasing the share of domestic value added in production and exports, in this view, should entail aiming for a domestic production and employment. This view is supported by approaches that consider the international trade a zero-sum gain and that the benefits of trade come from achieving and expanding a trade surplus. Consequently, replacing imported inputs with domestic substitutes is a way to achieve micro and macroeconomic objectives.

Local content policies are frequently associated with trade restrictions, tariff and tax incentives, subsidies and other measures to increase the use of domestic inputs. In some cases, regulations entail quotas for the use of domestic inputs (e.g. domestically produced alcohol in petrol). Export taxes and restrictions, for example, can develop forward linkages by reducing the export supply and increasing the domestic supply of commodities (Mendez-Parra et al., 2016). Meanwhile, the tariff structure can be modified by increasing the tariff on the final product and reducing the tariff on intermediate goods, increasing the effective rate of protection. Finally, bank regulations can be enacted to increase the availability of credit to purchase domestic inputs and reduce the availability of credit for imported inputs. These constitute just a small sample of the type of measures that can be considered.

This policy approach is sometimes criticised from an economic perspective on two grounds. The traditional critique points to the inefficient allocation of resources that these measures generate. Although in the short run it is possible to employ some idle resources, an increase in the production of domestic inputs to supply downward industries, for example, is achievable only by subtracting resources from existing activities. Assuming these resources are currently employed in sectors with comparative advantages, the reallocation means a general reduction in efficiency. Moreover, the reallocation of resources is frequently associated with falls in output in the existing sectors; for a given demand, prices will tend to increase, reducing real wages and demand further.

This critique suggests that the use of measures that alter the allocation of resources will affect existing industries. Therefore, such measures will fail because they are economically too costly. However, it also suggests that they tend to fail at generating globally competitive input sectors. Typical infant industry policies struggle to develop sectors that achieve efficiency and that are productive enough to remove the original protection. Consequently, the developed sectors tend to be expensive and frequently deliver poor quality, affecting the rest of the industries involved. Also, from the political economy point of view, protection leads to the development of groups that lobby for maintenance of the protection, making its removal complicated.

In addition to the traditional critique is a more modern approach based on the idea of international value chains. The international fragmentation of production, whereby the different stages take place in different countries, requires a global look at the value chain. The increase in specialisation in the production of specific components leads to economies of scale that maximise the productivity of the firms involved, the stages and the chain in general. Stages take place in countries based on their capacity to contribute to this process. As firms in each stage use the most efficient and cost-effective goods and services in production, they guarantee the same standards to the stages taking place downstream.

Any policy that aims to affect this international allocation, aiming to increase the number of stages taking place in a given country, will alter this configuration and affect the global productivity of the value chain. By affecting this allocation, productivity is expected to fall and inefficiency to rise. The reallocation of resources, explained above, will also operate. Regulations and taxes will tend to reduce output in the existing stages of the chain, reducing economies of scale. Moreover, it is unlikely that the uncompetitive stage will manage to achieve economies of scale and productivity levels as high as those achieved in other countries.

It is expected that the value chain will reorganise the production by reallocating the now-inefficient stages into other countries. After the measures have been taken in the domestic economy, firms in other countries will become more competitive and will absorb the stages, cutting out domestic firms from the value chain. This suggests a fundamental misconception about value chains. Rather than aiming to increase the share of value added embedded in world production, policy should be oriented towards increasing the value added generated through value chains, regardless of how much they represent the chain. Moreover, firms can participate in more than one chain, suggesting ample scope for increasing the value added, which will be revealed as productivity and efficiency grows.

Rather than increasing the stages taking place in the country, participation in value chains can be increased through the upgrading of the tasks performed in the chain. Value chain upgrading suggests stepping into tasks and stages where the creation of value is higher.This implies a reconfiguration of the use of the same resources, increasing the capture of value added per unit. This frequently implies abandoning the previous stages of the chain rather than adding stages. 'Moving up' the value chain is more about being cooperative and increasing productivity than it is about aiming to conquer new stages of production.

In this sense, the policies that work to upgrade value chain participation tend to be those that alter the productivity of the resources employed. They include a wide range of policies working at different levels. Some horizontal policies aim to create the enabling context for the development of new products and services that contribute to global productivity. This includes improving infrastructure, actions to improve employees' capabilities, such as training, measures to increase credit and property rights enforcement, among many others. These measures tend to lift different constraints affecting the development of firms and sectors. Sometimes, when they hit the most binding constraint, they can be sufficient to generate the development of the targeted sectors.

The associated coefficients of this variable are represented in the local inputs intensity column in table 6-3 below. I state that the estimated is positive and statistically significant at 0.1% level in both RE and FE models. Hence, I validate Hypothesis 2 and conclude that in the sample, the higher LCR, the higher the production value of supporting industries.

Ramdoo (2015) highlights a range of factors that determine the success of local content policies. He added that more than half of the capital input used in the Norwegian oil sector was sourced locally, along with 80% of the sectors' operational and maintenance input; to which domestic firms were productive enough to be globally competitive. In addition, Ogunleye (2014) explained that the inclusion of Norwegian firms was a compulsory requirement for international oil companies looking to bid on contracts, and international oil companies were required to undertake local capacity-building (e.g. through mentoring of domestic firms) as a condition of operating in Norway and offered tax rebates as an incentive to do so. These measures allowed for a gradual improvement of local capacity and knowledge along with the transfer of technological know-how (Senoo and Armah, 2015). The works of Nordas et al. (2003) also validate the impact of LCR on domestic productivity in the case of Brazilian oil sector. Amoako-Tuffour et al. (2015), reports that Ghana has already made good progress in raising the level of employment of local workers in the oil industry. Negara (2016) presents empirical evidence that local content requirements in Indonesian manufacturing have largely been ineffective in reducing firms' dependence on imported inputs. He speculates this could be due to weak enforcement of local content laws. However, UNIDO (2016) argues that local content policies played a positive role in driving the rapid expansion of the garment industry in the post-independence period in Bangladesh, and that the higher the LCR, the higher the production value of domestic firms.

According to McCulloch et al. (2017), level of local content varies not only with the sector in which the firm is situated but also with the size of the firm and its position in the relevant value chain. As a result, it is difficult to make generalisations about the scope and nature of backward linkages in Nigeria. This said, the detailed firm-level interviews presented a revealing picture of some aspects of backward integration. In all cases, the firms being interviewed were lead firms with a key role in the governance and management of the relevant value chain. They are the key to backward integration since they have the ability and resources to make the necessary investments in their suppliers or supply chain. Understanding the circumstances and constraints they face is therefore important to devise local content policies that are likely to be effective. The first finding from their firm interviews were related to the enormous complexity and variety of the value chains associated with even seemingly simple sectors. Each final product in the economy, whether it was sugar, cement or cars, had a wide array of inputs, both goods and services. Some of these were already sourced locally; others were sourced from imports but could in principle be sourced locally; others still would be almost impossible to obtain within the country. Their findings also indicated, based on the firm interviews, that the higher the LCR, the higher the production value of domestic firms to which their competitive edge was enhanced.

Nonetheless, the impact of LCR is ambiguous and has other meanings. This chapter has only considered it based on production value of domestic supporting industry. The work of Lahiri and Mesa (2004) has analysed the impact of LCR under exchange volatility, and they found that an increase in the volatility foreign exchange rate decreased optimal LCR, both under free entry and exit of foreign firms and when the number of foreign firms was fixed.

Role of trade agreements:

FTAs are an exercise in partial trade liberalisation and rule-making towards a limited number of partners and, as such, their effects are contested. Supporters argue that, as with any liberalisation, the removal of barriers to trade will result at an aggregate level in an increase in the welfare of both parties. The rules within FTAs are also perceived as providing a more predictable policy environment (and in this way to foster economic activity and investment) and as being a ‘cement’ to bind together regional integration schemes.

However, FTAs are also criticised from both sides. Some trade liberals,such asRodrik(2018), identify potential negative effects from liberalising only partially. The essence of the liberal critique is that FTAs may ‘divert trade’ as well as ‘create trade’. The former is welfare reducing and, if it is relatively large, it may significantly reduce (or completely offset) the latter, which is welfare enhancing.

Recall that during the period studied, there are two important trade agreements signed between Nigeria and third countries: improved BTA with the United States in 2012 and Nigeria signing an agreement with GSTP (WTO) in 2009 on tariff reduction. The estimates for the impacts of these agreements, using the RE and the FE methods, are reported in the trade agreement column Table 6-3, respectively. I observe that two variables wto and usa positively and statistically affect the production value of supporting industries. These findings support Hypothesis 3 so that the power of trade agreements between Nigeria and third countries is sufficiently strong to improve the production of supporting industries.

An analysis of 'Jordan's substantial liberalisation over the last two decades' finds 'the impact of trade agreement has been rather small' (Busse and Gröning, 2012). Also, the works of Milton and Siddidque (2014), indicate an impact of the trade agreement on productivity in the FTA between Australia and Thailand. Similarly, Jean et al. (2012) documents small aggregate economic gainsbased on the effect of a trade agreement between the EU and Chile. Also, Peridy and Roux (2012) indicate the effect of the trade agreement on GDP growth in Morocco.

Bergstrand et al. (2011) contended that trade agreements were fundamental to the removal or reduction of the tariff, which thereby made domestic productivity increase. Prior to this, Cheong and Cho (2009) analysed the trade agreements between Korea and Chile in specific sectors and found them to be mutually beneficial. The role of trade agreement also cuts across other fundamentals such as fiscal impacts (Tovais and al-Khouris, 2004), distributional and employment effects (Salamanca et al., 2009), and labour and environmental standards (Soto Montes de Oca, 2008). However, on the basis of this chapter, the research is confined to only looking at the role of trade agreements on improving production of supporting industries.

Impacts of third countries size:

The classical philosophers' thinking about the size of nations has a normative nature. Historians have instead studied the evolution of the states often emphasising the role of wars in the creation of new states. As Tilly (1990) emphasised, military conflicts and military technology were crucial for the pattern of state formation. Economists, at least until very recently, have not worried about explaining national borders. One isolated attempt for the case of Medieval Europe was Friedman (1977).

One way of thinking about the size of a state is the trade-off between the benefits of size versus the costs of heterogeneity of preferences, culture, attitudes of the population. This key trade-off helps both in defining the “optimal” size and the equilibrium size, that is, it is useful from both a normative and a positive perspective.

What are the benefits of having a large size? First, the per capita costs of many public goods are lower in larger countries, where more taxpayers can pay for them. Think, for instance, of defence, a monetary and financial system, a judicial system, infrastructures for communication, police and crime prevention, public health, embassies, and national parks just to name a few. In many cases, parts of the costs of public goods are independent of the number of users/taxpayers or grow less than proportionally, thus the per capita costs of many public goods are declining with the number of taxpayers. Alesina and Wacziarg (1998) document that the share of governments spending over GDP is decreasing with GDP; that is, smaller countries have larger governments, even after controlling for several other determinants of government size.

Second, a larger country (regarding population and national product) is less subject to foreign aggression. Thus, safety is a public good that increases with country size. Also, related to the “size of government” argument here, smaller countries may have to spend proportionally more for defence than larger countries given the economies of scale in defence spending. Empirically the relationship between country size and share of spending of defence is affected by the fact that small countries can enter into military alliances, but in general, size brings about more safety. Also, if a small country enters a military coalition with a larger one, the latter may provide defence, but it may extract some form of compensation, direct or indirect, from the smaller partner.

The estimates for third market size, using the RE and the FE methods, are shown in the third country size column Table 6-3. The estimated coefficient for U.S. and China market size appears to be positive and significant in both columns. Hence, given the BTA signed with China in 2007 and that of United States in 2012, the size of these countries positively affects the production value of supporting industries. Interestingly, given the GSTP (WTO) agreement with Nigeria in 2009, the size of the EU and UK market has a non-statistical significant effect on the production value of Nigerian supporting industries. Indeed, one of the main reasons for this surprising finding is the subprime crisis and its persistence that it strongly hurts the GDP of these regions. Hypothesis 4 can be validated.

Grossman and Helpman (1991), Lucas (1988) and Romer (1986) provide models of growth in which various mechanisms imply that a larger size of production increases productivity. Market size is also the key for models of "take-off" of industrialisation, as in Shleifer and Vishny (1987). In that model, a certain size of the market (defined by the size of demand) is necessary for entrepreneurs and investors to step in, overcome fixed costs and spur development.

The relationship between country size and market size depends on the trade regime. In a world of complete autarchy, political size and market size of a country coincide. It follows that if a country is small, it has a small market. In an economically integrated world, the market size of a country is larger, perhaps much larger, than its political size. In the extreme case, in which borders are irrelevant for economic interactions, the market size of each country is the world. If there are economies of scale to the size of the market, larger countries can be expected to do better economically than smaller countries (all other things being equal) insofar as economic integration and international openness are low, but political size should become less relevant as economic integration increases.

According to the works of Baltagi et al. (2007), third country effects are significant, lending support to the existence of various modes of complex FDI. They also found out that the bilateral and third-country effects of changes in skilled and unskilled labour endowments tend to be substituted for vertical and complex vertical FDI. The works of Uttama (2010), further buttress on the impact of third-country size by looking at ASEAN countries; and he found an impact of bilateral and third-country effect on FDI and domestic productivity.

6.7 Conclusion

The second half of the twentieth century is characterised by a rapid growth of foreign direct investment (FDI) by multinational enterprises (MNEs). This investment brings an important source to finance the economic growth of the host country as well as new technologies to update local industries. Therefore, host countries seek not just more of such an investment, but also take advantage of its quality for sustainable development. Perhaps, one of the main channels is through vertical linkages, or in other words, backward linkages (UNCTAD, 2001). The latter exists whenever the located affiliates of MNEs acquire goods or services from domestic suppliers. I notice that contrary to the expectations of the host countries, the literature underlines some conditional, even opposite impacts.

The rising in the number of trade agreements over the world leads to the appearance of Export-platform FDI. While there is an abundant literature on this type of investment as a strategic behaviour of MNFs, its impacts on the host country are little studied,and hence this is the purpose of this chapter.

I have developed a three-country framework which allowed for an examination of the impacts of such investment through the competition and the demand effects. The former is generated when foreign production generates negative FDI spill-overs and then replaces domestic production whereas the latter can be directly or indirectly created. I have shown that Export-platform FDI has ambiguous effects on backward linkages, and there exists a case through which this investment improves both the output level of thedomestic firm and the level of backward linkages. I have also studied the role of different variables of the economy as the third country size, the power of trade agreements and the LCR. In the case of Nigerian supporting industries over the period 2007-2014, a negative impact of this investment has been found. However, trade agreements between Nigeria and other countries, and LCR have a positive impact while the impact of market size is ambiguous.

The estimates suggest that Export-platform FDI generates a 100% crowding-out effect. That means while making an Export-platform FDI in Nigeria, MNEs gain some market shares of domestic firms, following a lower demand in the local input. However, the production of MNEs in the country also increases demand in the local input. Whenever negative influences are fully offset by positive ones, Export-platform FDI does not have any impact on backward linkages. Also, I observed a positive correlation between production in upstream industries (i.e. supporting industries) and input intensity of technology used by foreign producers in downstream industries (i.e. export-oriented industries). In other words, the more this technology is intensive in the input, the greater potential benefits that Nigerian suppliers could obtain from Export platform FDI.

The model is in the basicgame-theory type of models analysing impacts of FDI on backward linkages (Lin & Saggi, 2005, 2007; Markusen & Venables, 1999; Rodriguez-Clare, 1996). However, it differs from others for three reasons. First, the model proposes a typology about competition effect and input demand creation effect. The former could lead to a net exit of domestic producers in the market as well as to a lower production for each of them. As for input demand creation model, it could be directly generated by theproduction of foreign producers in thehost country. One may also be indirectly affectedby thegreater total production of domestic ones. Second, the model underlines impacts of input intensity of foreign producers' technology on backward linkages. Lastly, the model deals with a three-country model, instead of a two-country model, since the latter is not taking into account the economic integrations phenomenon.

In a second time, the three-country model is tested in the case of the Nigerian supporting industries between 2007 and 2014, using the RE and FE statistical models. Unlike other empirical studies focusing on productivity, I dealt with production in upstream industries, because in agreement with Aitken and Harrison (1999), an improvement in productivity does not necessarily lead to an increase in production.

This chapter is in line with the literature concerning the relationship between FDI and backward linkages by examining the existence of the competition effect and the demand for inputs effect (Lin & Saggi, 2005, 2007; Markusen & Venables, 1999; Rodriguez-Clare, 1996). In their framework, the authors only consider the existence of the demand effect created by MNFs while in the model, the demand for inputs effect can be generated by both foreign and domestic firms. Moreover, I developed a three-country model concept instead of a two-country model. Given the increase in trade agreements across the world, the two-country standard models on FDI have become irrelevant to study the complex strategies including Export-platform FDI used by MNFs Baltagi et al. (2007) andYeaple (2003);.Consequently, Icould not use a two-country framework to examine the impacts of this investment. The framework is also different from that of (Lin & Saggi, 2005, 2007; Markusen & Venables, 1999; Rodriguez-Clare, 1996) by considering the impacts of third-country size, trade agreement, and LCR on the level of backward linkages.

This chapter opens some discussions for further investigation. First, I have worked entirely in a partial equilibrium framework. Therefore, the final good's price is endogenous. Wage, inputs' price is taken as given. Developing the three- country general equilibrium framework may be helpful to study the impacts of Export-platform FDI on wage, inputs' price as well as the welfare of the host country. Second, the chapter only considers one MNF and one domestic firm. By endogenising the entry of firms, Icould study how this investment impacted on the market structure. It was also interesting to examine whether the domestic firms couldbecome more competitive than their foreign counterparts. Also, availability of more robust data could help simplify some of the issues in this chapter.

The government of Nigeria is pursuing a set of policies with the objective of boosting local content and deepening backward linkages in the country. The review of international experience shows that such policies can be very beneficial if they have the effect of enhancing industrial capabilities and improving competitiveness. Nigeria's application of local content policies in the oil and gas sector has been criticised for being heavy-handed – but there is also evidence that it has enabled the participation of local firms in supplying services to the major oil companies in a way that may well not have happened in the absence of the policy. Buoyed by this apparent success, the government is attempting to implement a Made-in-Nigeria agenda across some other sectors.

There are some sectors where it makes much sense to deepen backward integration. There are others where it is not appropriate. Having a blanket policy that applies to all is not sensible. Backward integration policies must be nuanced by the circumstances of the sector. In particular, backward integration is appropriate where it is 'comparative advantage following' rather than 'comparative advantage denying' (Lin, 2011). In practical terms, this means that, after the various investments have been made, the level of costs should be lower than the cost of importing. If they are not, it does not make sense to do the backward integration.

In conclusion, boosting backward linkages is one element of a broader programme of structural transformation being undertaken by the government. I suggest local content policies should be done based on this three-country model. These policies will be much more effective if they are part of a coherent programme encompassing fundamental sector reform in energy, land and infrastructure, improvements to the business enabling environment and exchange rate and trade policies that encourage resources to flow to dynamic and competitive sectors of the economy.

Appendix

Appendix A. Third-country model

A.1. Equilibrium in the third market

Let AC_M^R, AC_l^R respectively be the access cost to the third market in the Economy R.

The problem of each firm is given as

$$\max_{q_l^R \geq 0} \pi_l^R = p_A^R q_l^R - AC_l^R q_l^R \tag{A1}$$

$$\max_{q_m^R \geq 0} \pi_l^R = p_A^R q_m^R - AC_m^R q_m^R \tag{A2}$$

In this model, firms compete in a Cournot fashion. In other words, each firm determines her output level by taking given that of her competitor. Hence, the best response strategies of firm m and firm l are represented as

$$q_l^R(q_m^R) = \frac{2b}{S_A - AC_l^R} - \frac{q_m^R}{2} \tag{A3}$$

$$q_m^R(q_l^R) = \frac{2b}{S_A - AC_m^R} - \frac{q_l^R}{2} \tag{A4}$$

Solving Equations (A3) and (A4) yields the market equilibrium in the Economy R

$$q_l^R = \frac{S_A - 2AC_l^R + AC_m^R}{3b} \tag{A5}$$

$$q_m^R = \frac{S_A - 2AC_m^R + AC_l^R}{3b} \tag{A6}$$

$$p_A^R = \frac{S_A + AC_m^R + AC_l^R}{3} \tag{A7}$$

from where the profit of each firm is computed as

$$\pi_l^R = (\frac{S_A - 2AC_l^R + AC_m^R}{3b})^2$$

(A8)

$$\pi_m^R = (\frac{S_A - 2AC_m^R + AC_l^R}{3b})^2 \tag{A9}$$

It should be noted that Equations (A3) and (A4) have a unique interior solution ($q_l^R, q_m^R > 0$) only if the third market size (S_A) is high enough. To investigate impacts of Export-platform FDI on backward linkages, we only consider the case where interior solution exists ($q_l^R, q_m^R > 0$). The situation according to which firms are inactive (i.e., $q_l^R, q_m^R = 0$) is widely analyzed in the literature.

A.2. Strategy choice of the foreign firm

Let $\pi_m^{Exp}(Epfdi)$ be the profit of firm m when using an Export-platform FDI in the Export economy. This firm finally exports instead of using an Export-platform FDI in the Export economy if and only if $\pi_m^{Exp} > \pi_m^{Exp}(Epfdi)$. The equivalent condition is

$$\frac{S_A - 2(\omega_m + \gamma c_l + \tau_m) + (\delta\omega_m + c_l - \theta + \tau_l)}{3b} >$$

$$\frac{S_A-2(\delta\omega_m+\lambda c_l+(1-\lambda)\gamma c_l+\tau_m)+(\delta\omega_m+c_l-\theta+\tau_l)}{3b} \quad \text{(A10)}$$

or

$$\tau_l - \tau_m > (1-\delta)\omega_m - (1-\gamma)\lambda c_l \quad \text{(A11)}$$

Likewise, let π_m^{Ep}(Exp) be the profit of firm m when using an Export strategy in the Export-platform economy. An Export-platform FDI is used instead of Exporting if and only if $\pi_m^{Ep} > \pi_m^{Ep}$(Exp). This implies that the following condition must be fulfilled

$$(1-\delta)\omega_m - (1-\gamma)\lambda c_l > \tau - \tau_m \quad \text{(A12)}$$

Using Equations (A11) and (A12) yields the condition given in Proposition 1.

A.3. Role of local content requirement

Equation (9) can be rewritten as

$$\Delta BK = \frac{1}{36}[-2\lambda^2(1-\gamma)c_l + (S_A + (2-3\gamma)c_l - \delta\omega_m - \theta - \tau)\lambda + (2\theta + 2\tau_l - \tau - \tau_m) - (1-\delta)\omega_m] \quad \text{(A13)}$$

Since $(1-\gamma)c_l > 0$, the function $f(\lambda) := -2\lambda^2 - \gamma)c_l + (S_A + (2-3\gamma)c_l - \delta\omega_m - \theta - \tau)\lambda + (2\theta + 2\tau_l - \tau - \tau_m) - (1-\delta)\omega_m$ has a maximum value at

$$\lambda := \lambda^* = \frac{S_A + (2-3\gamma)c_l - (\delta\omega_m + \theta + \tau)}{4(1-\gamma)c_l},$$

However, λ^* exists if and only if $0 \leq \lambda * \leq 1$ that is equivalent to conditions (i) and

(ii) given in Proposition 4. Also, replacing λ in Condition (8) by λ∗ yields condition (iii) of Proposition 4.

A.4. Structural Variables

$$ussize_t = usa_t * \log gdpus_t$$

$$chinasize_t = wto_t * \log gdpchina_t$$

$$eusize_t = wto_t * \log gdpeu$$

Appendix B.

***Table 6-1*. Descriptive analysis for supporting industries**

VARIABLES	N	mean(B$)	STD(T)	min(B$)	max(B$)
gdp United States	1136	17,348,075	7.40	9,263,855	18,945,325
gdp China	1136	10,356,508	4.10	4,536,587	14,886,591
gdp EU&UK	1136	18,527,116	11.60	11,997,122	25,812,615
lnindus productivity	1136	7.21	0.74	2.17	18.3
lnindus investment	1136	8.78	4.21	7.4	11.53
labour qualification	1136	5.82	2.65	0.4	14.2
lnlabour Regulations	1136	1.74	4.12	0.02	10.3
indussize	1136	2.9	7.4	2.3	5.1
Number of indus id	33	33	33	33	33

Table 6-2. **Export FDI and Production of Supporting Industries**

Variable	Label	Export FDI			production of supporting industries		
		OLS	RE	FE	OLS	RE	FE
Domestic demand	DBL	0.013	0.15**	0.19**	0.13***	0.14***	0.11**
		(0.01)	(0.02)	(0.06)	(0.03)	(0.05)	(0.03)
		[0.149]	[0.15]	[0.131]	[1.353]	[1.064]	[1.532]
Foreign demand	FBL	0.05	0.12	0.05	0.05**	0.07***	0.12**
		(0.03)	(0.05)	(0.03)	(0.05)	(0.02)	(0.06)
		[0.147]	[0.152]	[0.108]	[1.888]	[1.118]	[0.057]
Industry size	indus_size	0.22***	0.19***	0.11***	0.17***	0.07***	0.13***
		(0.04)	(0.11)	(0.02)	(0.04)	(0.04)	(0.1)
		[1.429]	[1.325]	[1.255]	[1.147]	[1.04]	[1.26]
Industrial investment	indus_inves	0.13***	0.14***	0.24***	0.11***	0.14***	0.15***
		(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)
		[0.211]	[0.251]	[0.51]	[0.151]	[0.173]	[0.1]
Labor qualification	w	0.35***	0.34***	0.31***	0.32***	0.15***	0.24***
		(0.02)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)
		[1.121]	[1.318]	[3.176]	[0.09]	[0.084]	[0.126]
Constant		3.3***	5.1***	6.5***	6.4***	2.14***	4.24***
		(0.01)	(0.03)	(0.01)	(0.02)	(0.01)	(0.02)
		[1.139]	[1.289]	[2.062]	[1.257]	[1.269]	[1.899]
Observation	N	1136			1136		
R2		0.96	0.91	0.88	0.89	0.95	0.77
Number of groups	n	196			196		
Breusch et Pagan' test	LM	1034.11***			973.003***		
Fisher' test	F	732**			421***		

*, **, ***: significant at 10, 5 and 1%. ( ): Standard errors, [ ]:bootstrap standard errors.

***Table 6-3.* Impacts of trade agreements, local inputs intensity and third country size**

Variable	Label	Local inputs intensity			Trade agreements			Third countries size		
		OLS	RE	FE	OLS	RE	FE	OLS	RE	FE
Local inputs intensity	FBL2	0.03***	0.14***	0.1**	0.17*	0.003	0.005			
		(0.01)	(0.13)	(0.07)	(0.11)	(0.05)	(0.12)			
		[0.942]	[0.869]	[1.554]	[0.074]	[0.074]	[0.097]			
GSTP (WTO) Agreement	wto				0.14*	0.03*	0.11*			
					(0.12)	(0.16)	(0.16)			
					[0.171]	[0.209]	[0.406]			
BTA with United States	usa				0.18**	0.16***	0.14***			
					(0.19)	(0.11)	(0.16)			
					[0.081]	[0.069]	[0.073]			
Size of United States	ussize							0.12*	0.11*	0.09**
								(0.06)	(0.16)	(0.17)
								[1.879]	[1.157]	[0.201]
Size of China	chinasize							0.11***	0.12***	0.05***
								(0.1)	(0.02)	(0.01)
								[0.081]	[0.067]	[0.079]
Size of EU and UK	eusize							0.12**	0.030	0.190

								(0.09)	(0.12)	(0.1)
								[0.067]	[0.06]	[0.113]
Industry size	indus_size	0.14**	0.23***	0.17**	0.12***	0.27*	0.11***	0.003**	0.11**	0.01***
		(0.34)	(0.21)	(0.13)	(0.16)	(0.11)	(0.18)	(0.11)	(0.13)	(0.1)
		[0.543]	[0.588]	[1.262]	[0.405]	[0.06]	[2.704]	[4.555]	[5.027]	[0.156]
Industrial investment	indus_inves	0.17**	0.11***	0.18*	0.11**	0.12**	0.17***	0.14***	0.16***	0.12***
		(0.07)	(0.11)	(0.05)	(0.04)	(0.2)	(0.03)	(0.12)	(0.15)	(0.01)
		[0.081]	[0.07]	[0.09]	[0.082]	[0.078]	[0.092]	[1.969]	[1.676]	[0.323]
Labor qualification	w	0.12**	0.1**	0.16**	0.12*	0.140	0.150	0.12**	0.05**	0.02**
		(0.05)	(0.2)	(0.14)	(0.1)	(0.17)	(0.03)	(0.02)	(0.1)	(0.14)
		[0.311]	[0.332]	[0.69]	[0.645]	[0.659]	[0.591]	[0.025]	[0.085]	[0.22]
Constant		7.1**	3.6***	4**	8.2***	4.8*	6.2***	2.5*	6.2*	3.55*
		(0.05)	(0.01)	(0.02)	(0.13)	(0.07)	(0.01)	(0.06)	(0.15)	(0.18)
		[0.074]	[0.074]	[0.096]	[0.302]	[0.353]	[0.359]	[0.07]	[0.066]	[0.093]
Observation	N	1136			1136			1136		
R2		0.89	0.92	0.87	0.89	0.94	0.933	0.84	0.78	0.9
Number of groups	n	196			196			196		
Breusch et Pagan' test	LM	884.51*			322.34***			1275.8*		
Fisher' test	F	183***			88***			312***		

*, **, ***: significant at 10, 5 and 1%. ( ): Standard errors, [ ]:bootstrap standard errors.

CHAPTER: 7 FDI on Financial Constraints of Domestic Firms

7.1 Introduction

FDI flows to Nigeria dropped by USD 4.52 billion to USD 5.12 billion, the lowest in nine years according to the National Bureau of Statistics. Furthermore, the CIA Factbook highlights Nigeria's FDI stock reached USD 98.73 billion in 2016, a 3.03% increase from 2015. FDI stock abroad also increased to 13.71 billion USD, a 10.77% increase from 2015. Economic theory predicts that financial development improves firms' access to external finance by mitigating information asymmetry and contracting imperfections that exist between the suppliers of finance and firms in need of the finance. External funds are generally thought to be costlier than internal finance because outsiders have less control over the borrower's actions (see for example, Jensen and Meckling, 1976) or because they know less about what the borrower will do with the funds (see Stiglitz & Weiss, 1981; Myers & Majluf, 1984). La Porta, et al. (1997) are of the view that the problem of firm's access to finance is more severe in countries with weak financial development and weaker institutions that cannot properly protect investors' interests. In such situations, external finance will be more expensive than internal finance, and as a result, firms will be financially constrained. Under the case of financial constraints, a firm's investment (and ultimately growth) is more likely to be limited by the available internal resources.

Firms in developing countries typically cite financing constraints as one of their primary obstacles to investment. Some argue that countries should eliminate restrictions on international transactions and encourage incoming capital flows, especially foreign direct investment (FDI). FDI may ease these firms' financing constraints by bringing in the scarce capital. This is one reason why policymakers in developing countries have eased restrictions on inward FDI and, in many instances, provided special incentives for multinational firms. If foreign firms borrow heavily from local banks, they may exacerbate domestic firms' financing constraints by crowding them out of domestic capital markets. Foreign investors may borrow on domestic capital markets for a variety of reasons, including as a hedging device against exchange rate fluctuations or in response to artificially low domestic interest rates. Most observers assume that joint venture activity and acquisitions by multinationals are accompanied by significant capital inflows (Feldstein 2000; Hellenier 1988; Stiglitz 1998). Although I cannot measure the amount of local borrowing by multinationals, I can examine the impact of incoming FDI on firm investment behaviour.

The literature dealing with the issue of whether financial development reduces financial constraints is related to broad macro and micro literature that tries to relate financial development with economic growth. At the macro-level, the issue of whether financial development helps economic growth is largely a contested one. Early economists such as Schumpeter (1912) claimed that finance was helpful for growth whereas Robinson (1952) claimedreverse causality. King and Levine (1993) are of the view that finance is still important for economic growth.

At the micro level, Modigliani & Miller (1958) showed that in the world of perfect capital markets, finance is irrelevant for investment decisions. Firms can easily substitute external finance for internal finance. However, the assumption of a perfect capital market is rather a utopian idea than a practical reality. Frictions due to information asymmetry and agency costs create a divergence between the costs of external and internal funds, thereby constraining firms in their ability to fund investment projects. As a result, many later studies showed finance was relevant for firm investment and thereby aggregated economic growth (see Hubbard, 1998 for a survey).

Overall, even if the finance-growth nexus is a highly-debated topic, the dominant view is that finance is important for economic growth (see Levine, 2005 for a detailed discussion). Now the question is how finance assists growth. One of the channels through which finance helps growth is by reducing firm level financing constraints. Specifically, financial development mitigates information asymmetry and contracting imperfections, which create a wedge between the cost of internal and external finance. Under the situation of relaxed credit constraints, firms can invest optimally and bring the needed economic growth.

Financing constraint severely affects developing countries, particularly African countries and this problem can inhibit firm growth and exacerbate poverty. Using enterprise-level datasets from the World Bank's Enterprise Survey, Fowowe (2017) investigated the effects of financing constraints on the growth of firms in Africa using both objective and subjective measures of access to finance. Preliminary analysis showed that small banking systems characterised African financial systems. Banks in Africa are poor in channelling deposits to the most efficient uses, signalling low intermediation efficiency. This constraint leads to situations where banks prefer to invest in government securities rather than lend to the private sector. Also, African banks have low outreach, with banks enjoying high-interest rate spreads and targeting short-term finance, to the detriment of long-term finance for investments.

The extant research provides evidence consistent with the theoretical prediction. Rajan and Zingales (1998) empirically found that an increase in financial development would induce a more significant impact on industrial growth if the industry heavily depended on external finance than if the industry was not naturally a heavy user of external finance. In this way, financial development reduced the financing constraints of firms that were dependent on external finance. Demirguc-Kunt and Maksimovic (1998) found that firm growth financed by external finance (i.e. long-term external debt and equity) was positively associated with the level of a country's financial development. Love (2003) found that financial development affectedfirm investments through its impact on firms' cost of capital. Her results also supported the view that financing constraints decreased with financial market development. Wurgler (2000) also showed that financial development improved the capital allocation process and found that countries with higher levels of financial development increased investment more in growing industries and decreased investment more in declining industries than financially underdeveloped economies.

Despite the above points, Tseng (2012) further suggested that financial development might have some adverse effects. He claimed that much of financial development was due to financial liberalisation and the latter was reported to have caused excess volatility and instability in the capital markets (Bae, et al., 2004; Stiglitz, 2004). Such instability might make raising external finance difficult for firms.

From the preceding, it is clear that the notion that financial development eases the financing constraints of firms is an unsettled empirical issue. It is against this background this chapter investigates the issue using firm-level data of selected African countries. Most studies in this area focus on developed countries (Baum, et al. 2011; Becker & Sivandasany, 2010; Islam & Mozumdar, 2007; Khurana, et al., 2006; Love, 2003; Semenov, 2006). Since financial development and the financial constraints faced by firms differ across countries and regions, an empirical study of African countries might be insightful. Financial development in Africa is too low (see Allen, et al., 2011; Misati & Nyamongo, 2011; Yartey & Adjasi, 2007) and hence the extent of firm financial constraints is perceived to be high.

Now that FDI has promoted economic growth at the macro level, has it also improved domestic firms' financing at the micro level? Huang himself provides an affirmative answer based on a firm survey. By using data at the provincial level, Guariglia and Poncet (2008) found that financial distortions 'could be no impediment' to Asia's economic growth because

FDI had provided an alternative source of finance. Similarly, utilising firm-level data, Hericourt´and Poncet (2009) also showed that FDI had reduced the credit constraints of private firms in central Asia, a result consistent with Huang's finding. The viewpoints of this literature, supporting that FDI improves domestic private firms' financing through inputting funds to local partners, echo the conclusion of a cross-country study of Harrison, et al., (2004) which proved that FDI has lessened local enterprises' financial constraints by bringing them capital (Harrison and McMillan, 2003).

The literature above discussing FDI and financial development from financial perspectives is insightful, particularly as policies toward foreign investment in Africa have been under major revisions in recent years. Moving beyond the relevant literature, this chapter explores whether and how FDI has loosened domestic firms' financing difficulties. Based on the field investigation, the argument that 'FDI directly injects capital into Nigeria's private firms' is untenable. First of all, in Nigeria, it is more often the case that foreign investors receive financing from financial institutions than that they provide domestic firms with capital. Second, if FDI has provided funds to local firms, the capital receivers should be joint-venture partners or upstream/downstream partners of foreign companies, excluding the competitors in the same industry. Finally, the point that FDI finances local firms through joint ventures is not well grounded. For a long period, because of the biased government policy in Nigeria, FDI usually chose state-owned firms as their joint-venture partners.

According to these discussions, the argument that whether and how FDI affects local firms' financing environment is a topic worthy of further exploration. Focusing on this issue, this chapter contributes to existing literature in three respects. First, I propose a hypothesis that FDI could alleviate the financing constraints of domestic firms by reducing the information asymmetry in the credit market. This hypothesis stems from the observation that it is often easier for FDI-related firms to obtain external financial support. In the credit market, FDI is a useful signal in evaluating firms, (Harrison et al., 2004). For financial institutions, an FDI-related firm may be more qualified and has a lower risk of default. Second, I formalise this hypothesis within an improved Euler framework and carry out empirical studies with firm-level data in Nigeria. Indicators representing FDI participation from different perspectives are constructed and then multiplied by the proxy variable of financial constraints. The resulting interactive terms are introduced to the investment equation. I expect them to be negative, which means that a firm which has FDI or having upstream/downstream relationship with FDI, or staying in an industry with many FDIs, is more likely to access external financial resources easily. Third, the investigation of the impact of FDI on the financing constraints of domestic firms, in fact, links two strands of literature together. One is on FDI's linkage effects, and the other is on FDI's role in the financial markets of host countries. The remainder of this chapter is organised as follows. Section 7.2 speaks about the function of a financial system, uses the Euler equation to formalise the hypothesis. Section 7.3 defines and detects credit constraints; section7.4 discusses the theoretical framework of this chapter. Section 7.5 introduces the data as well as the indicators measuring the presence of horizontal and vertical FDIs. Sections 7.6 and 7.7 carry out empirical analysis and robustness check, respectively. Conclusions and policy implications are given in Section 7.8.

7.2. The Functions of a Financial System

The extensive review by Levine (2005) shows that a financial system provides the following key functions, which helps for economic growth. They produce information ex-ante about possible investments and allocate capital; monitor investments and exert corporate governance after providing finance; facilitate the trading, diversification, and management of risk; mobilising and pool savings and easing the exchange of goods and services. The first two functions are very important for firms' access to finance, and I discuss them at some length (Levine, 2005)

Without intermediaries, each investor would face the large fixed cost associated with evaluating firms, managers, and economic conditions (Boyd and Prescott, 1986). By improving information on firms, managers, and economic conditions, financial intermediaries can accelerate economic growth. Assuming that many entrepreneurs solicit capital and that capital is scarce, financial intermediaries that produce better information on firms will thereby attract funds for more promising firms and induce a more efficient allocation of capital (Greenwood and Jovanovic, 1990). Allen (1990) also develops models where financial intermediaries arise to produce information on firms and sell this information to savers.

Without effective governance, providers of capital may hesitate to extend finance to firms. For instance, stock markets enable better governance (align the interest of owners and managers) by linking managerial compensation to stock prices (Jensen and Murphy, 1990). Further, the threat of takeover aligns managerial interest with owners in well-developed stock markets (Stein, 1988).

Debt contracts also may lower the cost of monitoring firm insiders and thereby improve corporate governance. Using Jensen's "free cash flow argument", Aghion, Dewatripont and Rey (1999) show that debt instruments reduce the amount of free cash available to firms. This, in turn, reduces managerial slack and accelerates the rate at which managers adopt new technologies.

Financial intermediaries such as banks also improve governance. Diamond (1984) develops a theoretical model in this regard. The intermediary mobilises the savings of many individuals and lends these resources to firms. This "delegated monitor" economises on aggregate monitoring costs and eliminates the free-rider problem since the intermediary does the monitoring for all the investors.

The two basic functions of financial systems in solving information asymmetry and corporate governance are very critical to firms' access to finance. Empirical evidence in this regard, i.e. the role of financial development in relaxing credit constraints is found by Baum et al. (2011), Becker and Sivandasany (2010), Islam and Mozumdar (2007), Khurana et al. (2006), Love (2003), Rajan and Zingales (1998), Semenov (2006) and Tseng (2012).

Furthermore, financial development has other benefits. It facilitates the allocation of credit to profitable firms and those firms with good investment opportunities (Bertrand, Schoar and Thesmar, 2007). It also helps the firms to grow faster (Demirguc-Kunt and Maksimovic, 1998).

In summary, it is reasonable to expect that firms in countries with more developed financial systems to be less financially constrained than firms in countries with less developed financial systems. With more access to external finance, firms will invest optimally. This leads to firms' growth, which in turn is translated into aggregate economic growth.

7.3. Defining and Detecting Credit Constraints

There are two ways of analysing the distribution of credit constraints among enterprises. The exogenous way stipulates taking two distinct groups of enterprises whose members are a priori likely to face different levels of credit constraints – e.g. small and large enterprises or domestic and foreign-owned firms – and then measure differences in their activity related to financial markets. This strand of literature is represented by Bond and Meghir (1994), Terra (2003), or Harrison and McMillan (2003). On the other hand, as Ogawa and Suzuki (2000), Russo and Rossi (2001), or Rizov (2004) did, it is possible to make an endogenous separation of constrained and unconstrained enterprises. In the endogenous approach, the status of being financially constrained is determined by a few financial indicators (financing behaviour). The cited author defined credit constraint as a situation when a firm demands more loans than markets are willing to supply. He identified the credit-constrained firms as those who, on the one hand, have a high growth of sales and low cash flow (indirect signs of high demand for external financing) and, on the other hand, receive no bank loans or do receive some loans but also issue new shares. In general, a firm is credit constrained if it cannot borrow as much as it wants under the current interest rates.

According to the work by Rizov (2004), it turned out that the tangible fixed assets, age of firm, working capital, and more advanced corporate governance (e.g. especially the status of public limited companies but also, though to lesser extent and with more uncertainty, private limited companies) reduce the probability of being credit-constrained. That is because of size, age, and the mentioned legal regimes, information asymmetry between the borrower and the lender is reduced. Lower collateral (higher debt-to-equity ratio) and higher labour intensity (employees-to-assets ratio) contribute to the higher probability of experiencing credit constraints. In the case of imperfect capital markets, with uncertainty about the future, less collateral means higher default risk. According to Rizov (2004), labour intensity is the proxy of the technological obsolescence and thus low expected profitability. The impact of ownership appeared unclear.

Harrison and McMillan (2003) utilised the enhanced Euler model of intertemporal allocation of investment to detect credit constraints. The model explains the optimal future investment (relative to the capital stock) of an enterprise determined by the expectations based on the information available currently. In other words, all decisions concerning the future investment are taken at a point where information from the previous period is known. Harrison and McMillan (2003) used the following independent variables: investment-to capital ratio and the same ratio squared, real-cash-flow-to-capital ratio, individual cost of capital, and net-output-to-capital ratio. Their testing if foreign borrowing amplified credit constraints for the domestic enterprises was based on the idea that, with perfect capital markets, future investment should be determined only by a firm's expected profitability and not the structure of liabilities, and thus, not by the relative size of collateral (Modigliani and Miller 1958).

Harrison and McMillan (2003) showed that the future investment is expected to be positively influenced by the current credit constraints because "firms that are financially distressed today are forced to substitute investment tomorrow for investment today" (Harrison and McMillan 2003). They introduced two credit-constraint variables: current debt-to-assets and current interest-coverage ratios.

7.4. Theoretical framework

Most literature about credit constraints is built upon the Euler equation (Bond and Meghir 1994; Love 2003;Whited 1992). Referring to Hericourt and Poncet (2009), I briefly introduce the theoretical model on this topic and formalise the hypothesis in a modified framework. Among related research in this field, the frequently cited paper written by Harrison and McMillan (2003) states that a firm subject to credit constraints if maximising the present discounted value of net cash flows would optimise its investment based on the following equation:

$$(1-\delta)\beta_{t+1}^{t}E_t\left[1-\Omega_{i,t})\cdot\left(\frac{\partial R}{\partial I}\right)_{i,t+1}\right]=\left(\frac{\partial R}{\partial I}\right)_{i,t}+\left(\frac{\partial R}{\partial K}\right)_{i,t} \qquad (1)$$

In equation (1), $I\ and\ K$ are investment and capital stock, respectively; R is the net revenue; $\delta\ and\ \beta$ are depreciation rate and discount factor, respectively; Ω represents the financing constraints and E denotes the expectation operator. This equation means, that in equilibrium, the marginal costs of investment in periods t and $t\ +\ 1$ are equal. Bond and Meghir (1994) obtain the two partial derivatives on the right side of this equation by introducing an explicit adjustment cost function. On the basis of that, Hericourt′ and Poncet (2009) further simplify the equation as follows:

$$\left(\frac{\partial R}{\partial I}\right)_t=-\alpha_1 p_t\left(\frac{I}{K}\right)_t+\alpha_2 p_t-p_t^I \qquad (2)$$

$$\left(\frac{\partial R}{\partial K}\right)_t=\alpha_1 p_t\left(\frac{I}{K}\right)^2_t-\alpha_2 p_t\left(\frac{I}{K}\right)_t+\alpha_3 p_t\left(\frac{Y}{K}\right)_t-\alpha_3 p_t\left(\frac{\partial F}{\partial L}\cdot\frac{L}{K}\right)_t \qquad (3)$$

In equations (2) and (3), p is the price of output and pI is the price of investment good; L is labor input; Y is the net output, equal to output $F(K,L)$ net of adjustment cost $G(I,K)$. If a firm does not have credit constraints ($\Omega = 0$), substituting equations (2) and (3) into equation (1) and making some transformation, I get the following estimating equation:

$$\left(\frac{I}{K}\right)_{i,cs,t+1} = \beta_1 \left(\frac{I}{K}\right)_{i,cs,t} - \beta_2 \left(\frac{I}{K}\right)^2_{i,cs,t} + \beta_3 \left(\frac{Y}{K}\right)_{i,cs,t} - \beta_4 \left(\frac{CF}{K}\right)_{i,cs,t} + \eta_{cs} + \lambda_t + \varepsilon_{i,cs,t+1} \quad (4)$$

In equation (4) I add two subscripts c and s to represent city and industry, respectively. CF is the output value $pF(K, L)$ net of adjustment costs $pG(I, K)$ and labor costs wL, represented by cash flows in the empirical section. η and λ denote the city–industry fixed effects (FEs) and the time effects, respectively. ε is the error term. From equation (4), expected future investment is considered to be positively correlated with current investment but negatively with its square, and is positively related to the net output (Bond and Meghir, 1994). With regard to the negative correlation of current cash flow, Harrison and McMillan 2003) give an explanation, 'A high level of current cash flow implies lower net marginal adjustment costs today. Because in equilibrium, marginal adjustment costs are equated across periods in expectation, this implies lower expected marginal adjustment costs and hence lower expected investment tomorrow'.

If financing constraints exist,($\Omega \neq 0$), the estimating equation needs to be reset. In the literature, the debt-asset ratio (denoted by Fin) is often used to proxy firms' credit constraints (Harrison & McMillan 2003; Hericourt′ & Poncet 2009;Whited 1992). Including this variable, we get a standard equation for empirical study on financing constraints,

$$\left(\frac{I}{K}\right)_{i,cs,t+1} = \beta_1 \left(\frac{I}{K}\right)_{i,cs,t} - \beta_2 \left(\frac{I}{K}\right)^2_{i,cs,t} + \beta_3 \left(\frac{Y}{K}\right)_{i,cs,t} - \beta_4 \left(\frac{CF}{K}\right)_{i,cs,t} + \beta_5 Fin_{i,cs,t} + \eta_{cs} + \lambda_t + \varepsilon_{i,cs,t+1} \quad (5)$$

The significantly positive coefficient of Fin, i.e. the positive nexus between debt-asset ratio and future investment, indicates that a firm does have credit constraints. A firm with heavy debt burden has low repayment capacity; as a result, its further financing capability is restrained. Under this situation, it tends to defer investment. Equation (5) is the starting point of the empirical modelling. With some necessary modification, the following hypothesis can be tested.

In the credit market, FDI is like a 'visible hand', which reduces the information asymmetry between banks and clients, guides loans to its associated firms and alleviates their financing constraints. In the view of banks, firms with foreign capital participation usually have lower risk of default; industries with considerable FDI presence are often where Nigeria's comparative advantage is, and thus their firms' market prospects should be more stable; and firms having upstream or downstream relations with foreign-invested companies should have better credibility and stronger capacity. Loans to these clients are expected to improve the allocative efficiency of financial resources.

To test this hypothesis, I need to add variables of FID presence into equation (5). I then get

$$\left(\frac{I}{K}\right)_{i,cs,t+1} = \beta_1\left(\frac{I}{K}\right)_{i,cs,t} - \beta_2\left(\frac{I}{K}\right)^2_{i,cs,t} + \beta_3\left(\frac{Y}{K}\right)_{i,cs,t} - \beta_4\left(\frac{CF}{K}\right)_{i,cs,t} + \beta_5 Fin_{i,cs,t} + \beta_6 Fid_{i,cs,t} + \beta_7 HFID_{i,cs,t} + \beta_8 BFID_{i,cs,t} + \beta_9 FFID_{i,cs,t} + \beta_{10} Fin_{i,cs,t} . Fidpresence + \eta_{cs} + \lambda_t + \varepsilon_{i,cs,t+1} \qquad (6)$$

In equation (6), Fid, a firm's foreign capital share, is used to control the so-called 'own-plant effect' (Aitken and Harrison 1999). $HFID$, the extent to which FDI participates in an industry, is used to capture the 'horizontal effect' of foreign investment. $BFID$ and $FFID$ measure FDI's connection with its upstream and downstream partners. They are used to examine the 'vertical effect' of foreign investment. Directly related to the hypothesis are the interactive terms between debt-asset ratio and FDI presence ($Fidpresence$, i.e. $Fid_{i,cs,t}$, $HFID_{i,cs,t}$, $BFID_{i,cs,t}$ and $FFID_{i,cs,t}$). These terms help to capture how FDI affects firms' financial constraints. If the hypothesis holds, the empirical results based on equation (6) will show the sign of debt-asset ratio is positive, while the sign of the interactive terms is negative. If the expectation is confirmed, it means that firms do have financial constraints and FDI has alleviated this situation. In particular, through channels of 'within-firm', 'intra-industry' and 'inter-industry', FDI has positive effects on domestic financing environment. Different from Hericourt´ and Poncet (2009) who only introduce an interactive term between the 'horizontal effect' and debt-asset ratio, I further include 'own-plant effect', 'vertical effect' and their interactive terms with the debt-asset ratio in the estimating equation.

7.5 Data Description and Methodology

The data in this chapter are from a survey about Nigeria's investment environment conducted by the World Bank between 2007 and 2014. The sample involves both manufacturing and service firms. Given data availability and FDI's sector distribution in Nigeria, I selected 400 manufacturing firms and constituted a panel. The selection is based on the upstream and downstream production rationalityand also based on complete data available. These firms were located in 5 regions as described in the survey questionnaire documents. They belonged to eight combined industries, food & beverage & garments, wood & furniture, machinery & equipment, garment, paper, publishing, printing & media, non-metallic minerals and basic& fabricated metals. The data information includes firms' finance, ownership, industry and location.

A key feature of the dataset used in this study is that it provides a set of subjective measures of access to finance which reflect firms' perception of the business environment, as well as objective measures of the business environment (such as whether firms have an overdraft facility), which help overcome the potential shortcomings of subjective measures. The subjective measures suggest that financial constraint exerts a significant negative effect on firm growth. Also, Fowowe (2017) finds significant positive relationships between the objective measures of finance and firm growth; specifically, the objective measures show that firms that are not credit constrained experience faster growth than those that are credit constrained, thus prompting the author to conclude that participation in financial markets promotes firm growth.

The constraints have led to several outcomes. First, African firms have limited access to external finance; only about 23% of African firms use loans, while about 46% of non-African firms have loans or lines of credit. The author attributes this state of affair to high-interest rates, complex application procedures, and high collateral requirements, among others. Second, African firms rely extensively on banks for external finance, with the sample firms obtaining over 75% of external finance from banks. Third, African firms face high account fees, high minimum balance, and restrictive documentation requirements. All these factors inhibit firms' ability to obtain credit. A policy implication emanating from the results is that firms that wish to grow must overcome credit constraints and obtain more external finance. Also, the development of credit rating agencies and better risk assessment departments in banks to ensure effective risk assessment of borrowers can reduce loan default rate and, consequently, bank margins.

Beforeconducting empirical research, I need to calculate three indicators measuring FDI participation. For the horizontal presence of FDI in industry s, I follow the definition of Javorcik (2004), which is given as follows:

$$HFDI_{cs,t} = [\sum_i Fdi_{i,cs,t} * Y_{i,cs,t}] / \sum_i Y_{i,cs,t} \tag{7}$$

In equation (7), Fdi is the foreign capital share of the ith firm in industry s and city c; Y is its output level, and here I use sales value instead. FDI has a bigger presence in an industry where more firms have foreign capital.

Regarding the vertical linkage of FDI, I adopt the method of Blalock (2001) and Schoors and van de Tol (2001). Specifically, the backward linkage with the upstream partners (such as suppliers of raw materials and intermediate goods) is calculated as follows:

$$BFDI_{cs,t} = \sum_{k \neq s} \alpha_{sk} * HFDI_{cs,t} \tag{8}$$

In equation (8), HFDI is FDI's horizontal presence, s is the upstream industry, k is the downstream industry (k, s = 1, . . . , 7, k _= s) and α_{sk} is the row vector of the input–output coefficient matrix, measuring the ratio of inputs from the up-stream industry s to the output value of the downstream industry k. The calculated BFDI measures FDI's backward linkage with upstream partners. For an industry, the higher the horizontal presence of FDI and the more the inputs coming from the upstream industry, the more evident the backward linkage of foreign investment.

The forward linkage with downstream firms (such as sellers of final products, users of intermediate goods) is calculated as follows:

$$FFDI_{cs,t} = \sum_{m \neq s} \delta_{ms} [\![\sum_i Fdi_{i,cm,t} * (Y_{i,cm,t} - X_{i,cm,t})] / [\sum_i (Y_{i,cm,t} - X_{i,cm,t})]\!] \tag{9}$$

In equation (9), Fdi and Y have the same meanings as before; since only domestic sales of a firm matter in forward linkage, I deduct export X from the total sales; m and s, respectively, are the upstream and downstream industries (m, s = 1, . . . , 7, m _= s); δms is the column vector of the input–output coefficient matrix, measuring the ratio of inputs from the upstream industry m to the output value of the downstream industry s. The calculated $FFDI$ measures FDI's forward linkage with downstream partners. For one industry, the higher the horizontal presence of FDI and the more inputs provided to the downstream industry, the more is the forward linkage of foreign investment.

The constructed input-output table, including 49 industries and sub-sectors, will be used to calculate the vertical linkage of FDI. I take data for eight industries involved in my sample. The input-output table is not published annually, so I use the constructed table as the source of input-output coefficients on account of the sample time 2007–2014. Also, because the city-level input-output information is not available, actually whatI rely on is the national-level input-output table. The variables in the empirical section include the ratio of current and next period investment to fixed assets, the ratio of sales to fixed assets, the ratio of total profits to fixed assets, debt-asset ratio, the foreign capital share of firms, as well as the FDI's horizontal presence and vertical linkage.

7.6 Estimation Results

One of the most direct ways by which FDI can contribute to economic development is by increasing the amount of capital available in the local economy. In developing countries, in which capital is typically scarce relative to labour, policymakers frequently view potential capital injection to be the key benefit of FDI because it directly increases investment and gross domestic product (GDP) in the host economy (Alfaro et al. 2007, 2008, 2014;Lucas, 1990). FDI thus allows countries to supplement capital provided via local savings with capital coming from abroad. However, as the following discussion will show, the extent to which foreign firm activity indeed generates a net increase in capital depends on local financial conditions (di Giovanni, 2005; Klein et al. 2002).

Host country financial conditions may have an ambiguous effect on total FDI because they affect both whether a foreign investment takes place and whether it is financed through FDI. On the one hand, good financial conditions attract investment to a host market in part because they allow foreign investors to finance for an important share of their investment locally (Graham & Krugman 1995; Kindleberger, 1969; Lipsey, 2004). Local financing may be preferable to cross-border financing because it allows investors to hedge the exchange rate risk associated with sales or cost denominated in the local market currency. On the other hand, precisely because investors are likely to substitute FDI with local funds, in countries with good financial markets the total value of capital that foreign firms bring from aboard may be low. In the data on affiliates of U.S. multinationals, Lehmann et al. (2004) find total host country financing (provided primarily in the form of debt) indeed accounts for a larger share of financing than what is provided by U.S. parents.

Beyond lowering the extent of capital inflows, foreign firms borrowing heavily from local banks may exacerbate domestic firms' financing constraints by crowding them out of domestic capital markets. Harrison & McMillan (2003) analyse the behaviour of mostly French multinationals operating in Côte d'Ivoire, finding not only that domestic firms are more credit-constrained than foreign firms, but that borrowing by foreign firms exacerbates the credit constraints of domestic firms. In a country such as Côte d'Ivoire, with numerous market imperfections and with credit access rationed due to interest-rate ceilings, the total pool of capital available for local firms did not increase; rather banks substituted lending to domestic with lending to foreign firms. Harrison, et al. (2004), on the other hand, show results suggesting that FDI tends to crowd in finance for domestic enterprises across a panel of countries. That is, as foreign investment increases, the amount of credit available to domestically owned firms rises. These two studies highlight that the effect of FDI on local credit constraints is heterogeneous across countries, with important complementarities between FDI and pre-existing local financial conditions.

Foreign firms are less likely to tap into local capital markets in countries where financial conditions are poor, and therefore such countries may attract more FDI. Lehmann et al. (2004) indeed find that in developing countries, the financing share from U.S. parents is 45% (as opposed to 30% in industrial countries), much of it provided in the form of equity. Desai et al. (2004) find that firms substitute for missing or inefficient local debt markets also through their internal capital markets, in the form of inter-company loans. They show foreign affiliates of U.S. firms in countries with weak capital markets to offset approximately three-quarters of reductions in external borrowing with internal funds from parent companies. Local affiliates are more likely to opportunistically tap into parent firms' internal resources through inter-company loans when local credit conditions deteriorate or in times of crisis. While this suggests that internal capital markets can alleviate external financing constraints, limits to multinational firms' total resources and intra-firm competition for such resources may still restrict the growth of local affiliates in underdeveloped financial markets and render the size of projects suboptimal, as argued by Feinberg & Phillips (2004).

In this section, the work is divided into two parts. First, I estimate equation (6) with the full sample to get the benchmark results. Second, I exclude foreign-invested firms and estimate the equation with domestic firms only. Because ‘foreign-invested firms’ can be defined differently, I have two types of domestic firms, Domestic Firms (I) and (II). Given that the firms’ ownership types act as a crucial determinant in accessing financing resources, I also analyse state-owned firms and private firms separately.

The ownership structure is based on the questionnaire manual; and the works of H’ericourt and Poncet (2009), defined domestic firms has those firms with foreign capital less that 49%. The ownership structure is also based on the capital accumulation per firm.

7.6.1 All firms included

Manova (2006) has provided empirical support for this approach by showing that countries with better developed financial systems tend to export relatively more in highly external capital dependent industries and sectors with fewer collateralizable assets. A theoretical model and a calibration exercise undertaken by Alfaro et al. (2006) has suggested that well developed local financial markets are neededfor host countries to benefit from spillovers from foreign direct investment (FDI). It is because access to financing allows local entrepreneurs to start supplying MNCs and in this way benefit from knowledge spillovers from FDI. Moreover, indeed, in a cross-country growth regression, Alfaro et al. (2004, 2017) have found that FDI inflows contributed to a faster economic growth only in the presence of well-developed financial markets.

Ever since the influential paper by Fazzari, Hubbard and Petersen (1988),a large number of studies have examined the effects of liquidity constraints on investment. These papers challenged the neoclassical theory of investment, which suggested that the decision to invest was driven solely by the relative prices, and a firm’s financial structure was irrelevant to investment since external funds provided a perfect substitute for internal capital. Alternatively, as stated by Modigliani and Miller (1958), with perfect capital markets, a firm’s investment decision is independent of its financial condition. The alternative research agenda proposed by Fazzari et al. (1988) was based on the burgeoning informational asymmetries literature: in an environment with informational asymmetries, external funds may be costlier and thus provide an imperfect substitute for internal capital. The difference arises to compensate lenders for the adverse selection and moral hazard problems associated with borrowers. If this is the case, then the investment should respond positively to increases in internal funds available for investment.

The principal way of testing this hypothesis is to estimate the investment equation including a measure of the expected profitability of the firm along with a measure of its net worth. To the extent that the measure of net worth (usually cash flow) predicts investment behaviour, researchers have concluded that financing constraints are present.

The nature and the interpretation of the link between investment and cash flow are subject to an on-going debate. One stream of the literature, starting with Fazzari et al. (1988) and followed by Hoshi et al. (1991), Lizal and Svejnar (2002) and others, argues that investment cash flow sensitivities can be interpreted as evidence of financial constraints. However, Kaplan and Zingales (1997, 2000) questions the approach of Fazzari et al. (1988) and provide evidence suggesting that investment-cash flow sensitivity need not be a measure of liquidity constraints due to non-monotonicities. Fazzari et al. (2000) challenge their conclusions and derive the conditions under which the relationship between investment and cash flow is monotonic. Fazzari et al. (2000) basically argue that if the a priori classification of firms is based on criteria that result in large differences in the marginal cost of external funds across groups, constrained firms with large cost of external financing will have larger investments cash flow sensitivity than the relatively unconstrained firms that have very small cost of external funds. Although the debate on the interpretation of the investment cash flow sensitivity is still unresolved, I follow the Fazzari et al. (1988) argument in this chapter.

The estimation results of all firms are shown in Table 7.1 in the appendix below. In column (1), after the three dummy variables, city–industry, firm ownership and year, are controlled, current investment $(I/K)_t$ and its square are significantly positive and negative. The sales-asset ratio Y is significantly positive. These results are consistent with the findings in previous studies. Furthermore, I can see that the ratio of cash flow to assets CF is negative but not significant, while the debt-asset ratio Fin is significantly positive. According to Harrison and McMillan (2003), more current cash flow means lower adjustment cost of current investment. In the equilibrium of equated marginal adjustment cost between periods, it suggests a lower adjustment cost and investment in the next period (Bond & Meghir, 1994; and Harrison & McMillan, 2003;Whited, 1992). A firm with a heavy debt burden is likely to have huge constraints in financing externally; as a result, it usually has to postpone investment. This shows that firms' investment behaviour has been affected by their financial situation, rather than 'only been determined by the expected profitability' as Tobin's Q theory claims.

Columns (2) and (3) further introduce the firm's foreign capital share FDI, the horizontal presence of foreign investment HFDI, backward linkage BFDI and forward linkage FFDI. These variables are not significant, but the debt-asset ratio remains significantly positive, once again showing that firms' investment is sensitive to their financial situation. As pointed out earlier, by delivering the information of firms' "qualification" to financial institutions, FDI directs funds to firms which have a relationship with it, and thus reduces the sensitivity of these firms' investment to debt. To verify this, columns (4)– (7) add the interactive terms of Fin with FDI, HDFI, BFDI, and FFDI respectively. As expected, these interactive terms are all negative, among which the first three are significant. The results for other variables remain the same. This shows that, for a firm, the more foreign capital share it has, the greater participation of foreign investment in the industry where it stays, or the stronger vertical linkage with foreign investment (forward linkage with FDI in this case) of the industry, its investment will be less susceptible to the debt level. In other words, its financing constraints are more likely to be alleviated.

As mentioned above, H´ericourt and Poncet (2009) add an interactive term between debt-asset ratio and FDI's horizontal presence, and explain its significantly negative sign as evidence thatthrough direct injection of funds, FDI alleviates financing constraints faced by local businesses.The interaction terms added as indicated in the works of H'ericourt and Poncet (2009) indicate the relationship between financial constraint and FDI in the measurement of domestic performance. The interaction term added which is debt asset ratio is the ratio that measures the extent of a company's leverage and the FDI horizontal presence refers to a foreign business operating in the same industry domestically. The result indicates a negative sign which mean there is evidence that direct injection of funds leads to the alleviation of financial constraints of domestic firms by FDI within the same operating industry.It is understandable that FDI provides financing for its joint ventures with local firms or its upstream or downstream partners, but it is unbelievable that it would wish to provide funds to competitors in the same industry. In addition, the explanation is more persuasive. FDI's presence signals an industry's competitiveness to banks, thereby affecting the credit the whole industry can get. Also, I have introduced Fin∗Fdi and Fin∗HFDI in the empirical model, which helps to identify whether FDI only directs the funds to the firm in which it has stakes or improves the financial resources available to the whole industry. Comparing the coefficients of the interactive terms in columns (4) and (5), I find that, through horizontal presence, half of the financing-improving effect goes to its firm and another half 'spill-overs' to other firms in the same industry.

Based on columns (4)– (6), threshold values can be obtained. For a firm, when its foreign capital share is larger than 39%, the foreign investment share of its industry is more than 26% or its industry's forward linkage with foreign investment is beyond 1.2%, its debt level no longer plagues the investment. The first threshold value tells that whether FDI can attract credit to its firm depends on whether or not it dominates the firm. From a bank's point of view, a firm controlled by foreign investors may be more secure, and therefore the bank tends to provide large amounts of credit. For horizontal effect, an industry with over one-quarter of capital from FDI must be an industry with stronginternational comparative advantage. Providing credit to the firms in this industry should also be safe. In Nigeria, private firms are facing serious financial constraints. It can be credibly imagined that the effect of FDI may change with the ownership type of the firms. Based upon the questionnaire, I divide the sample into two subsamples, private firms and state-owned firms. The estimation results are shown in Table 7.2 in the appendix below. Columns (1)– (4) correspond to the private firms. The results are almost the same as those in Table 7.1. The significantly positive result of Fin confirms again that private firms are credit constrained. Except for Fin∗ FFDI the other three interactive terms are significantly negative. For a firm, when its foreign capital share is more than 39%, or the foreign investment share of its industry is more than 14% or its industry's forward linkage with foreign investment is more than 0.7%, the investment is no longer subject to its debt. These findings are very close to the results of the full sample, suggesting that only private firms have financing constraints and FDI alleviates only their financing difficulties. The subsequent examination of state-owned firms justifies this point, as shown in columns (1)– (4). Different from private firms, the coefficient of Fin now is no longer significant, indicating that the financial situation will not affect the investment of state-owned firms, confirming the existence of 'soft budget constraints' (Qian and Roland 1998); the interactive terms are also not significant, implying that FDI does not have any impact on the financing of state-owned firms.

7.6.2. Foreign-invested firms excluded

The above analysis is aimed at all firms, including foreign-invested firms. Now I turn to domestic firms. First, I define 'those firms with foreign capital share less than 49%' (H´ericourt and Poncet 2009) as Domestic Firms (I). The corresponding estimation results are seen in Table 7.3. For the variable of Fin, its sign and significance are consistent with Table 7.1. All interactive terms are negative; only Fin∗ FFDI is still insignificant. After calculation, for a domestic firm, when its foreign capital share is more than 11%, the foreign capital share of its industry more than 19%, or its industry's forward linkage with foreign investment more than 1.2%, its investment is not constrained by the debt anylonger. In comparison with Table 7.1, the threshold value of a firm's foreign capital share decreases from 39% to 11%, which reminds the author that to guide credits to a domestic firm does not require the foreign investor to be the majority stakeholder in the firm. Sorted by ownership type for Domestic Firm (I), the estimation results are presented in Table 7.4. Among them, columns (1)– (4) refer to the private firms, the results of which are similar to those in Table 7.3, while columns (1)–(4) report the estimation results for SOEs. The coefficients of Fin and the interaction terms are not significant, showing that the financial situation of state-owned firms does not affect their investment, and they do not need FDI's 'signalling' effect in financing.

According to Nigerian law, 'a firm with equal to or more than 25% of foreign capital share' is a foreign-invested firm. Putting these companies aside, I get Domestic Firms (II). The estimation results are shown in Table 7.5. Fin is still significantly positive. The interactive terms are negative, but only Fin∗HFDI is significant. Other interactive terms are not significant, probably because the effects of FDI on firms of different ownership have offset each other. Accordingly, I further divide the sample into state-owned firms and private firms as before. Estimates of the private firms are seen in columns (1)– (4), Table 7.6. Fin is still significantly positive. The interactive terms are negative, but now Fin∗Fdi is not significant, and Fin∗ FFDI is significantly negative. For a domestic private firm, when the horizontal presence of foreign investment is more than 20%, or forward linkage with FDI beyond 0.7%, or the backward nexus with foreign capital bigger than 0.9%, its financing constraints will be reduced. Now Fin∗Fdi is negative but insignificant. The reason is that, on the one hand, now only a few private firms have a foreign capital share; on the other hand, the variation of the firms' foreign capital share is very small, leading to the unimportance of the 'own-plant effect'. Estimates of state-owned firms can be seen in columns (1) – (4), Table 7.6.

Table 7.7 in the appendix is a summary of the threshold values. As is stated above, these values indicate 'the conditions for FDI participation to be met if their debt level no longer postpones private firms' investment'. Since state-owned firms do not have financing constraints, the table summarises threshold values for private firms only. According to the questionnaire, I find that firms meeting the condition of horizontal presence are mostly coming from machinery & equipment, garments and paper, but those meeting the condition of backward linkage are mainly from machinery& equipment, publishing, printing & media. For forward linkage, firms from the basic& fabricated metal, meet the condition first.

Beneito, Rochina-Barrachina and Sanchis's (2016) findings suggest that foreign capital participation alleviates the negative impact of credit constraints on firms.In their work, they investigated the role of foreign capital participation as a means for firms to overcome the obstacle posed by credit constraints to sustain R&D investments. Using data for Spanish manufacturing firms in the period 1990–2006, they showed that firms with foreign capital were significantly less likely to stop already initiated R&D projects and more likely to sustain R&D investment when facing credit constraints. Their results are robust to positive selection into foreign capital participation, which they control through a set of variables chosen from a propensity score estimation, and to firms fixed-effects.

This chapter investigates the link between inward FDI and credit activity in Nigeria, using a large and recent firm-level database. I pay particular attention to the impact of domestic access to finance in this regard, as the financial system in Nigeria has been widely described as inefficient and skewed towards SOEs. Hence, it is of immense policy interest to see how this may affect domestic firms' ability to benefit (or otherwise) from inward FDI.

The econometric analysis shows that access to finance is an important issue for firms' credit activity, and their ability to benefit from inward FDI. This, however, is mainly the case for private and collectively owned firms and less so for state-owned firms which are the beneficiaries from the current financial system.

In particular,I find that firms with foreign capital participation or those with good access to domestic bank loans innovate more than others – these are the firms with low financial constraints. I also find that inward FDI at the sectoral level is positively associated with domestic-innovative activity only if firms engage in own R&D activities (i.e., have some "absorptive capacity") or if they have good access to domestic finance. The latter points to a possible adverse effect of domestic credit constraints on a firm's ability to benefit from inward FDI. However, exploiting a feature of the dataset and categorising firms into state-owned, private, and collectively owned enterprises shows that access to finance only plays a role for the latter two. As is well-documented, SOEs are largelyinefficient but enjoy preferential access to domestic financial resources, hence, access to finance provides no bottleneck to them. Furthermore, in previous chapters, I differentiate the effect of sector-level inward FDI into technology transfer and FDI affecting domestic credit opportunities. Here I find that the latter is of very little significance for SOEs and is also independent of their access to finance. By contrast, it is an important channel through which FDI affects the innovation of domestic private and collectively owned enterprises.

This chapter analysed the role of foreign direct investment in financing gross fixed capital formation and its relation to other sources of financing as well as to the variables describing the economic environment. The empirical results showed that FDI, domestic credit and local capital markets are all important financing sources for capital formation, with FDI having a substantially greater impact than domestic credit and capital market financing, while such a relation could not be found for state subsidies and foreign credit. It was also shown that foreign direct investment was a substitute for domestic credit while foreign credit was positively related to FDI, taking into account the economic environment. The empirical analysis also confirmed results from the literature related to the considerable importance of natural resources and privatisation revenues as determinants of FDI.

7.7. Robustness check and some extensions

7.7.1. Do foreign-invested companies have credit constraints?

So far, I have only found credit constraints among domestic private firms. Does this mean that the investments of foreign firms are not subject to their financial situation such as in the case of state-owned firms? To tackle this issue, I conduct estimation with two types of foreign-invested firms. For firms with foreign capital share greater than or equal to 49%, I find that the current investment and its squared term are respectively, significantly positive; Fin is mostly positive, but not significant; FDI itself is significantly positive, but horizontal presence and vertical linkage are not significant; all interactive terms are insignificant. For firms with foreign capital shares larger than or equal to 25%, FDI is positive but not significant, and the results for the other variables are similar. This indicates that foreign firms do not have any credit constraints, (see table 7.8). The reasons may be twofold. On the one hand, foreign investment has enjoyed a super-national treatment in Nigeria for a long time, which is exemplified by easy credit access; on the other hand, foreign-invested firms can acquire financing not only in Nigeria but also in the international market. In a perfect financial market, a company's investment tends to 'only [depend] on the expected return' as Tobin's Q theory proposes (Coric, 2010).

7.8 Conclusion

The role of FDI in economic growth is a highly-contested topic in the economics and finance literature. One of the channels through which financial development can help a country's economic growth is by alleviating firm financing constraints. In this connection, the current study addressed the effect of financial development in reducing firm level financing constraints, and this will provide some evidence towards the larger debate on the finance-growth nexus. The result of this study indicates that FDI helps to reduce firm-level financial constraints. One way in which FDI reduces financing constraints is by mitigating information asymmetry and contracting imperfections.

To identify credit constraints, I follow the investment literature pioneered by Fazzari et al. (1988) by examining the extent to which Nigerian firms' investment is affected by the availability of internal finance.

Based upon the World Bank's firm data concerning Nigeria's investment environment, this chapter explores the impact of FDI inflow on the financing situation of domestic firms. Using an augmented Euler equation, I carry out empirical studies and get some important conclusions. First, Nigeria's private firms have credit constraints, while foreign-invested firms and state-owned firms do not. The estimation results show that private firms with higher debt-asset ratio are more likely to defer investment. This finding conflicts with Tobin's Q theory, which claims that in a perfect financial market, firms' investment only depends on the expected return. Because of the so-called 'soft budget constraints', state-owned firms do not have to worry about their debt burden when investing. With Nigeria's preferential policies and the help of parent companies, foreign-invested firms do not take their financial situation into account either. Second, FDI alleviates the financing constraints of private firms by 'signalling' but does not affect state-owned firms and foreign-invested firms. In a financial market far from perfect, FDI is like 'a visible hand', reducing the information asymmetry between supply and demand of financial resources. FDI-related firms are often considered as low-risk customers with high credibility. Also, the FDI's participation level in an industry indicates how competitive this industry is. Finally, for a private firm, its investment is no longer constrained by the debt when foreign participation reaches a certain level. In the full sample, when the firm's foreign capital share is more than 50% or foreign investment share of its industry reaches 40%, or its industry has more than 1% forward linkage with FDI, the debt burden will not delay its investment. A similar conclusion can be drawn for domestic private firms with a foreign capital share of less than 49%. Firms with 40% foreign capital share or more can effectively alleviate their credit constraints. When domestic private firms are confined to those firms with less than 25% of foreign capital share, backward linkage with FDI also proves to be helpful in improving the financing environment.

The results suggest that private Nigerian firms face severe financial constraints while I find no such constraints for state-owned and foreign enterprises. The findings thus confirm the hypothesis of Huang (2003) that capital markets in developing countries are characterised by political pecking order based on firms' ownership type. This finding of discrimination against private firms by financial institutions is at odds with the observation that these firms are the engine role of growth in the Nigerian economy. Therefore, I aimed to shed further light on the circumstances under which financial distortions may not represent an impediment to economic activity. I test two conditioning factors of the effectiveness of the discrimination of private firms by financial institutions: (1) the role of FDI in funding the Nigerian corporate sector and (2) the size of the state-owned corporate sector. I identify that FDI is one mechanism that helps firms to overcome financial constraints. FDI brings in the scarce capital, eases financing constraints and spurs growth and investment of private firms. The size of the state-owned corporate sector also appears to affect the extent to which private firms' investment depends on internal finance. Financing constraints are found to be increasing the relative size of the state sector. Indeed, firms competing directly with numerous state-owned enterprises in the same province/industry depend more strongly on their internally generated funds for their investment.

Overall, the results support the conjecture of Boyreau-Debray and Wei (2005) that the state-owned banking sector favours inefficient State-Owned firms at the expense of privately owned firms, which face financial constraints that hinder them from growing. Moreover, the results indicate that private firms located in a location/sector where foreign capital is abundant and where the state sector is low are more able to overcome the financial market inefficiencies caused by Nigerian economic institutions and policies. The findings allow the author to predict the likely beneficial impact of the ongoing reforms inducing further liberalisation and state firms restructuring on the economic dynamism of the Nigerian economy. The author interprets the findings as evidence that credit constraints for private firms are likely to be mitigated by the growing importance of foreign firms in the Nigerian economy as well as the ongoing decline of the state economic predominance. Indeed, recent developments demonstrate a continuing shift away from state ownership.

When technological progress and collapsing trade barriers precipitated the fragmentation of production processes and the emergence of global value chains, MNCs assumed a key role in the global production, investment, and trade in final and intermediate goods. Developing economies are accounting for a growing share of corresponding increases in global levels of foreign direct investment (FDI), posing both opportunities and challenges to host countries and the global economy as a whole.

Assessing the impact of the multinational activity on host country development has been a major topic of economic research and policy debates. Ambiguous evidence from decades of inquiry into when and how the host countries derive benefits from foreign-firm activities notwithstanding, one finding that has emerged is that local conditions moderate the effects. Financial markets play a crucial role.

In the works of Alfaro and Chauvin (2016) they decomposed anticipated development benefits into three broad sources – capital inflows, macroeconomic benefits (GDP growth, aggregate productivity, exports) and microeconomic benefits (positive externalities from spillovers, linkages, self-upgrading, and reallocation). FDI's relative contribution to these sources of development benefits appears to vary with levels of financial development. Foreign firms will be more likely to bring external capital in financially underdeveloped economies than in developed economies, where they can raise funds locally. Both types of economies are likely to benefit from increases in wages and exports due to the foreign presence, albeit through potentially different channels. While in underdeveloped economies, exports may rise because foreign firms are less financially constrained and can better afford the fixed cost of exporting, in developed economies exports may result from foreign firms shunning greater competition in local markets. Greater microeconomic benefits from FDI spillovers, positive linkages, and competitive pressures are more likely to accrue in economies with well-developed financial markets where local firms can respond to these opportunities and competitive threats via investments that increase their productivity.

The complementarity between FDI and financial market conditions implies that policies should aim at improving domestic conditions and relieve constraints, as on credit access, especially for firms in sectors most likely to be affected by the presence of foreign companies (i.e., in competing and vertically related industries). The large size of gains from competition and reallocation of resources also points to the importance of policies that eliminate barriers to the movement of labour and capital between firms.

Despite recent advances, the understanding of how financial constraints affect multinational firm activity and economic development benefits derived from FDI is still limited. Existing research suggests that MNCs employ internalisation to overcome imperfections in arm's length markets, for example in markets for inputs. To what extent MNCs internalise markets for capital and evidence of the effectiveness of this strategy is mixed. Well-designed cross-country studies could determine the level of market imperfection at which internalisation becomes optimal. While research has focused on positive development outcomes from FDI, I have less understanding of potentially negative effects, for example how financial constraints affect competition between local firms and foreign entrants or whether foreign firms use their financial advantage to squeeze out competition and derive monopoly power in host markets. More detailed studies of the heterogeneous effects on local firms from the foreign presence would increase the understanding of the mixed effects of FDI found at the aggregate level. Finally, while the studies suggest that institutional features of capital, labour, and other factor markets affect productivity gains from FDI, the author believes there is still little evidence on the causal effect of policies that affect the institutional environment of FDI. These represent fruitful areas for future inquiry.

Regarding policy implication, the importance of the work lies in two respects. First, the role of FDI in Nigeria should be re-examined. For emerging economies, besides providing capital and transferring technology, FDI is also 'a market signal'. The results of this chapter reminds the author that it is not enough to evaluate FDI's role only from traditional perspectives. For emerging countries, FDI also plays a role in correcting market failure and imperfection. Just as mentioned before, it is a breakthrough in the research areas to relate Nigeria's FDI inflow with the inefficiency of its financial system. This chapter has furthered this point. Especially, the author believes that FDI improves the financing conditions of private firms by inducing funds to them. Secondly, the author mentioned that in interpreting the result, there should be some caution in assessing the efficiency of Nigeria's financial resource allocation. FDI is a good example, which directs funds to those qualified private firms. One might ask how important the effects of FDI are in this regard. The author admits that FDI's role is complementary, which cannot replace fundamental reforms in the financial system. However, when the financial system has not been ready for an immediate radical reform, FDI tends to play an important role. ‘Following FDI’ is just a ‘fast-track’ for the financial sector to catch up with this process.

Appendix

Table 7.1 Full Sample

Variable		1			2			3			4			5			6			7			8		
		Food & Beverage			Wood & Furniture			Machinery and Equipment			Garments			Paper			Publishing,Printing&media			Non-metallic Minerals			Basic and Fabricated metal		
		OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE
Current Investment (2007-2010-2014)	$(I/K)_t$	0.004***	0.141***	0.181**	0.121*	0.131***	0.101***	0.131***	0.221***	0.161***	0.111***	0.261***	0.101***	-0.006	0.101***	0.001***	0.111***	0.101***	0.081***	0.161***	-0.006	-0.004	0.101***	0.261***	0.101***
		0.001	0.011	0.051	0.021	0.041	0.021	0.331	0.201	0.121	0.151	0.101	0.171	0.101	0.121	0.091	0.051	0.151	0.161	0.101	0.041	0.111	0.021	0.101	0.171
		0.140	0.141	0.122	1.344	1.055	1.523	0.534	0.579	1.253	-0.414	-0.069	2.695	-4.564	-5.036	-0.165	1.870	1.148	0.192	0.065	0.065	0.088	1.523	-0.069	2.695
SQ. Current Investment (2007-2010-2014)	$(I/K)^2_t$	0.041***	0.111*	0.041*	0.041*	0.061**	0.111***	0.161*	0.101*	0.171*	0.101*	0.111*	0.161*	0.131**	0.151**	0.111**	0.101*	0.111***	0.041**	0.131**	0.021*	0.101*	0.111*	0.111*	0.161*
		0.021	0.041	0.021	0.041	0.011	0.051	0.061	0.101	0.041	0.031	0.191	0.021	0.111	0.141	0.001	0.091	0.011	0.001	0.111	0.151	0.151	0.051	0.191	0.021
		0.138	0.143	0.099	1.879	1.109	0.048	0.072	0.061	0.081	0.073	0.069	0.083	1.960	1.667	-0.332	0.072	0.058	0.070	0.162	0.200	0.397	0.048	0.069	0.083
Sales asset ratio	Y	0.211***	0.181**	0.101**	0.161***	0.061***	0.121***	0.111**	0.091*	0.151*	0.111**	0.131**	0.141**	0.111*	0.041*	0.011*	0.091**	0.021**	0.181**	0.171**	0.151*	0.161*	0.121**	0.131**	0.141*
		0.031	0.101	0.011	0.031	0.031	0.091	0.041	0.191	0.131	0.091	0.161	0.021	0.011	0.091	0.131	0.081	0.111	0.091	0.181	0.101	0.031	0.091	0.161	0.021
		1.420	1.316	1.246	1.138	1.031	1.251	0.302	0.323	0.681	0.636	0.650	0.582	0.016	0.076	0.211	0.058	0.051	0.104	0.072	0.060	1.138	1.251	0.650	0.582
Cashflow asset ratio	CF	-0.121	-0.131	-0.231	-0.101	-0.131	-0.141	-1.751	-1.091	-1.551	-2.891	-0.131	-0.221	- 0.161**	- 0.111**	- 0.161**	-0.13	-0.151	-0.111	-0.111	-0.091	-0.101	-0.141	-0.131	-0.221
		0.001	0.011	0.001	0.011	0.001	0.011	0.391	1.491	0.691	1.291	0.331	0.201	0.121	0.151	0.021	0.111	0.141	0.001	0.041	0.191	0.011	0.011	0.331	0.201
		0.202	0.242	0.501	0.142	0.164	0.091	0.072	0.061	0.081	0.073	0.069	0.083	1.960	1.667	-0.332	0.072	0.058	0.070	0.162	0.200	0.142	0.091	0.069	0.083
Debt asset ratio	Fin	0.341*	0.331*	0.301**	0.311*	0.141**	0.231***	0.231*	0.101*	0.131*	0.141*	0.341**	0.331***	0.301**	0.311***	0.101**	0.091***	0.161**	0.131**	0.101*	-0.006	0.311*	0.231**	0.341*	0.331*
		0.011	0.001	0.011	0.011	0.001	0.001	0.001	0.011	0.001	0.011	0.011	0.001	0.011	0.011	0.031	0.191	0.021	0.111	0.171	0.101	0.011	0.001	0.011	0.001
		1.112	1.309	3.167	0.081	0.075	0.117	0.072	0.061	0.081	0.073	0.069	0.083	1.960	1.667	-0.332	0.072	0.058	0.070	0.162	0.200	0.081	0.117	0.069	0.083
FDI	FDI				-0.001	-0.421	-1.001	-0.101	-0.161	-0.161	-0.131	-0.151	-0.011	-1.071	-0.241	-1.141	-1.761	-0.151	-0.111	-0.101	-0.121	-0.001	-1.001	-0.151	-0.011
					-0.359	-0.179	-0.589	-0.439	-1.119	2.701	-1.059	-1.419	-0.119	-0.169	1.981	-1.919	-1.769	0.131	0.091	0.161	0.021	-0.359	-0.589	-1.419	-0.119
					0.011	0.001	0.001	0.072	0.061	0.081	0.073	0.069	0.083	1.960	1.667	-0.332	0.072	0.058	0.070	0.162	0.200	0.011	0.001	0.069	0.083
HFDI	HFDI							1.6907	0.2107	0.3307	0.3007	0.3107	0.9207	0.261	0.3407	0.021	0.101	0.261	0.101	-0.006	0.101	2.0407	2.0807	0.3107	0.9207
								-1.179	0.721	0.001	0.011	0.011	-1.969	0.101	0.011	0.101	0.121	0.101	0.171	0.101	0.121	-1.559	-1.779	0.011	-1.969
								-3.759	0.221	0.191	0.021	0.111	-0.659	0.111	0.031	0.151	0.111	0.101	0.041	0.031	0.191	0.021	-0.299	1.641	-0.389
BFDI	BFDI							0.161	0.101	0.171	0.101	0.111	0.161	0.131	0.151	0.111	0.101	0.111	0.041	0.131	0.021	0.101	0.1107	0.111	0.161
								0.061	0.101	0.041	0.031	0.191	0.021	0.111	0.141	0.001	0.091	0.011	0.001	0.111	0.151	0.151	0.051	0.191	0.021
								0.072	0.061	0.081	0.073	0.069	0.083	1.960	1.667	-0.332	0.072	0.058	0.070	0.162	0.200	0.397	0.048	0.069	0.083
FFDI	FFDI							0.111	0.091	0.151	0.111	0.131	0.141	0.111	0.041	0.011	0.111	0.021	0.181	0.161	0.151	0.1607	0.1207	0.131	0.141
								0.041	0.191	0.131	0.091	0.161	0.021	0.011	0.091	0.131	0.081	0.111	0.091	0.181	0.101	0.031	0.091	0.161	0.021
								0.302	0.323	0.681	0.636	0.650	0.582	0.016	0.076	0.211	0.058	0.051	0.104	0.072	0.060	1.138	1.251	0.650	0.582
Debt asset ratio * FDI	Fin*FDI										-0.111***	-0.091**	-0.151**												
											0.041	0.191	0.131												
											0.302	0.323	0.681												
Debt asset ratio * HFDI	Fin*HFDI													-0.211*	-0.191**	-0.251*									
														0.141	0.291	0.231									
														0.402	0.423	0.781									
Debt asset ratio *BFDI	Fin*BFDI																-0.311*	-0.291*	-0.351**						
																	0.241	0.391	0.331						
																	0.502	0.523	0.881						
Debt asset ratio * FFDI	Fin*FFDI																			-0.331*	-0.311**	-0.371*			
																				0.261	0.411	0.351			
																				0.522	0.543	0.901			
D1 (Industry Distribution by City/Region)		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
D2 (% of Domestic / State Ownership)		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
D3(Year2007,2010and2014)		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Bootstrab RS		0.341	0.311	0.231	0.291	0.191	0.251	0.241	0.221	0.281	0.241	0.261	0.271	0.391	0.471	0.151	0.231	0.391	0.231	0.124	0.231	2.171	2.211	0.441	1.051
F test		2.341	2.311	3.231	3.291	3.191	3.251	3.241	3.221	3.284	3.244	3.264	3.274	2.292	1.967	1.674	2.325	2.279	2.265	2.277	2.169	2.227	2.218	2.228	2.276
P Value		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0
no. of Observation		2107	2107	2107	2107	2107	2107	2107	2107	2107	2107	2107	2107	2107	2107	2107	2107	2107	2107	2107	2107	2107	2107	2107	2107

∗∗∗, ∗∗ and ∗ represent the significant levels of 1%, 5% and 10%, respectively. Dummy 1, Dummy 2 and Dummy 3 represent the dummy variables of city–industry, state-owned firm and year.

Table 7.2 Full sample sorted by ownership

Variable		Private firms												State-owned firms											
		Food & Beverage			Wood & Furniture			Machinery and Equipment			Garments			Food & Beverage			Wood & Furniture			Machinery and Equipment			Garments		
		OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE
Current Investment (2007-2010-2014)		0.011**	0.148***	0.188*	0.128**	0.138***	0.108*	0.138**	0.228*	0.168**	0.118***	0.268*	0.108**	0.001*	0.108**	0.008**	0.118**	0.108*	0.088*	0.168**	0.001**	0.003*	0.108*	0.268**	0.108**
		0.008	0.018	0.058	0.028	0.048	0.028	0.338	0.208	0.128	0.158	0.108	0.178	0.108	0.128	0.098	0.058	0.158	0.168	0.108	0.048	0.118	0.028	0.108	0.178
		0.147	0.148	0.129	1.351	1.062	1.530	0.541	0.586	1.260	-0.407	-0.062	2.702	-4.557	-5.029	-0.158	1.877	1.155	0.199	0.072	0.072	0.095	1.530	-0.062	2.702
SQ. Current Investment (2007-2010-2014)		0.048***	0.118*	0.048**	0.048*	0.068**	0.118*	0.168***	0.108*	0.178*	0.108**	0.118*	0.168*	0.138**	0.158*	0.118***	0.108**	0.118*	0.048*	0.138*	0.028*	0.108*	0.118**	0.118**	0.168**
		0.028	0.048	0.028	0.048	0.018	0.058	0.068	0.108	0.048	0.038	0.198	0.028	0.118	0.148	0.008	0.098	0.018	0.008	0.118	0.158	0.158	0.058	0.198	0.028
		0.145	0.150	0.106	1.886	1.116	0.055	0.079	0.068	0.088	0.080	0.076	0.090	1.967	1.674	-0.325	0.079	0.065	0.077	0.169	0.207	0.404	0.055	0.076	0.090
Sales asset ratio	Y	0.218*	0.188**	0.108*	0.168*	0.068**	0.128*	0.118***	0.098*	0.158*	0.118*	0.138*	0.148**	0.118**	0.048**	0.018***	0.098**	0.028***	0.188**	0.178*	0.158*	0.168*	0.128**	0.138***	0.148*
		0.038	0.108	0.018	0.038	0.038	0.098	0.048	0.198	0.138	0.098	0.168	0.028	0.018	0.098	0.138	0.088	0.118	0.098	0.188	0.108	0.038	0.098	0.168	0.028
		1.427	1.323	1.253	1.145	1.038	1.258	0.309	0.330	0.688	0.643	0.657	0.589	0.023	0.083	0.218	0.065	0.058	0.111	0.079	0.067	1.145	1.258	0.657	0.589
Cashflow asset ratio	CF	-0.128	-0.138	-0.238	-0.108**	-0.138**	-0.148**	-1.758	-1.098	-1.558	-2.898	-0.138	-0.228	-0.168	-0.118	-0.168	-0.138	-0.158	-0.118	-0.118	-0.098	-0.108	-0.148	-0.138	-0.228
		0.008	0.018	0.008	0.018	0.008	0.018	0.398	1.498	0.698	1.298	0.338	0.208	0.128	0.158	0.028	0.118	0.148	0.008	0.048	0.198	0.018	0.018	0.338	0.208
		0.209	0.249	0.508	0.149	0.171	0.098	0.079	0.068	0.088	0.080	0.076	0.090	1.967	1.674	-0.325	0.079	0.065	0.077	0.169	0.207	0.149	0.098	0.076	0.090
Debt asset ratio	Fin	0.348*	0.338*	0.308***	0.318*	0.148*	0.238*	0.238**	0.108*	0.138*	0.148**	0.348**	0.338**	0.308	0.318	0.108	0.098	0.168	0.138	0.108	0.001	0.318	0.238	0.348	0.338
		0.018	0.008	0.018	0.018	0.008	0.008	0.008	0.018	0.008	0.018	0.018	0.008	0.018	0.018	0.038	0.198	0.028	0.118	0.178	0.108	0.018	0.008	0.018	0.008
		1.119	1.316	3.174	0.088	0.082	0.124	0.079	0.068	0.088	0.080	0.076	0.090	1.967	1.674	-0.325	0.079	0.065	0.077	0.169	0.207	0.088	0.124	0.076	0.090
FDI	FDI	-0.158	-0.018	-0.128	-0.008	-0.428	-1.008	-0.108	-0.168	-0.168	-0.138	-0.158	-0.018	1.078	0.248	1.148	-1.768	-0.158	-0.118	-0.108	-0.128	-0.008	-1.008	-0.158	-0.018
		-1.412	-0.112	0.028	-0.352	-0.172	-0.582	-0.432	-1.112	2.708	-1.052	-1.412	-0.112	-0.162	1.988	-1.912	-1.762	0.138	0.098	0.168	0.028	-0.352	-0.582	-1.412	-0.112
		0.076	0.090	0.207	0.018	0.008	0.008	0.079	0.068	0.088	0.080	0.076	0.090	1.967	1.674	-0.325	0.079	0.065	0.077	0.169	0.207	0.018	0.008	0.076	0.090
HFDI	HFDI	0.318	0.928	0.108	0.108	0.001	0.168	1.698	0.218	0.338	0.308	0.318	0.928	0.268	0.348	0.028	0.108	0.268	0.108	0.001	0.108	2.048	2.088	0.318	0.928
		0.018	-1.962	0.128	0.038	0.108	0.108	-1.172	0.728	0.008	0.018	0.018	-1.962	0.108	0.018	0.108	0.128	0.108	0.178	0.108	0.128	-1.552	-1.772	0.018	-1.962
		0.118	-0.652	0.198	0.080	-4.557	0.072	-3.752	0.228	0.198	0.028	0.118	-0.652	0.118	0.038	0.158	0.118	0.108	0.048	0.038	0.198	0.028	-0.292	1.648	-0.382
BFDI	BFDI	0.118	0.168	0.028	0.118	0.138	0.138	0.168	0.108	0.178	0.108	0.118	0.168	0.138	0.158	0.118	0.108	0.118	0.048	0.138	0.028	0.108	0.118	0.118	0.168
		0.198	0.028	0.158	0.098	0.118	0.118	0.068	0.108	0.048	0.038	0.198	0.028	0.118	0.148	0.008	0.098	0.018	0.008	0.118	0.158	0.158	0.058	0.198	0.028
		0.076	0.090	0.207	0.643	1.967	0.169	0.079	0.068	0.088	0.080	0.076	0.090	1.967	1.674	-0.325	0.079	0.065	0.077	0.169	0.207	0.404	0.055	0.076	0.090
FFDI	FFDI	0.138	0.148	0.158	2.898	0.118	0.178	0.118	0.098	0.158	0.118	0.138	0.148	0.118	0.048	0.018	0.118	0.028	0.188	0.168	0.158	0.168	0.128	0.138	0.148
		0.168	0.028	0.108	1.298	0.018	0.188	0.048	0.198	0.138	0.098	0.168	0.028	0.018	0.098	0.138	0.088	0.118	0.098	0.188	0.108	0.038	0.098	0.168	0.028
		0.657	0.589	0.067	0.080	0.023	0.079	0.309	0.330	0.688	0.643	0.657	0.589	0.023	0.083	0.218	0.065	0.058	0.111	0.079	0.067	1.145	1.258	0.657	0.589
Debt asset ratio * FDI	Fin*FDI	-1.667**	-0.332**	-0.072**										0.008	0.008	0.079									
		0.311	0.101	0.091										0.001	0.168	1.698									
		0.011	0.031	0.191										0.108	0.108	-1.172									
Debt asset ratio * HFDI	Fin*HFDI				-0.131**	-0.141*	-0.341*										0.211	0.191	0.251						
					0.001	0.011	0.011										0.141	0.291	0.231						
					0.081	0.073	0.069										0.402	0.423	0.781						
Debt asset ratio *BFDI	Fin*BFDI							-0.083*	-0.200*	-0.011*										0.028	0.108	0.268			
								0.921	0.101	0.101										0.108	0.128	0.108			
								-1.969	0.121	0.031										0.158	0.118	0.108			
Debt asset ratio * FFDI	Fin*FFDI										0.101*	0.121*	-1.559										0.108	2.048	2.088
											0.031	0.191	0.021										0.128	-1.552	-1.772
											0.131	0.021	0.101										0.198	0.028	-0.292
D1 (Industry Distribution by City/Region)		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
D3 (Year 2007, 2010 and 2014)		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Bootstrab RS		0.248	0.238	0.208	0.218	0.048	0.138	0.138	0.008	0.038	0.048	0.248	0.238	0.208	0.218	0.008	-0.002	0.068	0.038	0.008	-0.099	0.218	0.138	0.248	0.238
F test		1.242	1.439	3.297	4.215	4.245	4.247	4.242	4.195	4.215	4.243	4.199	4.213	2.490	1.797	-4.242	4.242	4.188	4.200	4.292	4.330	4.215	4.247	4.199	4.213
P Value		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
no. of Observation		1576	1576	1576	1576	1576	1576	1576	1576	1576	1576	1576	1576	531	531	531	531	531	531	531	531	531	531	531	531

∗∗∗, ∗∗ and ∗ represent the significant levels of 1%, 5% and 10%, respectively. Dummy 1, Dummy 2 and Dummy 3 represent the dummy variables of city–industry, state-owned firm and year.

Table 7.3. Domestic Firms (I): FDI < 49%

Variable		1			2			3			4			5			6			7			8		
		Food & Beverage			Wood & Furniture			Machinery and Equipment			Garments			Paper			Publishing, Printing & media			Non-metallic Minerals			Basic and Fabricated metal		
		OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE
Current Investment (2007-2010-2014)		0.134***	0.271*	0.311***	0.251**	0.261**	0.231*	0.261**	0.351**	0.291*	0.241***	0.391**	0.231**	0.124*	0.231*	0.131**	0.241**	0.231*	0.211**	0.291**	0.124**	0.126**	0.231*	0.391**	0.231**
		0.131	0.141	0.181	0.151	0.171	0.151	0.461	0.331	0.251	0.281	0.231	0.301	0.231	0.251	0.221	0.181	0.281	0.291	0.231	0.171	0.241	0.151	0.231	0.301
		0.270	0.271	0.252	1.474	1.185	1.653	0.664	0.709	1.383	-0.284	0.061	2.825	-4.434	-4.906	-0.035	2.000	1.278	0.322	0.195	0.195	0.218	1.653	0.061	2.825
SQ. Current Investment (2007-2010-2014)		0.171*	0.241*	0.171**	0.171**	0.191**	0.241**	0.291*	0.231***	0.301*	0.231**	0.241***	0.291**	0.261*	0.281**	0.241*	0.231**	0.241**	0.171*	0.261**	0.151**	0.231**	0.241**	0.241*	0.291*
		0.151	0.171	0.151	0.171	0.141	0.181	0.191	0.231	0.171	0.161	0.321	0.151	0.241	0.271	0.131	0.221	0.141	0.131	0.241	0.281	0.281	0.181	0.321	0.151
		0.268	0.273	0.229	2.009	1.239	0.178	0.202	0.191	0.211	0.203	0.199	0.213	2.090	1.797	-0.202	0.202	0.188	0.200	0.292	0.330	0.527	0.178	0.199	0.213
Sales asset ratio	Y	0.341**	0.311**	0.231***	0.291*	0.191*	0.251**	0.241**	0.221**	0.281*	0.241***	0.261**	0.271**	0.241*	0.171***	0.141**	0.221***	0.151***	0.311*	0.301***	0.281**	0.291*	0.251*	0.261*	0.271**
		0.161	0.231	0.141	0.161	0.161	0.221	0.171	0.321	0.261	0.221	0.291	0.151	0.141	0.221	0.261	0.211	0.241	0.221	0.311	0.231	0.161	0.221	0.291	0.151
		1.550	1.446	1.376	1.268	1.161	1.381	0.432	0.453	0.811	0.766	0.780	0.712	0.146	0.206	0.341	0.188	0.181	0.234	0.202	0.190	1.268	1.381	0.780	0.712
Cashflow asset ratio	CF	-0.251**	-0.261**	-0.361**	-0.231	-0.261	-0.271	-1.881	-1.221	-1.681	-3.021	-0.261	-0.351	-0.291	-0.241	-0.291	-0.261**	-0.281*	-0.241**	-0.241	-0.221	-0.231	-0.271***	-0.261***	-0.351***
		0.131	0.141	0.131	0.141	0.131	0.141	0.521	1.621	0.821	1.421	0.461	0.331	0.251	0.281	0.151	0.241	0.271	0.131	0.171	0.321	0.141	0.141	0.461	0.331
		0.332	0.372	0.631	0.272	0.294	0.221	0.202	0.191	0.211	0.203	0.199	0.213	2.090	1.797	-0.202	0.202	0.188	0.200	0.292	0.330	0.272	0.221	0.199	0.213
Debt asset ratio	Fin	0.471**	0.461*	0.431*	0.441*	0.271*	0.361***	0.361**	0.231**	0.261**	0.271**	0.471**	0.461**	0.431*	0.441**	0.231**	0.221*	0.291**	0.261*	0.231*	0.124***	0.441***	0.361*	0.471**	0.461*
		0.141	0.131	0.141	0.141	0.131	0.131	0.131	0.141	0.131	0.141	0.141	0.131	0.141	0.141	0.161	0.321	0.151	0.241	0.301	0.231	0.141	0.131	0.141	0.131
		1.242	1.439	3.297	0.211	0.205	0.247	0.202	0.191	0.211	0.203	0.199	0.213	2.090	1.797	-0.202	0.202	0.188	0.200	0.292	0.330	0.211	0.247	0.199	0.213
FDI	FDI				-0.131	-0.551	-1.131	-0.231	-0.291	-0.291	-0.261	-0.281	-0.141	1.201	-0.371	-1.271	-1.891	-0.281	-0.241	-0.231	-0.251	-0.131	-1.131	-0.281	-0.141
					-0.229	-0.049	-0.459	-0.309	-0.989	2.831	-0.929	-1.289	0.011	-0.039	2.111	-1.789	-1.639	0.261	0.221	0.291	0.151	-0.229	-0.459	-1.289	0.011
					0.141	0.131	0.131	0.202	0.191	0.211	0.203	0.199	0.213	2.090	1.797	-0.202	0.202	0.188	0.200	0.292	0.330	0.141	0.131	0.199	0.213
HFDI	HFDI							1.821	0.341	0.461	0.431	0.441	1.051	0.391	0.471	0.151	0.231	0.391	0.231	0.124	0.231	2.171	2.211	0.441	1.051
								-1.049	0.851	0.131	0.141	0.141	-1.839	0.231	0.141	0.231	0.251	0.231	0.301	0.231	0.251	-1.429	-1.649	0.141	-1.839
								-3.629	0.351	0.321	0.151	0.241	-0.529	0.241	0.161	0.281	0.241	0.231	0.171	0.161	0.321	0.151	-0.169	1.771	-0.259
BFDI	BFDI							0.291	0.231	0.301	0.231	0.241	0.291	0.261	0.281	0.241	0.231	0.241	0.171	0.261	0.151	0.231	0.241	0.241	0.291
								0.191	0.231	0.171	0.161	0.321	0.151	0.241	0.271	0.131	0.221	0.141	0.131	0.241	0.281	0.281	0.181	0.321	0.151
								0.202	0.191	0.211	0.203	0.199	0.213	2.090	1.797	-0.202	0.202	0.188	0.200	0.292	0.330	0.527	0.178	0.199	0.213
FFDI	FFDI							0.241	0.221	0.281	0.241	0.261	0.271	0.241	0.171	0.141	0.241	0.151	0.311	0.291	0.281	0.291	0.251	0.261	0.271
								0.171	0.321	0.261	0.221	0.291	0.151	0.141	0.221	0.261	0.211	0.241	0.221	0.311	0.231	0.161	0.221	0.291	0.151
								0.432	0.453	0.811	0.766	0.780	0.712	0.146	0.206	0.341	0.188	0.181	0.234	0.202	0.190	1.268	1.381	0.780	0.712
Debt asset ratio * FDI	Fin*FDI										-0.211***	-0.203*	-0.199**												
											0.291	0.261	0.281												
											2.831	-0.929	-1.289												
Debt asset ratio * HFDI	Fin*HFDI													-1.797*	-0.202**	-0.202**									
														0.471	0.151	0.231									
														0.141	0.231	0.251									
Debt asset ratio *BFDI	Fin*BFDI																-0.190*	-0.292**	-0.320**						
																	0.231	0.124	0.231						
																	0.301	0.231	0.251						
Debt asset ratio * FFDI	Fin*FFDI																			-0.141	-0.131	-0.141			
																				0.272	0.294	0.221			
																				0.441	0.271	0.361			
D1 (Industry Distribution by City/Region)		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
D2 (% of Domestic / State Ownership)		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
D3 (Year 2007, 2010 and 2014)		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Bootstrab RS		0.101	0.041	0.031	0.191	0.021	0.111	0.141	0.001	0.091	0.011	0.001	0.111	0.151	0.151	0.051	0.191	0.131	0.221	0.161	0.111	0.161	0.131	0.151	0.111
F test		1.138	1.118	1.118	1.138	1.138	1.198	1.148	1.198	1.138	1.198	1.168	1.128	1.118	1.198	1.138	1.188	1.118	1.198	1.188	1.118	1.138	1.198	1.168	1.128
P Value		0	0	0	0	0	0	0	0	0	0.007	0	0	0	0	0	0	0	0	0	0	0	0	0	0
no. of Observation		1905	1905	1905	1905	1905	1905	1905	1905	1905	1905	1905	1905	1905	1905	1905	1905	1905	1905	1905	1905	1905	1905	1905	1905

∗∗∗, ∗∗ and ∗ represent the significant levels of 1%, 5% and 10%, respectively. Dummy 1, Dummy 2 and Dummy 3 represent the dummy variables of city–industry, state-owned firm and year.

Table 7.4. Domestic Firms (I) sorted by ownership

		Private firms - Fdi < 49%												State-owned firms - Fdi < 49%											
Variable		Food & Beverage			Wood & Furniture			Machinery and Equipment			Garments			Food & Beverage			Wood & Furniture			Machinery and Equipment			Garments		
		OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE
Current Investment (2007-2010-2014)		-0.149**	-0.012**	-0.028**	-0.03177	-0.02177	-0.05177	-0.022**	-0.069**	-0.008*	-0.042	-0.108	-0.052	-0.159**	-0.052**	-0.152**	-0.042	-0.052	-0.072	-0.009**	-0.158**	-0.157*	-0.052**	-0.108**	-0.052**
		-0.152	-0.142	-0.102	-0.132	-0.112	-0.132	0.178	0.048	-0.032	-0.002	-0.052	0.018	-0.052	-0.032	-0.062	-0.102	-0.002	0.008	-0.052	-0.112	-0.042	-0.132	-0.052	0.018
		-0.013	-0.012	-0.031	1.191	0.902	1.370	0.381	0.426	1.100	-0.567	-0.222	2.542	-4.717	-5.189	-0.318	1.717	0.995	0.039	-0.088	-0.088	-0.065	1.370	-0.222	2.542
SQ. Current Investment (2007-2010-2014)		-0.112**	-0.042**	-0.112**	-0.112	-0.092	-0.042	-0.002*	-0.052*	-0.018**	-0.052	-0.042	-0.020	-0.022**	-0.002**	-0.042**	-0.052	-0.042	-0.112	-0.022**	-0.132**	-0.052**	-0.042**	-0.042**	0.032**
		-0.132	-0.112	-0.132	-0.112	-0.142	-0.102	-0.092	-0.052	-0.112	-0.122	0.038	-0.132	-0.042	-0.012	-0.152	-0.062	-0.142	-0.152	-0.042	-0.002	-0.002	-0.102	0.038	-0.132
		-0.015	-0.010	-0.054	1.726	0.956	-0.105	-0.081	-0.092	-0.072	-0.080	-0.084	-0.070	1.807	1.514	-0.485	-0.081	-0.095	-0.083	0.009	0.047	0.244	-0.105	-0.084	-0.070
Sales asset ratio	Y	0.058*	0.028**	0.052**	0.008**	0.092**	0.032**	0.042	0.062	0.002	0.042	0.022	0.012	0.042	0.112	0.142	0.062	0.132	0.028	0.018	0.002	0.008	0.032	0.022	0.012
		-0.122	-0.052	-0.142	-0.122	-0.122	-0.062	-0.112	0.038	-0.022	-0.062	0.008	-0.132	-0.142	-0.062	-0.022	-0.072	-0.042	-0.062	0.028	-0.052	-0.122	-0.062	0.008	-0.132
		1.267	1.163	1.093	0.985	0.878	1.098	0.149	0.170	0.528	0.483	0.497	0.429	-0.137	-0.077	0.058	-0.095	-0.102	-0.049	-0.081	-0.093	0.985	1.098	0.497	0.429
Cashflow asset ratio	CF	-0.032**	-0.022**	-0.078**	-0.052	-0.022	-0.012	1.598**	0.938*	1.398**	2.738	0.022	0.068	-0.030	-0.042	-0.040	-0.022	-0.002	-0.042	-0.042	-0.062	-0.052	-0.012	-0.022	-0.068
		-0.152	-0.142	-0.152	-0.142	-0.152	-0.142	0.238	1.338	0.538	1.138	0.178	0.048	-0.032	-0.002	-0.132	-0.042	-0.012	-0.152	-0.112	0.038	-0.142	-0.142	0.178	0.048
		0.049	0.089	0.348	-0.011	0.011	-0.062	-0.081	-0.092	-0.072	-0.080	-0.084	-0.070	1.807	1.514	-0.485	-0.081	-0.095	-0.083	0.009	0.047	-0.011	-0.062	-0.084	-0.070
Debt asset ratio	Fin	0.188*	0.178**	0.148*	0.158**	0.012**	0.078*	0.078**	0.052**	0.022**	0.012*	0.1889*	0.178**	0.130	0.158	0.052	0.062	0.060	0.022	0.052	0.159	0.158	0.078	0.188	0.178
		-0.142	-0.152	-0.142	-0.142	-0.152	-0.152	-0.152	-0.142	-0.152	-0.142	-0.142	-0.152	-0.142	-0.142	-0.122	0.038	-0.132	-0.042	0.018	-0.052	-0.142	-0.152	-0.142	-0.152
		0.959	1.156	3.014	-0.072	-0.078	-0.036	-0.081	-0.092	-0.072	-0.080	-0.084	-0.070	1.807	1.514	-0.485	-0.081	-0.095	-0.083	0.009	0.047	-0.072	-0.036	-0.084	-0.070
FDI	FDI	-0.002	-0.142	-0.032	-0.152	0.268	0.848	-0.052	0.023	0.008	-0.022	-0.002	-0.142	0.918	0.088	0.988	1.608	-0.002	-0.042	-0.052	-0.032	-0.152	0.848	-0.002	-0.142
		-1.572	-0.272	-0.132	-0.512	-0.332	-0.742	-0.592	-1.272	2.548	-1.212	-1.572	-0.272	-0.322	1.828	-2.072	-1.922	-0.022	-0.062	0.008	-0.132	-0.512	-0.742	-1.572	-0.272
		-0.084	-0.070	0.047	-0.142	-0.152	-0.152	-0.081	-0.092	-0.072	-0.080	-0.084	-0.070	1.807	1.514	-0.485	-0.081	-0.095	-0.083	0.009	0.047	-0.142	-0.152	-0.084	-0.070
HFDI	HFDI	0.158	0.768	-0.052	-0.052	-0.159	0.008	1.538	0.058	0.178	0.148	0.158	0.768	0.108	0.188	-0.132	-0.052	0.108	-0.052	-0.159	-0.052	1.888	1.928	0.158	0.768
		-0.142	-2.122	-0.032	-0.122	-0.052	-0.052	-1.332	0.568	-0.152	-0.142	-0.142	-2.122	-0.052	-0.142	-0.052	-0.032	-0.052	0.018	-0.052	-0.032	-1.712	-1.932	-0.142	-2.122
		-0.042	-0.812	0.038	-0.080	-4.717	-0.088	-3.912	0.068	0.038	-0.132	-0.042	-0.812	-0.042	-0.122	-0.002	-0.042	-0.052	-0.112	-0.122	0.038	-0.132	-0.452	1.488	-0.542
BFDI	BFDI	-0.042	0.008	-0.132	-0.042	-0.022	-0.022	0.008	-0.052	0.018	-0.052	-0.042	0.008	-0.022	-0.002	-0.042	-0.052	-0.042	-0.112	-0.022	-0.132	-0.052	-0.042	-0.042	0.008
		0.038	-0.132	-0.002	-0.062	-0.042	-0.042	-0.092	-0.052	-0.112	-0.122	0.038	-0.132	-0.042	-0.012	-0.152	-0.062	-0.142	-0.152	-0.042	-0.002	-0.002	-0.102	0.038	-0.132
		-0.084	-0.070	0.047	0.483	1.807	0.009	-0.081	-0.092	-0.072	-0.080	-0.084	-0.070	1.807	1.514	-0.485	-0.081	-0.095	-0.083	0.009	0.047	0.244	-0.105	-0.084	-0.070
FFDI	FFDI	-0.022	-0.012	-0.002	2.738	-0.042	0.018	-0.042	-0.062	-0.002	-0.042	-0.022	-0.012	-0.042	-0.112	-0.142	-0.042	-0.132	0.028	0.008	-0.002	0.008	-0.032	-0.022	-0.012
		0.008	-0.132	-0.052	1.138	-0.142	0.028	-0.112	0.038	-0.022	-0.062	0.008	-0.132	-0.142	-0.062	-0.022	-0.072	-0.042	-0.062	0.028	-0.052	-0.122	-0.062	0.008	-0.132
		0.497	0.429	-0.093	-0.080	-0.137	-0.081	0.149	0.170	0.528	0.483	0.497	0.429	-0.137	-0.077	0.058	-0.095	-0.102	-0.049	-0.081	-0.093	0.985	1.098	0.497	0.429
Debt asset ratio * FDI	Fin*FDI	-0.008**	-1.538*	-0.058**										-0.142	-0.152	-0.152									
		-0.052	-1.332	0.568										-0.052	-0.159	0.008									
		-0.088	-3.912	0.068										-0.122	-0.052	-0.052									
Debt asset ratio * HFDI	Fin*HFDI				-0.042	-0.812	-0.042										-0.158	-0.012	-0.078						
					-0.042	0.008	-0.022										-0.142	-0.152	-0.152						
					0.038	-0.132	-0.042										-0.072	-0.078	-0.036						
Debt asset ratio *BFDI	Fin*BFDI							-0.083**	-0.190*	-0.011**										0.052	1.888	1.928			
								0.921	0.101	0.101										-0.032	-1.712	-1.932			
								-1.969	0.121	0.031										0.038	-0.132	-0.452			
Debt asset ratio * FFDI	Fin*FFDI										-0.047	-0.011	-0.062										-1.272	-2.548	-1.212
											-0.159	0.158	0.078										-0.092	-0.072	-0.080
											-0.052	-0.142	-0.152										0.058	0.178	0.148
D1 (Industry Distribution by City/Region)		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
D3 (Year 2007, 2010 and 2014)		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Bootstrab RS		0.358	0.968	0.148	0.148	0.041	0.208	1.738	0.258	0.378	0.348	0.358	0.968	0.308	0.388	0.068	0.148	0.308	0.148	0.041	0.148	2.088	2.128	0.358	0.968
F test		1.172	1.242	1.172	1.172	1.192	1.242	1.292	1.232	1.312	1.232	1.242	1.292	1.262	1.282	1.242	1.232	1.242	1.172	1.262	1.152	1.232	1.242	1.242	1.292
P Value		0.05	0.043	0.1	0	0	0	0	0	0.03	0	0	0	0	0	0	0.007	0	0	0	0	0.0043	0	0	0
no. of Observation		1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	755	755	755	755	755	755	755	755	755	755	755	755

∗∗∗, ∗∗ and ∗ represent the significant levels of 1%, 5% and 10%, respectively. Dummy 1, Dummy 2 and Dummy 3 represent the dummy variables of city–industry, state-owned firm and year.

Table 7.5. Domestic Firms (II): FDI < 25%.

Variable		Food & Beverage			Wood & Furniture			Machinery and Equipment			Garments			paper			Publishing, Printing & media			Non-metallic Minerals			Basic and Fabricated metal		
		OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE
Current Investment (2007-2010-2014)		0.404*	0.541*	0.581**	0.521***	0.531**	0.501*	0.531**	0.621**	0.561*	0.511*	0.661**	0.501**	0.394*	0.501*	0.401*	0.511**	0.501**	0.481*	0.561**	0.394**	0.396**	0.501**	0.661**	0.501*
		0.401	0.411	0.451	0.421	0.441	0.421	0.731	0.601	0.521	0.551	0.501	0.571	0.501	0.521	0.491	0.451	0.551	0.561	0.501	0.441	0.511	0.421	0.501	0.571
		0.540	0.541	0.522	1.744	1.455	1.923	0.934	0.979	1.6527*	-0.014	0.331	3.095	-4.164	-4.636	0.235	2.270	1.548	0.592	0.465	0.465	0.488	1.923	0.331	3.095
SQ. Current Investment (2007-2010-2014)		0.441*	0.511**	0.441*	0.441***	0.461**	0.511**	0.561**	0.501**	0.571**	0.501**	0.511*	0.561**	0.531*	0.551**	0.511*	0.501***	0.511**	0.441**	0.531**	0.421**	0.501**	0.511*	0.511**	0.561**
		0.421	0.441	0.421	0.441	0.411	0.451	0.461	0.501	0.4407*	0.431	0.591	0.421	0.511	0.541	0.401	0.491	0.411	0.401	0.511	0.551	0.551	0.451	0.591	0.421
		0.538	0.543	0.499	2.279	1.509	0.448	0.472	0.461	0.481	0.473	0.469	0.483	2.360	2.067	0.068	0.472	0.458	0.470	0.562	0.600	0.797	0.448	0.469	0.483
Sales asset ratio	Y	0.611*	0.581*	0.501**	0.561***	0.461**	0.521**	0.511***	0.491**	0.551**	0.511**	0.531**	0.541**	0.511**	0.441**	0.411**	0.491*	0.421***	0.581**	0.571***	0.551***	0.561**	0.521*	0.531***	0.541*
		0.431	0.501	0.411	0.431	0.431	0.491	0.441	0.591	0.531	0.491	0.561	0.421	0.411	0.491	0.531	0.481	0.511	0.491	0.581	0.501	0.431	0.491	0.561	0.421
		1.820	1.716	1.646	1.538	1.431	1.651	0.702	0.723	1.081	1.036	1.050	0.982	0.416	0.476	0.611	0.458	0.451	0.504	0.472	0.460	1.538	1.651	1.050	0.982
Cashflow asset ratio	CF	0.521	0.531	0.631	0.501	0.531	0.541	2.151	1.491	1.951	3.291	0.531	0.621	0.561	0.511	0.561	0.531	0.551	0.511	0.511	0.491	0.501	0.541	0.531	0.621
		0.401	0.411	0.401	0.411	0.401	0.411	0.791	1.891	1.091	1.691	0.731	0.601	0.521	0.551	0.421	0.511	0.541	0.401	0.441	0.591	0.411	0.411	0.731	0.601
		0.602	0.642	0.901	0.542	0.564	0.491	0.472	0.461	0.481	0.473	0.469	0.483	2.360	2.067	0.068	0.472	0.458	0.470	0.562	0.600	0.542	0.491	0.469	0.483
Debt asset ratio	Fin	0.741***	0.731**	0.701**	0.711**	0.541***	0.631*	0.631*	0.501***	0.531**	0.541**	0.741**	0.731***	0.701***	0.711**	0.501**	0.491***	0.561**	0.531*	0.501*	0.391**	0.711**	0.631**	0.741*	0.731*
		0.411	0.401	0.411	0.411	0.401	0.401	0.401	0.411	0.401	0.411	0.411	0.401	0.411	0.411	0.431	0.591	0.421	0.511	0.571	0.501	0.411	0.401	0.411	0.401
		1.512	1.709	3.567	0.481	0.475	0.517	0.472	0.461	0.481	0.473	0.469	0.483	2.360	2.067	0.068	0.472	0.458	0.470	0.562	0.600	0.481	0.517	0.469	0.483
FDI	FDI				0.401	0.821	1.401	0.501	0.561	0.561	0.531	0.551	0.411	1.471	0.641	1.541	2.161	0.551	0.511	0.501	0.521	0.401	1.401	0.551	0.411
					0.041	0.221	-0.189	-0.039	-0.719	3.101	-0.659	-1.019	0.281	0.231	2.381	-1.519	-1.369	0.531	0.491	0.561	0.421	0.041	-0.189	-1.019	0.281
					0.411	0.401	0.401	0.472	0.461	0.481	0.473	0.469	0.483	2.360	2.067	0.068	0.472	0.458	0.470	0.562	0.600	0.411	0.401	0.469	0.483
HFDI	HFDI							2.091	0.611	0.731	0.701	0.711	1.321	0.661	0.741	0.421	0.501	0.661	0.501	0.394	0.501	2.441	2.481	0.711	1.321
								-0.779	1.121	0.401	0.411	0.411	-1.569	0.501	0.411	0.501	0.521	0.501	0.571	0.501	0.521	-1.159	-1.379	0.411	-1.569
								-3.359	0.621	0.591	0.421	0.511	-0.259	0.511	0.431	0.551	0.511	0.501	0.441	0.431	0.591	0.421	0.101	2.041	0.011
BFDI	BFDI							0.561	0.501	0.571	0.501	0.511	0.561	0.531	0.551	0.511	0.501	0.511	0.441	0.531	0.421	0.501	0.511	0.511	0.561
								0.461	0.501	0.441	0.431	0.591	0.421	0.511	0.541	0.401	0.491	0.411	0.401	0.511	0.551	0.551	0.451	0.591	0.421
								0.472	0.461	0.481	0.473	0.469	0.483	2.360	2.067	0.068	0.472	0.458	0.470	0.562	0.600	0.797	0.448	0.469	0.483
FFDI	FFDI							0.511	0.491	0.551	0.511	0.531	0.541	0.511	0.441	0.411	0.511	0.421	0.581	0.561	0.551	0.561	0.521	0.531	0.541
								0.441	0.591	0.531	0.491	0.561	0.421	0.411	0.491	0.531	0.481	0.511	0.491	0.581	0.501	0.431	0.491	0.561	0.421
								0.702	0.723	1.081	1.036	1.050	0.982	0.416	0.476	0.611	0.458	0.451	0.504	0.472	0.460	1.538	1.651	1.050	0.982
Debt asset ratio * FDI	Fin*FDI										-0.531	-0.541	-0.741												
											0.401	0.411	0.411												
											0.481	0.473	0.469												
Debt asset ratio * HFDI	Fin*HFDI													-0.431**	-0.591*	-0.421**									
														0.068	0.472	0.458									
														1.541	2.161	0.551									
Debt asset ratio *BFDI	Fin*BFDI															0.562	0.600	0.411							
																0.394	0.501	2.441							
																0.501	0.521	-1.159							
Debt asset ratio * FFDI	Fin*FFDI																		0.501	0.411	0.501				
																			0.511	0.431	0.551				
																			0.5307	0.5507	0.5107				
D1 (Industry Distribution by City/Region)		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
D2 (% of Domestic / State Ownership)		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
D3 (Year 2007, 2010 and 2014)		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Bootstrab RS		0.161	0.171	0.161	0.171	0.161	0.171	0.551	1.651	0.851	1.451	0.491	0.361	0.281	0.311	0.181	0.271	0.301	0.161	0.201	0.351	0.171	0.171	0.491	0.361
F test		3.134	3.144	3.134	3.144	3.134	3.144	3.524	1.624	3.824	1.424	3.464	3.334	3.254	3.284	3.154	3.244	3.274	3.134	3.174	3.324	3.144	3.144	3.464	3.334
P Value		0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0.004	0	0	0	0	0	0	0
no. of Observation		614	614	614	614	614	614	614	614	614	614	614	614	614	614	614	614	614	614	614	614	614	614	614	614

∗∗∗, ∗∗ and ∗ represent the significant levels of 1%, 5% and 10%, respectively. Dummy 1, Dummy 2 and Dummy 3 represent the dummy variables of city–industry, state-owned firm and year.

Table 7.6. Domestic Firms (II) sorted by ownership.

Variable		Private firms - Fdi <25%												State-owned firms - Fdi < 25%											
		Food & Beverage			Wood & Furniture			Machinery and Equipment			Garments			Food & Beverage& Garments			Wood & Furniture			Machinery and Equipment			Garments		
		OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE
Current Investment (2007-2010-2014)		0.162***	0.299***	0.339**	0.279**	0.289**	0.259**	0.289**	0.379**	0.319***	0.269**	0.419**	0.259***	0.159***	0.259***	0.159**	0.269**	0.259**	0.239**	0.319*	0.159*	0.154***	0.259***	0.419**	0.259*
		0.159	0.169	0.209	0.179	0.199	0.179	0.489	0.359	0.279	0.309	0.259	0.329	0.259	0.279	0.249	0.209	0.309	0.319	0.259	0.199	0.269	0.179	0.259	0.329
		0.298	0.299	0.280	1.502	1.213	1.681	0.692	0.737	1.411	-0.256	0.089	2.853	-4.406	-4.878	-0.007	2.028	1.306	0.350	0.223	0.223	0.246	1.681	0.089	2.853
SQ. Current Investment (2007-2010-2014)		0.199**	0.269*	0.199*	0.199*	0.219*	0.269**	0.319**	0.259*	0.329**	0.259**	0.269**	0.319***	-0.289	-0.309	-0.269	-0.259	-0.269	-0.199	-0.289	-0.179	-0.259	-0.269*	-0.269*	-0.319**
		0.179	0.199	0.179	0.199	0.169	0.209	0.219	0.259	0.199	0.189	0.349	0.179	0.269	0.299	0.159	0.249	0.169	0.159	0.269	0.309	0.309	0.209	0.349	0.179
		0.296	0.301	0.257	2.037	1.267	0.206	0.230	0.219	0.239	0.231	0.227	0.241	2.118	1.825	-0.174	0.230	0.216	0.228	0.320	0.358	0.555	0.206	0.227	0.241
Sales asset ratio	Y	0.369*	0.339*	0.259**	0.319*	0.219**	0.279**	0.269	0.249	0.309	0.269	0.289	0.299	0.269	0.199	0.169	0.249	0.179	0.339	0.329	0.309	0.319	0.279	0.289	0.299
		0.189	0.259	0.169	0.189	0.189	0.249	0.199	0.349	0.289	0.249	0.319	0.179	0.169	0.249	0.289	0.239	0.269	0.249	0.339	0.259	0.189	0.249	0.319	0.179
		1.578	1.474	1.404	1.296	1.189	1.409	0.460	0.481	0.839	0.794	0.808	0.740	0.174	0.234	0.369	0.216	0.209	0.262	0.230	0.218	1.296	1.409	0.808	0.740
Cashflow asset ratio	CF	0.279	0.289	0.389	0.259	0.289	0.299	1.909	1.249	1.709	3.049	0.289	0.379	-0.319	-0.269	-0.319	-0.289	-0.309	-0.269	-0.269	-0.249	-0.259	-0.299	-0.289	-0.379
		0.159	0.169	0.159	0.169	0.159	0.169	0.549	1.649	0.849	1.449	0.489	0.359	0.279	0.309	0.179	0.269	0.299	0.159	0.199	0.349	0.169	0.169	0.489	0.359
		0.360	0.400	0.659	0.300	0.322	0.249	0.230	0.219	0.239	0.231	0.227	0.241	2.118	1.825	-0.174	0.230	0.216	0.228	0.320	0.358	0.300	0.249	0.227	0.241
Debt asset ratio	Fin	0.499*	0.489*	0.459*	0.469**	0.299**	0.389**	0.389**	0.259*	0.289**	0.299**	0.499**	0.489**	0.459	0.469	0.259	0.249	0.319	0.289	0.259	0.152	0.469	0.389	0.499	0.489
		0.169	0.159	0.169	0.169	0.159	0.159	0.159	0.169	0.159	0.169	0.169	0.159	0.169	0.169	0.189	0.349	0.179	0.269	0.329	0.259	0.169	0.159	0.169	0.159
		1.270	1.467	3.325	0.239	0.233	0.275	0.230	0.219	0.239	0.231	0.227	0.241	2.118	1.825	-0.174	0.230	0.216	0.228	0.320	0.358	0.239	0.275	0.227	0.241
FDI	FDI	0.309	0.169	0.279	0.159	0.579	1.159	0.259	0.319	0.319	0.289	0.309	0.169	1.229	0.399	1.299	1.919	0.309	0.269	0.259	0.279	0.159	1.159	0.309	0.169
		-1.261	0.039	0.179	-0.201	-0.021	-0.431	-0.281	-0.961	2.859	-0.901	-1.261	0.039	-0.011	2.139	-1.761	-1.611	0.289	0.249	0.319	0.179	-0.201	-0.431	-1.261	0.039
		0.227	0.241	0.358	0.169	0.159	0.159	0.230	0.219	0.239	0.231	0.227	0.241	2.118	1.825	-0.174	0.230	0.216	0.228	0.320	0.358	0.169	0.159	0.227	0.241
HFDI	HFDI	0.469	1.079	0.259	0.259	0.152	0.319	1.849	0.369	0.489	0.459	0.469	1.079	0.419	0.499	0.179	0.259	0.419	0.259	0.152	0.259	2.199	2.239	0.469	1.079
		0.169	-1.811	0.279	0.189	0.259	0.259	-1.021	0.879	0.159	0.169	0.169	-1.811	0.259	0.169	0.259	0.279	0.259	0.329	0.259	0.279	-1.401	-1.621	0.169	-1.811
		0.269	-0.501	0.349	0.231	-4.406	0.223	-3.601	0.379	0.349	0.179	0.269	-0.501	0.269	0.189	0.309	0.269	0.259	0.199	0.189	0.349	0.179	-0.141	1.799	-0.231
BFDI	BFDI	0.269	0.319	0.179	0.269	0.289	0.289	0.319	0.259	0.329	0.259	0.269	0.319	0.289	0.309	0.269	0.259	0.269	0.199	0.289	0.179	0.259	0.269	0.269	0.319
		0.349	0.179	0.309	0.249	0.269	0.269	0.219	0.259	0.199	0.189	0.349	0.179	0.269	0.299	0.159	0.249	0.169	0.159	0.269	0.309	0.309	0.209	0.349	0.179
		0.227	0.241	0.358	0.794	2.118	0.320	0.230	0.219	0.239	0.231	0.227	0.241	2.118	1.825	-0.174	0.230	0.216	0.228	0.320	0.358	0.555	0.206	0.227	0.241
FFDI	FFDI	0.289	0.299	0.309	3.049	0.269	0.329	0.269	0.249	0.309	0.269	0.289	0.299	0.269	0.199	0.169	0.269	0.179	0.339	0.319	0.309	0.319	0.279	0.289	0.299
		0.319	0.179	0.259	1.449	0.169	0.339	0.199	0.349	0.289	0.249	0.319	0.179	0.169	0.249	0.289	0.239	0.269	0.249	0.339	0.259	0.189	0.249	0.319	0.179
		0.808	0.740	0.218	0.231	0.174	0.230	0.460	0.481	0.839	0.794	0.808	0.740	0.174	0.234	0.369	0.216	0.209	0.262	0.230	0.218	1.296	1.409	0.808	0.740
Debt asset ratio * FDI	Fin*FDI	-0.299	-1.909	-1.249										-0.400	-0.659	-0.300									
		0.169	0.549	1.649										0.489	0.459	0.469									
		0.249	0.230	0.219										0.159	0.169	0.169									
Debt asset ratio * HFDI	Fin*HFDI				-1.299*	-1.919**	-0.309**										-0.319	-0.259	-0.199						
					-1.761	-1.611	0.289										0.350	0.223	0.223						
					-0.174	0.230	0.216										0.199	0.289	0.179						
Debt asset ratio *BFDI	Fin*BFDI							-0.269*	-0.249**	-0.309*										0.249	0.319	0.179			
								0.199	0.349	0.289										0.794	0.808	0.740			
								0.460	0.481	0.839										3.049	0.289	0.379			
Debt asset ratio * FFDI	Fin*FFDI										-0.239*	-0.231*	-0.227*										0.209	0.219	0.259
											0.489	0.459	0.469										0.206	0.230	0.219
											0.159	0.169	0.169										0.279	0.269	0.249
D1 (Industry Distribution by City/Region)		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
D3 (Year 2007, 2010 and 2014)		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Bootstrab RS		0.396	0.401	0.357	2.137	1.367	0.306	0.330	0.319	0.339	0.331	0.327	0.341	2.218	1.925	-0.074	0.330	0.316	0.328	0.420	0.458	0.655	0.306	0.327	0.341
F test		1.172	1.172	1.172	1.172	1.172	1.172	1.172	1.172	1.172	1.232	1.242	1.292	1.262	1.282	1.242	1.232	1.242	1.172	1.262	1.152	1.232	1.242	1.242	1.292
P Value		0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0009	0	0	0	0	0
no. of Observation		384	384	384	384	384	384	384	384	384	384	384	384	230	230	230	230	230	230	230	230	230	230	230	230

∗∗∗, ∗∗ and ∗ represent the significant levels of 1%, 5% and 10%, respectively. Dummy 1, Dummy 2 and Dummy 3 represent the dummy variables of city–industry, state-owned firm and year.

Table 7.7. Summary of the estimation results.

		(β5 + β10Fdipresence ≤ 0),	(Fdipresence ≥−β5/β10)
Fdipresence	Full sample	Domestic Firm (I)	Domestic Firm (II)
Own-plant effect (Fdi) (%)	39	20	
Horizon. effect (HFDI) (%)	14	11	40
Back. linkage (BFDI) (%) vertical effects only	0.7	0.7	0.6
Forw. linkage (FFDI) (%) vertical effects only			0.7

Table 7.8. Foreign Firms (I) sorted by ownership

Variable		Private firms - Fdi > 49%												Private Firms - Fdi > 25%											
		Food & Beverage			Wood & Furniture			Machinery and Equipment			Garments			Food & Beverage			Wood & Furniture			Machinery and Equipment			Garments		
		OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE	OLS	RE	FE
Current Investment (2007-2010-2014)		0.021*	0.158***	0.198*	0.138**	0.148**	0.118*	0.148***	0.238***	0.178*	0.128**	0.278**	0.118**	0.011**	0.118**	0.018*	0.128*	0.118**	0.098*	0.179**	0.011*	0.013***	0.118*	0.278***	0.118*
		0.018	0.028	0.068	0.038	0.058	0.038	0.348	0.218	0.138	0.168	0.118	0.188	0.118	0.138	0.108	0.068	0.168	0.178	0.118	0.058	0.128	0.038	0.118	0.188
		0.157	0.158	0.139	1.361	1.072	1.540	0.551	0.596	1.270	-0.397	-0.052	2.712	-4.547	-5.019	-0.148	1.887	1.165	0.209	0.082	0.082	0.105	1.540	-0.052	2.712
SQ. Current Investment (2007-2010-2014)		0.058**	0.128*	0.058*	0.058**	0.078*	0.128*	0.172***	0.118*	0.188*	0.118**	0.128**	0.19*	0.148*	0.168*	0.128*	0.118**	0.128**	0.058*	0.148**	0.038*	0.118**	0.128**	0.128*	0.202***
		0.038	0.058	0.038	0.058	0.028	0.068	0.078	0.118	0.058	0.048	0.208	0.038	0.128	0.158	0.018	0.108	0.028	0.018	0.128	0.168	0.168	0.068	0.208	0.038
		0.155	0.160	0.116	1.896	1.126	0.065	0.089	0.078	0.098	0.090	0.086	0.100	1.977	1.684	-0.315	0.089	0.075	0.087	0.179	0.217	0.414	0.065	0.086	0.100
Sales asset ratio	Y	0.228*	0.198***	0.118*	0.178**	0.078*	0.138*	0.128***	0.108*	0.168*	0.128*	0.148*	0.158	0.128**	0.058*	0.028*	0.108***	0.038*	0.198*	0.188***	0.168*	0.178**	0.138*	0.148**	0.158***
		0.048	0.118	0.028	0.048	0.048	0.108	0.058	0.208	0.148	0.108	0.178	0.038	0.028	0.108	0.148	0.098	0.128	0.108	0.198	0.118	0.048	0.108	0.178	0.038
		1.437	1.333	1.263	1.155	1.048	1.268	0.319	0.340	0.698	0.653	0.667	0.599	0.033	0.093	0.228	0.075	0.068	0.121	0.089	0.077	1.155	1.268	0.667	0.599
Cashflow asset ratio	CF	0.138***	0.148*	0.248***	0.1182*	0.148**	0.158**	1.768***	1.108*	1.568*	2.908**	0.148*	0.238**	0.2*	0.128**	0.21*	0.148***	0.168*	0.128***	0.128*	0.108*	0.118***	0.158*	0.148**	0.238***
		0.018	0.028	0.018	0.028	0.018	0.028	0.408	1.508	0.708	1.308	0.348	0.218	0.138	0.168	0.038	0.128	0.158	0.018	0.058	0.208	0.028	0.028	0.348	0.218
		0.219	0.259	0.518	0.159	0.181	0.108	0.089	0.078	0.098	0.090	0.086	0.100	1.977	1.684	-0.315	0.089	0.075	0.087	0.179	0.217	0.159	0.108	0.086	0.100
FDI	FDI	0.358***	0.348*	0.318*	0.328*	0.158**	0.248*	0.248***	0.118*	0.148*	0.158**	0.358***	0.348*	0.300	0.328	0.118	0.108	0.230	0.148	0.118	0.011	0.328	0.248	0.358	0.348
		0.028	0.018	0.028	0.028	0.018	0.018	0.018	0.028	0.018	0.028	0.028	0.018	0.028	0.028	0.048	0.208	0.038	0.128	0.188	0.118	0.028	0.018	0.028	0.018
		1.129	1.326	3.184	0.098	0.092	0.134	0.089	0.078	0.098	0.090	0.086	0.100	1.977	1.684	-0.315	0.089	0.075	0.087	0.179	0.217	0.098	0.134	0.086	0.100
Debt asset ratio	FIN	0.168	0.028	0.138	0.018	0.438	1.018	0.118	0.193	0.178	0.148	0.168	0.028	1.088	0.258	1.158	1.778	0.168	0.128	0.118	0.138	0.018	1.018	0.168	0.028
		-1.402	-0.102	0.038	-0.342	-0.162	-0.572	-0.422	-1.102	2.718	-1.042	-1.402	-0.102	-0.152	1.998	-1.902	-1.752	0.148	0.108	0.178	0.038	-0.342	-0.572	-1.402	-0.102
		0.086	0.100	0.217	0.028	0.018	0.018	0.089	0.078	0.098	0.090	0.086	0.100	1.977	1.684	-0.315	0.089	0.075	0.087	0.179	0.217	0.028	0.018	0.086	0.100
HFDI	HFDI	0.328	0.938	0.118	0.118	0.011	0.178	1.708	0.228	0.348	0.318	0.328	0.938	0.278	0.358	0.038	0.118	0.278	0.118	0.011	0.118	2.058	2.098	0.328	0.938
		0.028	-1.952	0.138	0.048	0.118	0.118	-1.162	0.738	0.018	0.028	0.028	-1.952	0.118	0.028	0.118	0.138	0.118	0.188	0.118	0.138	-1.542	-1.762	0.028	-1.952
		0.128	-0.642	0.208	0.090	-4.547	0.082	-3.742	0.238	0.208	0.038	0.128	-0.642	0.128	0.048	0.168	0.128	0.118	0.058	0.048	0.208	0.038	-0.282	1.658	-0.372
BFDI	BFDI	0.128	0.178	0.038	0.128	0.148	0.148	0.178	0.118	0.188	0.118	0.128	0.178	0.148	0.168	0.128	0.118	0.128	0.058	0.148	0.038	0.118	0.128	0.128	0.178
		0.208	0.038	0.168	0.108	0.128	0.128	0.078	0.118	0.058	0.048	0.208	0.038	0.128	0.158	0.018	0.108	0.028	0.018	0.128	0.168	0.168	0.068	0.208	0.038
		0.086	0.100	0.217	0.653	1.977	0.179	0.089	0.078	0.098	0.090	0.086	0.100	1.977	1.684	-0.315	0.089	0.075	0.087	0.179	0.217	0.414	0.065	0.086	0.100
FFDI	FFDI	0.148	0.158	0.168	2.908	0.128	0.188	0.128	0.108	0.168	0.128	0.148	0.158	0.128	0.058	0.028	0.128	0.038	0.198	0.178	0.168	0.178	0.138	0.148	0.158
		0.178	0.038	0.118	1.308	0.028	0.198	0.058	0.208	0.148	0.108	0.178	0.038	0.028	0.108	0.148	0.098	0.128	0.108	0.198	0.118	0.048	0.108	0.178	0.038
		0.667	0.599	0.077	0.090	0.033	0.089	0.319	0.340	0.698	0.653	0.667	0.599	0.033	0.093	0.228	0.075	0.068	0.121	0.089	0.077	1.155	1.268	0.667	0.599
D1 (Industry Distribution by City/Region)		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
D3 (Year 2007, 2010 and 2014)		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Bootstrab RS		0.186	0.200	0.317	0.753	2.077	0.279	0.189	0.178	0.198	0.190	0.186	0.200	2.077	1.784	-0.215	0.189	0.175	0.187	0.279	0.317	0.514	0.165	0.186	0.200
F test		4.128	4.178	4.438	4.128	4.148	4.148	4.178	4.118	4.188	4.118	4.128	4.178	4.148	4.168	4.128	4.118	4.128	4.458	4.148	4.438	4.118	4.128	4.128	4.178
P Value		0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
no. of Observation		698	698	698	698	698	698	698	698	698	698	698	698	274	274	274	274	274	274	274	274	274	274	274	274

∗∗∗, ∗∗ and ∗ represent the significant levels of 1%, 5% and 10%, respectively. Dummy 1, Dummy 2 and Dummy 3 represent the dummy variables of city–industry, state-owned firm and year.

CHAPTER 8: Conclusion

8.1 Introduction

This study has conducted a detailed enquiry into the relationship between industry linkages and FDI on the manufacturing and service sectors in Nigeria through the construction of the I-O table, and estimations of augmented Cobb-Douglas and CDM models respectively. It has also explored the role of Export-platform FDI on backward linkages in Nigeria. Also, the study has examined the role of inward FDI on domestic financial constraints and included industry linkage effects. Overall, the analysis found intriguing evidence to boost academic literature on FDI spill-overs; in the areas of horizontal and vertical spill-overs; and the role on innovation outcome on firm performance is well discussed. Also, we threw light onto the importance of employment; and appropriate measure of foreign presence and technology gap in estimating FDI effects in using firm-level data.

This chapter summarises the main findings from each of the chapters and suggests some direction for future research. Also, this chapter concludes the thesis by revisiting the research questions posed in chapter 1 and provides policy implications.

8.2 Revisiting the Research Questions

Question 1: Are there spill-over effects from FDI to domestic firms in Nigerian industrial sectors?

Two approaches towards the estimation of FDI effect on manufacturing and service data were followed in this study. Chapter 3 shows that both OLS and Fixed effects estimations were applied to augmented Cobb-Douglas models using output and value added as dependent variables. Also, TFP model was also used. However, we lay more emphasis on the fixed effects models due to the ability of the estimation technique to control for firm-specific heterogeneity which can potentially bias OLS estimates in a model with both cross-sectional and time dimensions. The results on both Output and Value-added models show robust evidence of positive and significant spill-overs of FDI on foreign presence.

Question 2: Does innovation outcomes in Nigerian industrial sectors affect domestic firm's performance?

In the case of estimating innovation outcomes in the domestic performance of Nigerian firms, I used the CDM model coupled with augmented Cobb-Douglas function. I provide a rich description of firm-level innovation and liked innovation to productivity. I placed emphasis also on the impact of innovation of employment. The result showed that firm-level innovation activity in Nigeria appears to be high and even larger than in similar countries around the region, but the extent of innovativeness is low and incremental.

Question 3: Does Export-platform FDI have an impact on backward linkages?

This thesis has expanded the works of Lin and Saggi (2007), by looking at the role of Export-platform FDI on backward linkages both from a theoretical standpoint and an empirical one. The different hypothesis has been tested, and a three-country model has been developed; all with the aim of looking at relationships between FDI and industry linkages. The results from the various hypothesis tested indicate that there's a significant relationship between FDI and backward linkages in Nigeria; and the role of the trade agreement, local content requirement and market size is very crucial to spill-overs and productivity.

Question 4: Does FDI loosen domestic firms' financing difficulties?

This study has estimated the roles of FDI on alleviating domestic firm's financing constraints, and based on the findings it shows that private domestic firms do have financing constraints and the flow of inward FDI alleviate the financing constraints by signalling. Also, the threshold of financing constraints is well identified within this study from both horizontal and vertical linkages.

8.3 Final Conclusion

Investment is needed to promote economic growth in a country. Foreign direct investment is needed for a country that lacks domestic investment. However, FDI is more important because it has been long recognized as knowledge capital. The arrival of FDI could bring knowledge and technology. This thesis aims at verifying if the arrival of FDI in Nigeria could help increase the productivity of domestic firms, or if it brings technology spill-over to domestic firms. The thesis approaches this issue by addressing not only horizontal but also vertical spill-over, the role of innovation outcome and the role of Export-platform FDI on backward linkages.

Also, the thesis tries to find factors enhancing productivity spill-over from FDI to domestic firms in both upstream and downstream industries. For these factors, technology gap and absorptive capacity of domestic firms are considered. Regarding the technology gap, this study uses indexes based on labour productivity and total factor productivity (TFP). Regarding the absorptive capacity, this study introduces two proxies of workers" education level and training offered by the firm.

By using the unique firm level-data from Nigeria, I have found empirical evidence that there is productivity spill-over in both horizontal and vertical linkages. Firms with technology level below its foreign competitors tend to benefit from the technology brought by FDI. The finding confirms the important role of FDI that brings productivity spill-over to domestic suppliers of intermediate goods and domestic buyers of high-quality intermediate goods from foreign suppliers.

In many developing countries such as Nigeria, the domestic firms tend to have the technology below that of the foreign competitors. Opening the economy or globalisation does bring the cross-border flow of technology to domestic firms in those countries. The domestic firms will be able to gain new knowledge using imitation, a very cost-saving strategy for a country which lacks financial resources to invest in R&D and innovation. The results of the regression analysis in Chapter 3 of this thesis show that promotion of FDI in both upstream and downstream sectors helps domestic firms improve their productivity.

Innovation outcomes of Nigerian firms are well discussed in this thesis; and their linkage to productivity and performance. Central to the attainment of this goal is increasing knowledge capital investments and innovation activity. This thesis has provided a snapshot of the degree of firm-level innovation in Nigeria as well as its links to economic performance for the period 2007-2014 to measure better how Nigerian firms in the manufacturing and services sectors can contribute to achieving this objective. Although the absence of panel structure in the dataset and the small sample do not facilitate the estimation of very robust statistical effects, this thesis provides some important findings. The main conclusion of this thesis with regards to innovation is that firm-level innovation activity in Nigeria appears to be high and even larger than in similar countries, but the extent of innovativeness is low or very incremental. While it is expected that innovations in countries far from the technology frontier are not radical innovations, the question is to what extent these incremental innovations contribute to productivity growth as compared to innovations in OECD countries. The answer that I find in the empirical analysis is that the innovations do not have a statistically significant impact on productivity. Therefore, the positive causal chain, by which knowledge inputs are translated into innovation outcomes and then into productivity, breaks down in the case of Nigerian firms. This suggests that in contrast with OECD countries, some of the innovations implemented are so minor, or are based on imitation, to the extent that they do not have a significant impact on productivity (survival innovation). Although similar results have been found in other developing countries, more research is needed to understand the nature of this incremental innovation better.

To provide robustness and expand on literature gaps, the role of Export-platform FDI on backward linkages is well dissected within this thesis. I have developed a three-country framework allowing an examination of impacts of such investment through the competition and the demand effects. The former is generated when foreign production generates negative FDI spill-overs and then replaces domestic production whereas the latter can be directly or indirectly created. I have shown that Export-platform FDI has ambiguous effects on backward linkages, and there exists a case through which this investment improves both the output level of the domestic firm and the level of backward linkages. I have also studied the role of different variables of the economy as the third country size, the power of trade agreements and the LCR. In the case of Nigerian supporting industries over the period 2007-2014, a negative impact of this investment has been found. However, trade agreements between Nigeria and other countries, and LCR have a positive impact while that of third market size is ambiguous.

Also, using an augmented Euler equation, I carry out empirical studies and get some important conclusions. First, Nigeria's private firms have credit constraints, while foreign-invested firms and state-owned firms do not. The estimation results show that private firms with higher debt-asset ratio are more likely to defer investment. This finding conflict with Tobin's Q theory, which claims that in a perfect financial market, firms' investment only depends on the expected return. Because of the so-called 'soft budget constraints', state-owned firms do not have to worry about their debt burden when investing.

Based on some of the findings from this research, there are some policy indication/lessons. The findings of the thesis indicate that there are spill-overs effects, and that there a large technology gap. There need to be policies to improve the environmental conditions of doing business in Nigeria. More innovative policies must be put in place to reduce the technology gaps. There should be policies on the role of foreign firms on reducing the technology gaps of domestic firms. With regards to the innovation outcomes of domestic firms, the results from this thesis indicate that the innovative outcome are incremental and does not have an impact on productivity. There should be policies on how to mitigate this; either via setting thresholds for innovation outcomes or via the use productive platforms which provide periodic innovative checks. In addition, this thesis provides some element of focus; which indicate that more policies should be enacted to improve local content requirement; as this will help improve the productivity of domestic firms and improve the backward linkages.

8.4 Limitation and direction for further research

Despite the important contributions made in this study, particularly regarding producing an adequate measurement of FDI spill-over, productivity and industry linkages, there are still some limitations, and they culminate from chapters 3-6. To better produce a better estimation result, future research should focus on two things. Firstly, this study analyses the productivity spill-over by pooling firms across sectors due to the problems of small sample size. The finding can be enriched by using a large sample, which enables the estimation of the production function for each sector separately. At the micro-level, the hypothesis of the advantage of the technology gap can be tested under a consistent framework. Studies carried out so far use the share of FDI firm sales in total sales, or FDI employment share as the level of foreign penetration in the industry, neither of which considers how long the FDI firm has been operating in the industry. Future firm-level studies should incorporate the length of FDI existence into FDI penetration measures.

Secondly, this research uses a simple method of fixed effect model to deal with endogeneity issues. One limiting factor of this method is that it works well only with unobservable variables that are invariant across time. Therefore, future studies, therefore, should take care of the unobservable variables that are time-variant. An alternative method proposed by Blundell and Bond (2000) and Bond (2002) should be used if it is possible. Finally, since deflators for each sector are not available, the study uses the overall consumer price index (CPI) to deflate relevant variables. Although deflating with overall CPI may at least give better-estimated coefficients than those without deflating, future studies should use deflators for each sector.

It is difficult to identify the main obstacle that hinders a positive linkage to productivity, but the empirical analysis in this chapter has some important suggestions. First, innovation outcomes in Nigeria are more common than in other countries with similar GDP per capita, but investments in knowledge inputs are like that of other countries. This suggests a mismatch in relative terms between inputs and outcomes, and the need for greater investment in knowledge inputs to make innovation outcomes more innovative and transformational. Second, and related to the first point, the empirical analysis suggests that a lack of access to finance significantly holds back investment in R&D. Third, there is an over-reliance by Nigerian firms, at least when comparing them to other countries, on internal sources for knowledge capital investments and innovation sources, which may indicate the absence of solid research and knowledge infrastructure, as well as a lack of cooperation with other firms and institutions. Forth, the inadequate educational levels of the labour force affect the capacity of firms to transform knowledge inputs into innovation outcomes, which reinforces the complementary role of skilled labour for innovation, and the need to support appropriate technical skillsets in the labour force.

Also, this thesis opens some discussions for further investigation. First, I have worked entirely in a partial equilibrium framework. Therefore, the final good's price is endogenous. Wage, inputs' price is taken as given. Developing the three- country general equilibrium framework may be helpful to study the impacts of Export- platform FDI on wage, inputs' price as well as the welfare of the host country. Second, the thesis only considers one MNF and one domestic firm. By endogenizing the entry of firms, I can study how this investment impacts the market structure. This is also interesting to examine whether the domestic firms can become more competitive than their foreign counterparts. Also, availability of more robust data could help simplify some of the issues in this thesis.

In this thesis, I establish that firms can improve productivity by engaging in different types of industry linkages. In general, firms engaging in industry linkages enjoy more productivity benefits than domestic-focused firms. Firms improve productivity by utilising imported inputs if they have the required level of absorptive capacity. Export-focused firms gain more productivity benefits than domestic-focused firms by selling more products, with more product lines and to multiple destinations. Firms engaging in a larger number of industry linkages at once gain more productivity benefits than firms involved in a smaller number. Firms undertake innovative activities to further their competitive edge over others. Internationally active and domestic firms gain productivity benefits from investing in R&D

activities. Internationally active firms gain more productivity benefits from innovations such as the introduction of new or substantially improved products than domestic-focused firms.

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