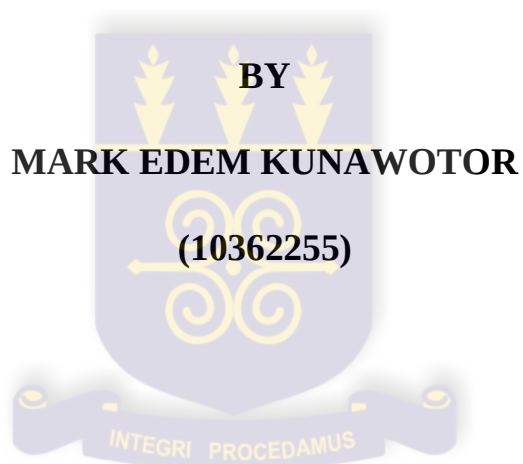


UNIVERSITY OF GHANA

**FINANCIAL ACCESS AND FIRMS' PRODUCTIVITY IN SUB-
SAHARAN AFRICA**



**THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA,
LEGON IN PARTIAL FULFILLMENT OF THE REQUIREMENT
FOR THE AWARD OF MPhil FINANCE DEGREE**

JUNE 2016

DECLARATION

I do hereby declare that this thesis is the result of my own original research and has not been presented by anyone for any academic award in this or any other university. All references used in the work have been fully acknowledged. Nonetheless, I bear sole responsibility for all errors and omissions within the work.

.....

MARK EDEM KUNAWOTOR

(10362255)

.....

DATE



CERTIFICATION

I hereby certify that this thesis was supervised in accordance with the procedures laid down by the University of Ghana.

.....

DR. CHARLES ACKAH
(PRINCIPAL SUPERVISOR)

.....

DATE

.....

PROF. GODFRED ALUFAR BOKPIN
(CO-SUPERVISOR)

.....

DATE



DEDICATION

I fully dedicate this work to the memory of my late and ever amazing father, Mr. Fred Kunawotor. I say God bless you for all your support.



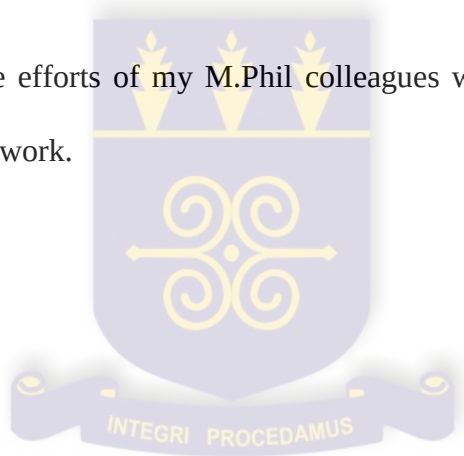
ACKNOWLEDGEMENTS

I give glory to God Almighty for his faithfulness and his sure promises towards my educational career. I thank my parents for their sacrifices financially, spiritually and all forms of encouragement during my Masters program.

Special thanks to my supervisors Prof. Godfred Alufar Bokpin and Dr. Charles Ackah for their useful comments and guidance. I also want to thank my lovely friend Hannah Tieku, for her assistance in diverse forms and her encouraging words.

Another thanks to Prof. Godfred Alufar Bokpin for his good counsel and fatherly love, God bless you Sir.

Finally, I appreciate the efforts of my M.Phil colleagues who in one way or the other have contributed to this work.



ABSTRACT

This study aimed at finding the effect of financial access and other potential determinants on productivity of firms in Sub-Saharan Africa. Data was sourced from the World Bank's Enterprise Survey for 2,830 manufacturing firms collected over the period 2003 – 2014.

With the aid of the Semi-parametric approach by Levinsohn and Petrin which uses intermediate inputs to proxy for unobservable productivity shocks, total factor productivity was estimated and regressed on several variables including financial access proxied by line of credit/loan and access to an overdraft facility. The result indicates that access to cost-effective line of credit/loan or an overdraft facility has positive and statistically significant effect on firms' productivity.

Using firms' age, size and location as control level variables, the study found foreign ownership, exports and internationally-recognised quality certification to be positively related to productivity whilst frequent power outages and female managers to adversely affect productivity. These findings are consistent with robustness checks using alternative approaches.

The study therefore suggests that credit constraints should be significantly relaxed, starting with governments in Africa lessening their policy rates. Also firms should acquire internationally recognised quality certification and take part in exporting of their products as well as allowing foreign partnerships on their shareholding structure.

TABLE OF CONTENTS

DECLARATION	i
CERTIFICATION	ii
DEDICATION.....	iii
ACKNOWLEDGEMENTS.....	iv
ABSTRACT	v
TABLE OF CONTENTS	vi
LIST OF TABLES.....	ix
 CHAPTER ONE	 1
INTRODUCTION	1
1.1 Background of the study	1
1.2 Statement of the research problem.....	4
1.3 Objectives of the study.....	6
1.4 Justification of the study	6
1.5 Organization of the study.....	6
 CHAPTER TWO	 8
LITERATURE REVIEW	8
2.1 Introduction.....	8
2.2 The Concept of Productivity	8
2.3 The concept of financial Access and its measures	10
2.4 Theoretical Review	12
2.4.1 Growth Accounting Framework.....	12
2.5 Production function measurement issues	13
2.6 Empirical Evidence on Financial Access and Productivity Nexus	14
2.7 Empirical Evidence on the Determinants of Productivity	16
2.8 Finance and Growth: the Linkage and Channels	19
2.9 Productivity in Africa and Why African firms have low TFP	21
2.10 Conclusion	23
 CHAPTER THREE	 24
METHODOLOGY	24

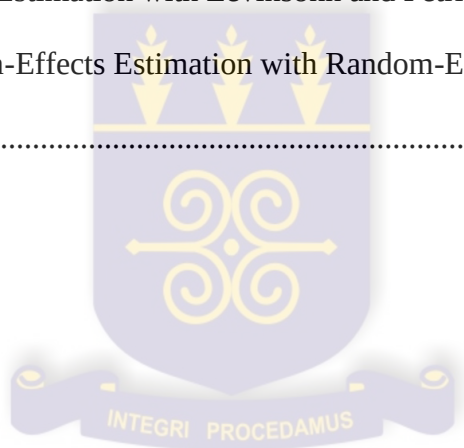
3.1 Introduction.....	24
3.2 Data and Sources.....	24
3.3 Estimating Total Factor Productivity (TFP)	25
3.4 Productivity Estimation techniques and Methodological Issues.....	27
3.5 Model Specification	29
3.6 Choice of Empirical Model Estimation Technique.....	31
3.7 Explanation and Measurements of Variables.....	32
3.8 Variables and A priori Expectations	35
3.9 Countries and Periods	36
 CHAPTER FOUR	 38
PRESENTATION OF DATA AND ANALYSIS	38
4.1 Introduction.....	38
4.2 Summary Statistics of Productivity Estimators and Productivity	38
4.3 Summary statistics of Production Function Estimates.....	39
4.4 Discussion of summary statistic of variables used in regression analysis	42
4.5 Econometric Issues	44
4. 5.1 Test of Multicollinearity.....	44
4.5.2 Endogeneity concerns.....	45
4.6 Empirical Findings.....	46
4.6.1 GLS Random-Effects Estimation with Levinsohn and Petrin Method for TFP	46
4.7 Robustness checks.....	51
4.7.1 Robust OLS Estimation.....	51
4.7.2 GLS - Random Effects with Random Effects (OLS) used for TFP	53
4.8 Conclusion	55
 CHAPTER FIVE	 56
SUMMARY, CONCLUSION AND RECOMMENDATION.....	56
5.1 Introduction.....	56
5.2 Summary	56
5.3 Conclusion	59
5.4 Policy Recommendations.....	59

REFERENCES	61
APPENDIX.....	65



LIST OF TABLES

Table 3.1: Table showing variables to be used in the regression and a priori expectations	36
Table 3.2: Countries under consideration and Periods	37
Table 4.1: Summary Statistics	38
Table 4.2: Production Function Estimates.....	39
Table 4.3: Summary Statistic of regressors	42
Table 4.4: Correlation Matrix	44
Table 4.5: GLS Random-Effects Estimation	46
Table 4.6: Robust OLS Estimation with Levinsohn and Petrin for TFP	52
Table 4.7: GLS Random-Effects Estimation with Random-Effects (OLS) Method for TFP	54



CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The debate on financial development and economic growth has been in existence since the early 1900s. Evidence (Levine, 2005) suggests that financial development can impact output either through macro or micro level. Levine and Warusawitharana (2014) pointed out that one crucial way of distinguishing the linkage by which financial development impacts economic growth is by assessing the nexus between financial access and productivity at the firm level.

There may seem to be more important factors to firms' existence but one key component that cannot be neglected is the firms' productivity. I cannot agree more with Nobel Laureate Paul Krugman when he said "Productivity isn't everything, but in the long run it is almost everything" (Chen & Guariglia, 2011). Productivity is defined as efficiency in production and can be measured in two ways; partial or total. The most widely used measure however is the total factor productivity (TFP). This, according to neoclassical theorist, Solow (1957), is a residual of output after all factors especially input components of labour and capital have been accounted for. In other words, TFP is the output share of a firm that is inexplicable by the amount of labour, capital and other input factors used in the production process. The partial measure which is total output per unit of input such as labour (labour productivity) has inherent limitations such as its inability to show clearly why productivity varies across firms (Nto & Mbanasor, 2011) and hence hardly used in most empirical studies. Every effort to enhance firms' productivity growth is instrumental and one way of doing so is by identifying and enhancing its determinants.

There are so many determinants however, of firms' productivity that have been identified in the literature. Chauvet and Jacolin (2015) identified the following firm characteristics to affect productivity; whether the firm is foreign owned or not, size of the firm, firms' access to credit, whether the firm is state owned or not and whether the firm exports its products or not. They also identified the following country level characteristics; Corruption, GDP growth, population and income. Nto and Mbanasor (2011) mentioned skilled labour, cost of raw materials, years of operation, access to credit and distance to a nearby market as the main determinants of TFP in agribusiness firms in Nigeria. Teal et al. (2006) identified export orientation, foreign ownership, firm size and age for differences in TFP.

Though most of these identifiable determinants are explored further in the subsequent sections, this study's main concentration will be on the effect of financial access on productivity of firms since empirical evidence (Wolf, 2007) indicates that most of these determinants hinge on the firms' access to finance.

Access to finance refers to easy availability and cost-effectiveness of financial products and services to firms. The 2008 World Bank finance for all report posits that, there are three main channels through which finance and more especially external finance affects firms' productivity and growth; easy access to finance enables most firms in their initial upcoming and helps them to be more innovative. Secondly, finance enables firms' to take advantage of economies of scale and it opens more investment doors. Finally, easy access to finance is needed to acquire more efficient productive asset portfolio. Chen and Guariglia (2011) also argued that efficiently functioning financial markets can offer easy and cheap loans to firms for innovative projects.

Getting access to finance is an undeniably imperative factor for firm efficiency and growth. One most significant way of achieving this is government boosting through innovative financial policies geared towards improving access which can empower firms to achieve efficiency. The literature informs us that most firms and especially those in African countries lack easy access to financial services and products and are highly financially constrained. This is one major reason for stunted growth and uncompetitiveness among African countries in world trade. Beck, Demirguc-Kunt and Maksimovic (2005) asserts in a survey that financial constraint had the highest toll on firm's productivity growth among a host of other constraints that includes corruption and legal factors that these firms face. World Bank (2008) and International Finance Corporation (2013) reports indicate that most firms are significantly constrained by lack of access to finance especially in Sub-Saharan Africa.

Firms with greater access to finance have higher TFP than those without (Goedhuys et al., 2006). The interpretation they gave to this phenomenon is that either firms with high level of productivity are entitled to more funds or productive projects are not being undertaken because of financial constraints. They grouped determinants of TFP into institutional variables (regulation and business association, access to external finance, regulation and government support and health of workforce) and technological variables (foreign ownership, quality of management and licensing).

There is enough empirical evidence pointing to the capability of improved financial access in promoting firms' growth and the lack of its access in creating unnecessary friction and stifling productivity growth (Chauvet & Jacolin, 2015; Harrison, Lin & Xu, 2014; Arnold et al., 2008; Muhammad, 2006; Besley, 1994). Contrary to this positive nexus, Chen and Guariglia (2011) opinionated that in spite of serious financial constraint faced by Chinese firms, they continue to show strong growth in productivity. This

therefore necessitates an in depth study of the precise link between finance and firms' productivity in developing countries of which Sub-Saharan Africa is paramount.

1.2 Statement of the research problem

There is a positive relationship between financial development and economic growth. Much empirical evidence (World Bank, 2008; Beck & Laeven, 2006; King & Levine, 1993; Schumpeter, 1911) has documented this fact. The channel through which this happens however is a grey area which is still being researched as indicated by numerous authors (Levine & Warusawitharana, 2014; Osei-Assibey, 2013; Gatti & Love, 2008; World Bank, 2008). One such channel is the linkage between financial access and firms' productivity measured mostly as Total Factor Productivity (TFP) which in turn affects economic growth and development.

It is imperative to study about TFP growth and more especially within African economies because most empirical evidence suggests that cross-country differences in growth of gross domestic products per capita are mainly due to differences in TFP among these countries and not due to factor accumulation (Chen & Guariglia, 2011; Zheng et al., 2009; Easterly & Levine, 2001; Hall & Jones, 1999) and Africa has been identified as the slowest growth region of the world (Wolf, 2007; Akinlo, 2005).

However, the few studies that documented on TFP either used industry-level data focusing on industry-level determinants of productivity or country-level macroeconomic determinants (Akinlo, 2005; Biatour, 2011), although evidence (Gal, 2013) indicates that using firm-level data has the potential to more credibly identify the effects of certain policies than studies using only industry-level or country-level data. Other studies; (Chen & Guariglia, 2011; Osei-Assibey, 2013 and Ahiakpor & Dasmani, 2012; Krishnan,

Nandy & Puri, 2012; Gati & Love, 2008) focused on specific countries such as Chinese manufacturing firms, Ghanaian firms, US firms and Bulgarian firms respectively. None of these studies seem to explore the specific link between financial access and firm-level determinants of TFP in Sub-Saharan Africa.

Moreover, a couple of these studies (Nto & Mbanasor, 2011; Osei-Assibey, 2013; Gatti & Love, 2008) used cross-sectional data set constructed in their respective countries with its inherent limitations of accurately estimating TFP over time, as well as the finance-productivity growth causality.

This present study overcomes this barrier using a more reliable World Bank's Enterprise survey panel data set. Arnold, Mattoo and Narciso (2008) who studied on sub-Saharan African firms focused on access to services inputs (telecommunication, electricity and financial services) and productivity whilst Ahiakpor and Dasmani (2012) focused on how perceived financial constraint affects productivity.

In addition, it is consequential to make an in depth study of the determinants of TFP of which a key component financial access, has been neglected in the literature because survey data on firm's access to finance is quite enormous (World Bank, 2008) but the empirical evidence on the link between financial access and firm's productivity has been limited (Levine & Warusawitharana, 2014; Chen & Guariglia, 2011; Gatti & Love, 2008). The research questions that emerge from the above are:

1. What is the linkage between financial access and firms' productivity in Sub-Saharan Africa?
2. What are the firm-level determinants of TFP among African manufacturing firms?

1.3 Objectives of the study

This study specifically addresses the following objectives;

1. To determine the effect of access to finance on firms' productivity in Sub-Saharan Africa.
2. To find out the firm-level specific determinants peculiar total factor productivity in Sub-Saharan African economies.

1.4 Justification of the study

Empirical evidence points to the fact that TFP is the main driver of cross-country differences in GDP per capita and hence identifying its determinants is urgent. Moreover, the determinants of TFP which have been identified in the developed world for which policy recommendations have been made may not apply to countries in Sub-Saharan Africa. Also empirical evidence shows that the impact of financial access on economic growth and development hinges more on firms access to such credit rather than households' access. This study using firm-level data will identify specific determinants of TFP which are peculiar in the African context to inform policy in the sub-region and bridge the knowledge gap between financial access and firm productivity in the sub region. Findings from this study will also inform policy on how to enhance productivity on the African continent besides adding to literature which is in dearth.

1.5 Organization of the study

This study is organized into five main chapters. Chapter one entails the background of the study, problem statement, objectives of the study, the motivation behind the study and how the study is organized. Chapter two discusses and reviews relevant but detailed

empirical literature. The third chapter involves methodological issues including type and source of data used for the study as well as estimation techniques. Chapter four which is the most critical part presents and thoroughly discusses the findings. The last but not the least chapter summarizes the study, suggests plausible recommendations and concludes.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Productivity is not just another subject matter but a very peculiar and relevant topic of global concern. Many firms' and countries existence largely depend on their productivity. This chapter therefore reviews and gathers empirical literature relevant and related to the subject matter; productivity and finance. It begins with an illustration of how important productivity is, the definition and how it is measured. It continues with a theoretical review of growth accounting framework which is rooted in the theory of production. It further discusses few methodological issues that may arise with production function estimations. Financial access, its definitions and measurements and empirical evidence on the relationship between financial access and productivity are not left out. A detailed discussion of the determinants of productivity is next on the agenda, followed by the channels through which finance affects growth. Chapter two ends with a brief diet on productivity in Africa and why Sub-Sahara African countries lag behind.

2.2 The Concept of Productivity

The effect of productivity on economies cannot be overemphasized and explained any further than it sounds and echoes. Productivity growth is said to be the main factor responsible for long run growth in per capita income, welfare and overall standard of living of nations (Haltiwanger & Bartelsman, 2011). This simply summarizes how important productivity is and how the subject matter needs to be addressed each time it comes to the fore. It is estimated (Nin-Pratt et al., 2012) that Total Factor Productivity (TFP) has been growing far below potential on the African continent at an average rate of 2.1% in the 2000s (2001-2010) up from the 1.4% growth rate in the 1990s. A scalar

of two of the current amount is anticipated for any meaningful change to take place on the continent. Therefore measures, approaches and studies to boost productivity are always welcome which is the main focus of this present study.

Productivity can broadly be explained as the efficiency by which inputs are turned into outputs (Syverson, 2011; Hulten, 2001). Productivity is also commonly defined as a ratio of a volume measure of output to a volume measure of input used.

Productivity has so many intended objectives as to why it is measured. Productivity measurement enables us trace changes in technology and changes in efficiency. It helps to identify the real cost savings associated with production and also identify inefficiencies, as well as serving as a means of identifying changes in standards of living (OECD, 2001).

Productivity assumes two forms of measurement. It can be measured by the partial method or by Total Factor Productivity (TFP) approach. Partial method or single-factor productivity means output per unit of input. Example is output per unit of labour called labour productivity. Partial approach however, has limitations of not indicating why there is change in productivity level across firms (Nto & Mbanasor, 2011) and what accounts for such productivity. Studies that used labour productivity in its measurement include studies by Ali and Najman (2015) and Goedhuys, Janz and Mohnen (2006).

Total Factor Productivity (TFP) on the other hand refers to the share or portion of output of a firm, an industry or a country that cannot be explained by the amount of labour, capital and intermediate inputs used in production (Biatour et al., 2011). Since TFP is a residual after all factors of production are taken care of, it is said to be a measure of ignorance, misspecification or omitted variable. TFP is also used as a proxy for technical efficiency. A lot more studies used TFP as a measure of productivity than labour

productivity. Few of these studies are Gatti and Love (2008); Ackah et al., (2012); Levine and Warusawitharana (2014). Others used TFP alongside labour productivity for the sake of robustness checks (Krishnan, Nandy & Puri, 2014).

2.3 The concept of financial Access and its measures

The depth of financial development and financial inclusion is of paramount interest to all countries. The G20 financial inclusion indicators identified financial inclusion to comprise of the following dimensions; access to financial services, usage of financial services and quality of products and service delivery. The dimension of financial inclusion which is of essence to this study is financial access. Most establishments rely on various forms of external and internal finance to grow their businesses largely depending on its availability, cost and the firms' policy directives and preference. World Bank (2008) records that all effort to encourage and promote more access to financial services hasn't been fruitful in practice as much as it has gained popularity in theory, mainly because much empirical work hasn't been done to link financial access to economic growth and development and hence providing at best cloudy guide for policy formulation and accurate decision making.

Financial access according to Demirguc-Kunt and Levine (2008) is the "absence of price and non-price barriers to finance". Barriers include obstacles such as information asymmetry, high transaction cost and collateral requirements. In simple terms, access to finance refers to easy availability and cost-effectiveness of financial products and services to households and most especially, firms.

The 2008 World Bank report has it that, less than half of the populace of developing countries have access to financial services at the household level whilst less than one in

five households do in Africa. This they say has led to high income inequality and stunted growth because poor households and small entrepreneurs who cannot get access to financial services rely on their own meager personal funds and savings, with its adverse effects of foregoing quality education of themselves and their wards and also foregoing good business opportunities.

Improved financial access provides an atmosphere for new firms and businesses to thrive. It also promotes many startups, innovation and growth. The direct effect of this is job creation and improved standards of living through higher wages and salaries. Lots of firms usually cite lack of access to finance as a major constraint. Teal et al. (2006) for instance mentioned that about 70% of small firms in Africa cite lack of access to credit as their major problem whilst a little over 20% of large firms do likewise. In a more recent survey, the International Finance Corporation (2013) reiterated the fact that lack of access to finance serves as the major constraint facing businesses in Sub-Saharan African economies with adverse effects on employment, growth and shared prosperity.

Access to finance, which is this study's focus, can be measured in various ways. Whilst some studies use access to an overdraft facility, others use access to a credit line also known as a line of credit or loan. Some few studies also use having a savings or checking account. Quite a number of recent studies use the extent to which finance serves as a constraint to firms' growth. Using the latter indicator however requires a converse interpretation since a negative relationship with productivity or performance will be expected.

Access to external finance is imperative because empirical evidence suggest that lack of access to external funds is the main barrier to firms' growth in developing countries. Demircuc-Kunt and Maksimovic (2008) pointed out that firms in developing countries

and countries with poor regulatory institutions are entitled to less external finance, more specifically, bank finance.

It should however be noted that, access to external funds depends on many factors including the firms' internal resources, the business environment of the country concerned, soundness of the proposed projects to be undertaken, the risk inherent in the project among other factors.

The 2008 World Bank policy research report based on empirical evidence concluded that the effects of financial development on economic growth will mainly be felt if there is an improvement in granting enterprises financial access.

2.4 Theoretical Review

2.4.1 Growth Accounting Framework

The theoretical framework of the growth accounting approach is deeply rooted in the economic theory of production (OECD, 2001). The framework assumes that the production function relates output to various inputs such as capital, labour and intermediate inputs and contains a Hicks neutral shifter (affects all inputs proportionally). It also assumes that the production function exhibits constant returns to scale. There are however, different models of productivity growth; the classical models (Malthus-Ricardo model and Harrod-Domar model), the neoclassical model and the new growth models. Briefly narrated below are the latter two which mainly underline this present study.

The neoclassical models

The neoclassical model of growth pioneered by Robert Solow explains that exogenous technical progress drives productivity growth because of diminishing returns to capital.

Thus, productivity growth can be attributed to more capital accumulation, but only in the short run, due to diminishing returns. In the long run however, any improvement in productivity is explained by exogenous factors rather than endogenous causes (capital and labour). The neoclassical model uses the production function as shown below, though it is extensively discussed in the methodology section. $Y_{it} = A_{it}F(K_{it}, L_{it})$. The Solow model explains that “A” which represents productivity is exogenously determined.

New growth models (Endogenous growth models)

New growth model explains productivity growth with endogenous technical progress by ignoring diminishing returns to capital or by citing internal reasons for technical progress (Stiroh, 2001). The model explains that, the neoclassicals failed to consider the effects of research and development and also the stock of knowledge that may be available to firms, and hence diminishing returns has no effect. Thus, whilst the neoclassicals think that “A” is determined outside the model, the new growth theorists think it is determined within the model. They see “A” which is technical progress measured by TFP as a deliberate investment in human capital and research and development (Biatour, Dumont & Kegels, 2011).

2.5 Production function measurement issues

Quite a number of issues arise in estimating production functions and productivity. A critical question that needs to be answered is how should output and inputs be measured? Whilst some studies measure gross output using revenue/sales (Fernandes, 2006; Saliola & Seker, 2011; Ahiakpor & Dasmani, 2012), others (Ospina & Schiffbauer, 2010; Levine & Warusawitharana, 2014) use value added. Better still, few other studies

(Biatour et al., 2011; Ackah et al., 2012) use both gross output and value added approaches. None of these measures seems superior or preferred to the other. In most cases, it is as a result of choice depending on the data available since the value added approach requires the availability of data on intermediate inputs. Sales/Revenue is mostly used however, after it is deflated using a price deflator series with a given year as base. Another issue that may arise is how labour should be measured. Some studies use the number of employees at the firm and others use the total cost of labour employed. Capital is mainly measured as the book value of the asset after accounting for depreciation whilst intermediate input is measured using intermediate materials, fuel and other utilities depending on the data available.

2.6 Empirical Evidence on Financial Access and Productivity Nexus

This section reviews works on the relationship between access to finance especially external credit and productivity of firms. The discussion begins with the profound and seminal work of Gatti and Love (2008), whose findings revealed access to credit to impact strongly and positively on productivity of a sampled 548 Bulgarian firms. They used access to a credit line and an overdraft facility as alternative measures of access to credit. By means of estimation, the Levinsohn and Petrin (2003) approach was used as their measure of productivity and Ordinary Least Square (OLS) was used for both robustness check of productivity measure and as the main technique for the second stage regression. The findings of Chauvet and Jacolin (2015) did not differ from that of Gatti and Love. Proxying their finance variable as access to an overdraft facility with a sample of 5000 firms in 29 developing and emerging countries, it was revealed that access to an overdraft facility is positively and significantly related to the performance of firms.

Study by Krishnan, Nandy and Puri (2014) also shows that increased access to bank financing plays a positive role in affecting the productivity of smaller and financially constrained firms. Their study unlike the others was based on a natural experiment of private and public manufacturing firms in the United States of America, after an interstate banking deregulation which increased access to bank financing. Robb and Robinson (2014) had similar line of thought as they found increased access to bank finance to be noted to play a very critical role in firms' productivity, especially for small and start up firms who need bank finance to operate. It is evident in their study that a large proportion of startups rely heavily on bank debt financing. Ayyagari, Demirguc-Kunt and Maksimovic (2007) discovered through a sample of 17, 000 firms in 47 countries that, external finance plays a very critical role in firms' innovation whilst Ali and Najman (2015) found line of credit and savings or checking account to be positively related to productivity measured by Total Factor Productivity (TFP).

Furthermore, in relation to the above discussion, Goedhuys, Janz and Mohnen (2006) opined that access to external finance (credit) results into a higher TFP for Tanzanian manufacturing firms, whilst Levine and Warusawitharana (2014) found debt finance to be associated with higher total factor productivity in four European countries; Spain, France, Italy and United Kingdom.

Findings in China also line up to the above. Du and Girma (2012) observed in a large survey of Chinese firms that access to domestic bank loans was positively related to productivity of much bigger firms and firms with foreign investment, whilst self-raised finance was instrumental to the growth of smaller firms, medium firms and domestically private-owned firms.

Though, the literature has it that access to finance directly affects productivity, there are limitations to the interpretation of this result that need to be addressed (Krishnan, Nandy & Puri, 2014). Reverse causality and endogeneity concerns arise as to whether it is easy access to finance that makes firms more productive or more productive firms seek access to additional finance.

Some other studies measure their finance variable as a constraint. Ali and Najman (2015) for instance revealed that the more severe the perceived access to finance is an obstacle for a sample of firms in 33 African and developing countries, the less productive they are; and the more access to external finance they are granted, the better is the productivity. International Finance Corporation (2013) also identified the lack of access to finance as a major hindrance to enterprise growth and productivity especially among small and medium sized ones. The findings of Arnold, Mattoo and Narcisso (2008) didn't differ. They mentioned that the more firms are prevented from exploiting productivity-enhancing investment opportunities, the more pervasive it is for them to get credit facilities from banks.

2.7 Empirical Evidence on the Determinants of Productivity

There exists abundant empirical evidence on the determinants of productivity. Whilst some of these determinants are country level or industry level determinants, others are firm level determinants. It should however be indicated here as a reminder that this study's focus is on firm-level determinants.

In their investigation on the determinants of productivity among Tanzanian manufacturing firms and with the aid of data from World Bank Investment Climate Survey, Goedhuys, Janz and Mohnen (2006), identified technological variables such as

foreign ownership, International Organisation for Standardisation (ISO) certification and high education of management to have significant positive effect on productivity among variables which includes research and development and innovation. They also found institutional variables such as access to formal credit and being a member of a business association as important determinants of productivity.

In Osei-Assibey (2013), the use of debt finance or loan is associated with higher productivity after controlling for age, firm size, location and industry dummies on a sample of Ghanaian medium and small enterprises with data sourced from the Ghana Living Standards Survey (GLSS 5). In the same vein in terms of country, while using the stochastic frontier approach in estimating the production function and data sourced from the World Bank Enterprise Survey, Ahiakpor and Dasmani (2012) revealed that perceived access to finance negatively affects efficiency of firms in Ghana. Firms were asked the extent to which they perceived access to finance as an obstacle; no obstacle, minor, moderate, major or very severe obstacle. They found female-owned firms to be more efficient than male-owned ones and managerial experience to have same effect on efficiency whilst age of the firm to have adverse effect on efficiency.

Another strand of literature headed by Arnold, Mattoo and Narciso (2008) studied on service inputs and productivity of firms and discovered that factors such as, good access to telecommunication inputs and foreign owned firms, had significant positive effect on productivity of manufacturing firms in some selected Sub-Saharan African economies, whilst difficulty in accessing credit and power outage had adverse effect on productivity. The latter variable implying that firms that operate in regions where there are frequent power outages are more likely to be less productive. The main conclusion that can be drawn from their study is that, hindrances to essential services such as telecommunication, power and financial services adversely affect productivity. The

findings of Teal et al. (2006) focusing on some selected Sub-Saharan African countries including South Africa, Nigeria, Kenya and Tanzania discovered that exporting firms have higher productivity than non-exporting ones. They also found foreign ownership, firm age and size to be highly correlated with productivity.

Findings from Chinese manufacturing firms differ a little from previous ones. Sheng and Song (2013) found firms' productivity (TFP) to be highly and positively correlated with investment in research and development activities, firm size, market share and market reforms, but negatively related with market monopoly power.

One important work worth mentioning is by Chauvet and Jacolin (2015) who distinguish between firm level determinants and country level determinants. They identified foreign ownership, size, export and overdraft facility as statistically significant and positive firm-level determinants of productivity, whilst citing GDP growth, income per capita, population and corruption as country level determinants. Fernandes (2006) found smaller firms to be more productive than large firms in Bangladesh. Also firms' age, firms with more educated workforce and more experienced managers are found to be more productive. In the same study, foreign owned firms and exporters are significantly more productive than those who are not. Finally, firms with research and development activities and internationally recognized quality certification, overdraft facility are also more productive whilst power supply on the other hand harms productivity measured by TFP.

Other broad determinants of productivity are industry level determinants of productivity which includes research and development, investment in ICT, market regulation, human capital and international trade as shown by Biatour, Dumont and Kegels (2011). Also some macro level determinants of productivity (see Akinlo, 2005) are external debt,

inflation, agricultural value added as a percentage of GDP, lending rate and local price deviation from purchasing power parity. All these aforementioned factors negatively impact productivity. Others which affect productivity positively are export to GDP, human capital, credit to private sector as percentage of GDP and foreign direct investment as a percentage of GDP.

In summary to this section, there are industry-level, country-level macroeconomic determinants and firm-level determinants of productivity. Focusing mainly on the firm-level, the predominant determinant of productivity/efficiency identified in the literature are age, research and development, export, ownership status, location, power supply, quality certification, access to external credit, firm size, education of the workforce and managerial experience. The variables which this study introduced and are mostly not in other studies are both alternative measures of financial access; line of credit and overdraft facility, female manager, certification and power outage.

2.8 Finance and Growth: the Linkage and Channels

Finance affects economic growth in diverse ways. One major focus of this present study is to explore the channels through which this happens. This section explains with empirical evidence the transmission mechanism through which finance measured by financial development, financial deepening, financial inclusion and financial access affect economic growth.

The debate on the role of finance on growth and development dates back to the works of Schumpeter (1911) who concluded that financial intermediation through savings mobilization, risk management, project evaluation, monitoring of managers and transactions facilitation are highly essential for innovation and economic development.

Ever since then, much literature abounds to prove that finance really has positive effects on growth of countries. King and Levine (1993) profound study titled “Finance and Growth: Schumpeter might be right” came up with findings supposedly consistent with the findings of Schumpeter that various indices of financial development are strongly and positively correlated with real per capita GDP growth of about 80 countries between the period 1960 - 1989. They used the ratio of liquid liability of the financial system to GDP and the proportion of credit allocated to the private enterprise by the financial system to measure financial depth. They further stated that, financial services affect growth through the increased rate of capital accumulation and the efficiency with which capital is used by economies.

A major channel through which finance affects growth is through improvement in productivity (Chen & Guariglia, 2011). Also financial deepening makes long term funds available for long term projects hence reducing the liquidity risks inherent in using short term funds for long term projects. Whilst a large strand of empirical literature exists for these studies (finance-growth nexus) at the aggregate level, few studies turn their attention to the more granular level .i e. firm and household levels (Levine & Warusawitharana, 2014). The potential channels through which finance affect productivity they indicated is through firms’ carrying out more research and development into new products and rigorous advertising of their existing products, though they also mentioned that more research is needed to identify the precise channels.

A good and developed financial market is so competitive that the cost of external finance is at its minimal with its attendant positive effects on productivity of firms and economic growth of countries. It thus alleviates poverty and reduces income inequality even at the household level.

The voice of World Bank (2008) deepened this discussion through their identification of three important and precise channels through which finance affects growth at the firm level; Easy access to finance enables most firms in their initial upcoming and helps them to be more innovative. Secondly, finance enables firms' to take advantage of economies of scale and it opens more investment doors. Finally, easy access to finance is needed to acquire more efficient productive asset portfolio.

2.9 Productivity in Africa and Why African firms have low TFP

The 2015 African competitiveness report of the World Bank mentioned that Africa has been growing at an average rate of 5% over the past 15 years with little or no trickle-down effects on their populace. Before then, most African countries have had slow growth rates over decades; and almost all Sub-Saharan African countries almost never meet their projected economic growth rates. One possible reason for the low economic growth rates and underdevelopment amongst other factors is the low productivity growth (Wolf, 2007). Amongst the host of reasons for the low productivity are financial constraints particularly for small firms, corruption, uncertain government policies and poor rule of law.

It is long established in literature that African countries export non diversified commodities and the average manufactured products as a percentage of export lags behind 10% according to the World Development Indicators. The dominant forms of exports are primary and traditional products with little or no value added. Examples of such products include crude oil, raw cocoa beans, coffee, cashew, gold bars, pineapple, ginger etc. The prices of these products keep falling or at best stable at relatively low prices on the international market, a contributory factor for low industrial growth rates.

Firm-level evidence (Eifert et al., 2005) suggests that high indirect cost and business environment related losses are hindrances to African firms' performance relative to other countries. Another characteristic of African businesses is that they are sparsely distributed along ethnic lines with low productivity recorded, and making allowance for new entrants difficult, as compared to businesses with foreign ownership which are far more productive.

Human resources also play a significant role in firms' growth. The human capital base measured by education and health is of essence than the physical capital base. However, the skills level of most African entrepreneurs lack behind. Many are unskilled in business proposal writing and inexperienced in business management unlike their foreign counterparts; a major reason for high and quick start up of businesses with high failure rates. Africa's business climate is characterized with myriad challenges including bureaucratic and cumbersome administrative processes, poor road network, high utility tariffs, high interest rates and taxes, frequent power outages, under developed and deficit infrastructural services and frequent changes in governments necessitating changes in business policies.

Policy documents suggest that African countries need to boost productivity across all sectors probably by shifting towards value addition which can create more employable opportunities to the ever increasing but youthful population thereby enhancing an all inclusive growth.

It may be worth reiterating that growth in Sub-Saharan Africa hinges more on productivity of firms. Any research to enhance knowledge and efforts directed towards enhancing productivity is worthy of encouragement.

2.10 Conclusion

There are many strands of literature on productivity but it is still not clear what the firm-level determinants of productivity may exactly be. The recurring determinants identified are age, managerial experience, power outage, finance, certification, ownership status, export orientation, research and development, innovation, high educated workforce and access to essential services like water, electricity and telecommunication. This study tries its best to come out with some determinants of firm level productivity in Sub-Saharan African economies.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter outlines the methods used in the study. It discloses the sources of data, the sample size, scope of the study, approaches to estimating productivity, empirical model, description and justification of variables, the estimation techniques, a priori expectations of the variables used and countries in the sample with the periods of data collection.

3.2 Data and Sources

The data is sourced from the World Bank's Enterprise surveys which collects standardized panel data set with uniform sampling methods and as such, constrains minimal errors comparable among countries. The enterprise survey is a firm-level survey designed to collect panel data sets of a representative sample of an economy's private sector, usually the manufacturing and service sectors. These surveys cover business environment topics including access to finance and performance indicators which capture production function variables.

Panel data of firms has advantage over cross sectional and time series data because of heterogeneity in units. It also gives more informative data, more variability, less collinearity among variables, more degrees of freedom, more efficiency and minimal biases (Gujarati, 2004).

The sample for this study covers 15 Sub-Saharan African countries between 2003 and 2014 due to data availability, but with a good representation of the major countries of concern as shown in the last section of this chapter. However, due to large number of missing observations, the study focuses only on the manufacturing sector with examples

of products such as food, textiles, metals, chemicals, machinery and equipment. The sample of manufacturing firms used for this study totaled 2,830.

3.3 Estimating Total Factor Productivity (TFP)

Production function could take several forms such as the Transcendental Logarithmic (Translog) production function, Constant Elasticity of Substitution (CES) and Cobb-Douglas production function. This study just like other empirical studies (Chen & Guariglia, 2011; Osei-Assibey, 2013; Gatti & Love, 2008; Arnold et al., 2008; Eifert et al., 2005) uses the Cobb-Douglas production function in estimating Total Factor Productivity (TFP).

The Cobb-Douglas production function expresses output (sales) as a function of labour, capital and intermediate inputs. It also contains “ A_{it} ” which is the main variable of concern when estimating productivity. It captures the residual after accounting for all input variables and it is used to measure productivity. i. e. it represents changes in output (sales/revenue) which cannot be accounted for by the various inputs. The process of estimating TFP is shown below;

$$Y_{it} = A_{it} K_{it}^{B_1} L_{it}^{B_2} M_{it}^{B_3} \dots \dots \dots (3-1) \text{ Where}$$

Y_{it} represents Output/Sales of firm i in time t

K_{it} represents Capital stock

L_{it} represents Labour

M_{it} represents intermediate inputs

A_{it} represents Total Factor Productivity (Hicks neutral shifter) of firm i at time t

B_1 , B_2 and B_3 are capital, labour and intermediate input shares respectively

i and t means all variables vary with firm and time.

If the input shares (B_1 , B_2 and B_3) sum up to 1, the production function exhibits constant returns to scale, less than 1, the production function exhibits decreasing returns to scale and more than 1, the production function exhibits increasing returns to scale.

The next step in estimating TFP is by taking the natural log of the production function (the logs are used in order to estimate average level firm input elasticities, which shows the degree of responsiveness of output to changes in the various inputs used in the production function). This results in a linear production function as shown in equation (3-2);

$$\ln Y_{it} = \ln A_{it} + B_1 \ln K_{it} + B_2 \ln L_{it} + B_3 \ln M_{it} \dots (3-2a)$$

Since equation (2a) is estimated using a regression, it can be expressed as;

$$\ln Y_{it} = B_0 + B_1 \ln K_{it} + B_2 \ln L_{it} + B_3 \ln M_{it} + \varepsilon_{it} \dots (3-2b)$$

TFP is measured as the residual (Solow residual) and expressed as;

$$\ln A_{it} = \ln Y_{it} - B_1 \ln K_{it} - B_2 \ln L_{it} - B_3 \ln M_{it} \dots (3-3)$$

$$\ln A = B_0 + \varepsilon_{it} \dots (3-4)$$

B_0 is the mean productivity across firms over time.

ε_{it} is the deviation from the mean productivity for firm i at time t .

TFP is finally estimated as the exponential of the sum of the residual and constant;

$$TFP_{it} = \exp(B_0 + \varepsilon_{it}) \dots \dots \dots (3-5)$$

Thus, Total Factor Productivity (TFP_{it}) serves as this study's dependent variable.

3.4 Productivity Estimation techniques and Methodological Issues

Total Factor Productivity can be estimated using several approaches notably; OLS, Fixed Effects, Random Effects, Generalised Method of Moments (GMM), Olley and Pakes (1996) and Levinsohn and Petrin (2003). However, only the methods used in this study which are pooled OLS, Fixed Effects and Levinsohn and Petrin (2003) method are briefly discussed with their inherent limitations.

Ordinary Least Square (OLS)

It is believed that the use of the traditional method of Ordinary Least Square (pooled OLS), which in estimating TFP on a panel of firms has inputs choices more likely to be correlated with productivity resulting in what is termed as simultaneity or endogeneity bias (Van Beveren, 2010), hence biased and inconsistent estimates.

Fixed Effects

Fixed Effects/Random Effects is the traditional method used to deal with the simultaneity bias or endogenous input issue. Fixed effects however, require a restrictive assumption that firm-observed productivity is time-invariant which is imprecise, given that panel data which is used in most cases as well as in this study, spans over periods (Staal & Brogaard, 2011).

This model is expressed in equation (3-6). Lower case letters are used to represent the natural logarithm of the production function, with “y” representing output, “k”

representing capital, “l” representing labour, “m” representing intermediate inputs, “w” represents deviation from mean productivity which is observed by the firm but unobserved by the econometrician and “u” represents deviation from mean productivity which is unobserved by both the firm and the econometrician.

$$y_{it} = B_0 + B_1 k_{it} + B_2 l_{it} + B_3 m_{it} + w_i + u_{it} \dots (3-6)$$

It can be observed from equation (3-6) that the firm observed mean productivity which is the intercept doesn't have the time dimension; “t” subscripts supposing that it is invariant with time. Estimating equation (3-6) removes the simultaneity and endogeneity concerns, hence resulting in consistent and unbiased coefficients. However, extant literature (Akerberg et al., 2007; Van Beveren, 2010) has indicated that fixed effect does not perform well in practice and also produces capital shares or elasticities that are unreasonably low.

Levinsohn and Petrin (2003) Method

At the base of the Levinsohn and Petrin (2003) approach is the Olley and Pakes (1996) method. Olley and Pakes (1996) semi-parametric approach tried to solve the simultaneity issue inherent in the pooled OLS and Fixed effects approaches by using the firms' investment as proxy for unobserved productivity shock. It requires a monotonicity condition of investment strictly increasing in productivity (Van Beveren, 2010) implying that only observations with positive investments are considered. This results in significant loss of data, creating somewhat inefficient and biased coefficients. Also, a number of firms can report zero investment which is ignored by Olley and Pakes (1996).

Levinsohn and Petrin (2003) addressed this concern by using intermediate inputs as a proxy for unobserved productivity shock. Most firms, especially manufacturing firms, report positive usage of intermediate inputs; raw materials, intermediate goods, fuel, etc,

hence its use as proxy for unobserved productivity shock retains a lot more observations than the Olley and Pakes method. For the technicalities of all the productivity estimations (see Levinsohn and Petrin, 2003; Olley and Pakes, 1996; Van Beveren, 2010)

This study therefore, uses the semi-parametric method by Levinsohn and Petrin (2003) in estimating productivity (TFP), because of its upper hand in controlling for simultaneity between firms inputs and productivity shocks with intermediate input as proxy, capital as a state variable and labour as a free variable. The OLS and Random effect are used as alternatives for robustness checks. STATA software was used to generate all the results including all the regressions.

3.5 Model Specification

The second major procedure after estimating productivity (TFP) will be to regress TFP_{it} on several of its policy variables. The main policy variable of concern in this present study is financial access proxied by access to an overdraft facility or a line of credit/loan.

Other potential determinants of firms' productivity identified in the literature are ownership status, export orientation, power outage, female manager, managerial experience and certification. According to Akinlo (2005) however, empirical theory does not indicate any particular determinant to be included in an empirical model. This study will therefore use the stepwise approach of adding as many significant variables as the data may provide.

Also, firm level control variables as suggested by recent studies (Osei-Assibey, 2013; Du and Girma, 2012; Gatti and Love, 2008) to be included in the model include age, size

and location. To the extent that all these control variables are significant, a positive relationship with productivity is expected.

The specification of the empirical model is as shown below;

$$TFP_{it} = B_1 FinAcc_{it} + B_2 FirmChar_{it} + B_3 FirmCont_{it} + u_i + u_t + \varepsilon_{it} \dots\dots\dots (3-7) \text{ Where}$$

TFP_{it} is total factor productivity of firm i in time t

$FinAcc_{it}$ is a proxy for financial access of firm i in time t which is the key explanatory variable. Alternative measures of financial access used in this study are overdraft facility and line of credit/loan

$FirmChar_{it}$ is a vector of firm i's characteristics at time t which includes; ownership status, export orientation, power outage, female manager, managerial experience and certification.

$FirmCont_{it}$ is a vector of firm level control variables which includes age of the firm, firm size (large, medium) and location.

B_1 , B_2 and B_3 are the parameters to be estimated on financial access, firm characteristics and firm controls respectively.

U_i is the firm specific effect

U_t is time specific effect

ε_{it} is the idiosyncratic error

3.6 Choice of Empirical Model Estimation Technique

Panel data regression models can be estimated using several approaches including Generalized Method of Moments, Instrumental Variables, Fixed Effect and Random Effect. The latter two are the most commonly used and are discussed briefly below.

Fixed Effects model explains that although the intercept term may be different across firms, each firm's intercept is time-invariant, i.e. does not change over time. Fixed effect has the limitations of generating multicollinearity especially when there are so many variables in the model, making imprecise the coefficient/parameter estimates.

The Random effect also called Error Components Model on the other hand, assumes that, firms' have a common mean value for the intercept term and the individual differences in the intercept values of each firm are reflected in the error term. The random effect assumes that the individual error components are not correlated with each other and are not autocorrelated across both cross-section and time series units (Gujarati, 2004).

The choice of the error components model or fixed effect depends largely on the researcher's assumption about the likely correlation between the firm, or cross section specific error component (ε_i) and the explanatory variables (X's). If it is assumed that ε_i and the X's are uncorrelated, random effect may be appropriate whilst the fixed effect may be more appropriate if there is any such correlation.

It should however be mentioned that, if the number of time series data (T) is large and the number of cross-sectional units is small (N), there is likely to be a little difference in the values of the parameters estimated by either the fixed effect or random effect, and hence the choice is based on computational difference (Gujarati, 2004).

The Hausman test is the preferred test performed to decipher on the choice between fixed effect and random effect. The null hypothesis underlying the Hausman test is that, the fixed effect model and random effect model estimators do not differ substantially. It further suggests that the random effect is more appropriate. Rejection of the null hypothesis therefore, will imply that the error component model (random effect) is not appropriate, and hence the fixed effect will be preferred.

The Hausman test performed for this study in the choice between fixed effect and error component model in estimating the determinants of TFP is shown in Appendix 1. The error component model was chosen because $\text{Prob}>\chi^2 = 0.1445$, implying the failure to reject the null hypothesis at the 5 per cent significant level.

It should be noted that the fixed effect model produced highly insignificant and inconsistent results in both cases for which the random effect model was used, resonating the essence of the usage of the random effect.

3.7 Explanation and Measurements of Variables

Output/Sales (Y_{it}): This is measured as the monetary value of all manufactured goods sold during the year. All sales data have been converted to international dollars and deflated using country-specific GDP deflators with 2010 used as the base year. The exchange rates and GDP deflators are sourced from World Development Indicators (WDI).

Capital (K_{it}): Capital is measured as Net book value of firms' capital stock or assets. This is computed as the purchase value of assets minus depreciation. Assets include buildings, structures, machinery, plants and equipment. Capital stock was also deflated as sales.

Labour (L_{it}): Labour is measured as the total cost of labour including total annual wages, salaries and annual benefits. Labour cost was also deflated.

Intermediate inputs (M_{it}): This comprises of the annual cost of all inputs used in the production process. It includes raw materials and intermediate goods as well as fuel.

Financial access (Y_{it}): Financial access is measured by the extent to which the firm has access to an overdraft facility, a line of credit or a loan facility.

Overdraft facility as per the World Bank's Enterprise survey refers to a flexible account that allows firms to draw upon in the event their account balance becomes negative. The firm will incur fees or are subject to interest payments if they exercise this option. Overdraft is measured as a dummy variable with "1" if the firm has an overdraft and "0" if otherwise.

Line of credit is also defined in the survey as an available amount of credit that the establishment can draw upon or leave untapped. Lines of credit usually carry monthly interest rates, and are repaid quickly (as soon as the establishment's cash flow allows for repayment). They may or may not have a defined date of expiration. Line of credit/loan is measured as a dummy variable with "1" if the firm has a line of credit/loan and "0" if otherwise.

Loan is generally a much less flexible form of finance. It comes in fixed amounts (rather than ranges), carries annual interest rates (either fixed or floating), and a determined term to maturity (finite period for repayment).

Location: This refers to the geographical location of the firm. That is whether the firm is located in the capital city or otherwise. Location is measured as a dummy with “1” for firms’ located in the capital city and “0” if otherwise.

Foreign ownership: This refers to whether the firm is owned by a resident or a foreigner. Ownership is defined in terms of the nationality of the shareholders. A firm is considered to have foreign ownership if at least 10% of ownership is held by foreigners. If the firm has less than 10% foreign ownership, it is classified as domestically owned. i.e. foreign ownership is also a dummy with “1” for firms that have at least 10% foreign stake and “0” for firms that have less than 10% foreign stake.

Export orientation: This refers to whether the firm exports part or all of its products or services. A firm is said to be an exporter if at least 10% of its annual sales is exported. Export is classified as a dummy with “1” if the firm exports at least 10% of its annual sales and “0” for exports less than 10% of annual sales.

Firm size: Firm size has to do with whether the firm is small, medium or large. A small firm is a firm that employs 5-19 employees inclusive. A medium firm is one that employs between 20 and 99 employees inclusive whilst a large firm employs 100 or more people. It is created as a dummy with “1” for large and “0” if otherwise and “1” for medium and “0” if otherwise with the reference group being small firms.

Firms’ age: Age refers to the number of years the firm has been in operation in the country of concern. Age is a continuous variable and computed as the difference between the year the survey was undertaken minus the year the firm was established, plus one.

Managerial experience: This has to do with the number of years the top manager has worked with the firm. Top manager refers to the highest management personnel of the firm. It is also a continuous variable.

Female Manager: This has to do with the top manager heading the firm being female. It is classified as a dummy with “1” representing female manager and “0” if otherwise.

Certification: Certification implies whether the firm has received and still has an internationally- recognized quality certification. Example is International Organisation for Standardization (ISO). It is also a dummy with “1” for firms that are internationally certified and “0” if otherwise.

Power Outage: This refers to the average number of days in a month the firm experienced power outages during the fiscal year. It is classified as a continuous variable.

3.8 Variables and A priori Expectations

This section with the aid of Table 3.1 summarizes how the variables used in the model are classified with their a priori expectations. A positive nexus is expected between productivity and line of credit, overdraft, age, certification, large, medium, location in capital, foreign ownership, export and managerial experience. Whilst a negative relationship is expected between productivity and age squared, managerial experience squared and power outage. The relationship between female manager and productivity is open and could take any sign.

Table 3.1: Table showing variables to be used in the regression and a priori expectations

Variable	Classification	Expected Sign (+/-)
Line of credit/Loan	Dummy variable	+
Overdraft	Dummy variable	+
Location in capital City	Dummy variable	+
Foreign Ownership	Dummy variable	+
Firm size (large)	Dummy variable	+
Firm size (Medium)	Dummy variable	+
Power outage	Continuous variable	-
Export status	Dummy variable	+
Firms age	Continuous variable	+
Firms age squared	continuous variable	-
Managerial Experience	Continuous variable	+
Managerial Exp squared	Continuous variable	-
Quality certification	Dummy variable	+
Female Manager	Dummy variable	+/-

3.9 Countries and Periods

The last section of this chapter briefly summarizes the countries used in the study and the years for which the panel data was collected. These countries had panel data set collected for two separate years but only few firms had data of the same firm in both years limiting the cross sectional nature of the data.

Table 3.2: Countries under consideration and Periods

Country	Period for Panel data
Angola	2006, 2010
Botswana	2006, 2010
Burkina Faso	2006, 2009
Cameroon	2006, 2009
DRC	2010, 2013
Ghana	2007, 2013
Kenya	2007, 2013
Malawi	2009, 2014
Mali	2007, 2010
Nigeria	2007, 2014
Senegal	2003, 2007
South Africa	2003, 2007
Tanzania	2006, 2013
Uganda	2006, 2013
Zambia	2007, 2013

Source: World Bank Enterprise Survey

CHAPTER FOUR

PRESENTATION OF DATA AND ANALYSIS

4.1 Introduction

This chapter begins by presenting a summary statistics of the productivity estimators and thereafter estimates productivity using three approaches. It discusses the summary statistics of the regressors used in the second stage estimation and also addresses econometric concerns of endogeneity and multicollinearity. It further touches on the main empirical findings with few robustness checks and finally concludes.

4.2 Summary Statistics of Productivity Estimators and Productivity

Table 4.1: Summary Statistics

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
ln_Sales	2830	14.05492	3.790926	5.183258	27.64247
ln_Capital	2830	6.281263	1.742734	0	7.658227
ln_Labour	2830	12.1178	3.725933	4.087796	26.3656
ln_Intermediate	2825	12.78358	3.982537	3.363099	27.02933
ln_TFP	2830	7.944146	2.38059	2.162691	18.64314

Source: Author's computation from World Bank data (2016)

Table 4.1 is a summary statistic of the variables used in estimating productivity and the natural logarithm of the estimated productivity itself. These variables are the natural logarithm of sales, capital, labour and intermediate inputs represented as *ln_sales*, *ln_capital*, *ln_labour* and *ln_intermediate* respectively. The average sales, capital, labour, intermediate inputs and total factor productivity are 14, 6, 12, 13 and 8 respectively. Though the summary statistics is worth presenting, not much exposition is needed here

since much explanation of the more desired productivity estimates are presented in the next section.

4.3 Summary statistics of Production Function Estimates

Table 4.2: Production Function Estimates

	OLS	RE	LEVPET
ln_Labour	0.4752009**	0.475201**	0.416324**
	*	*	*
	(0.0253943)	(0.017217)	(0.024159)
ln_Capital	0.0260897**	0.02609**	0.169686
	*		
	(0.014076)	(0.011511)	(0.435566)
ln_Intermediate	0.479986***	0.479986**	
		*	
	(0.0246822)	(0.016101)	
Constan	1.998915***	1.998915**	
t		*	
	(0.1010957)	(0.098217)	
R²	0.9212	0.9212	
N	2,825	2,825	2,825
Wald	test	constant	return
of			to scale
		s	Chi²
			=
			0.63

The dependent variable is natural log of sales and robust standard errors are in parenthesis.

*** and ** indicate significant level at 1%, and 5% respectively.

Table 4.2 shows the summary statistic of the coefficients or input elasticities of variables used in estimating productivity (TFP) using the Levinsohn and Petrin (2003) method (LEV PET), Random Effects (RE) and pooled Ordinary Least Square (OLS) techniques. The input elasticities of all three models conform to previous traditional empirical findings with pooled OLS and Random Effects estimates producing almost similar results, but for the statistically significant level of capital and the standard errors for all inputs which seem slightly different.

The input factor elasticity for OLS and Random Effect sums up to 0.982 which is approximately 1 and hence in terms of returns to scale, depicting a constant returns to scale. This explains that when all inputs (capital, labour and intermediate) increase by a proportion, output increases by the same proportion. It should further be noted that, but for capital using the Random Effects, all other inputs are highly significant even at 1% significant level, depicting the strong suitability of the Cobb-Douglas production function for these firms.

It can also be observed that labour and intermediate inputs (raw material, intermediate goods and fuel) accounted for 96% variation in annual sales of firms in Sub-Saharan Africa with a paltry 2% usage of capital. This confirms that most firms in Africa are more labour-intensive, produce low value-added products and use little capital for manufacturing; one major fact identified in literature to be responsible for its slow pace development. All three inputs are jointly significant and explain 92% variation in sales.

Turning now to the more robust Levinsohn and Petrin (2003) method which uses labour as a free variable, intermediate inputs as a proxy variable and capital as a state variable, and since intermediate input is used as a proxy for unobserved productivity shock, it is lost in the process of estimating total factor productivity.

Labour coefficient under the Levinsohn and Petrin (2003) method as can be seen from Table 4.2 decreases slightly to 0.42 whilst capital increases significantly to 0.17 from 0.48 and 0.03 respectively; a plausible indication of correcting simultaneity and endogeneity bias otherwise present in the Random Effects and OLS. The null hypothesis of wald test of constant returns to scale (whether the input elasticities sum to one) is rejected even at 5% significant level indicating a decreasing returns to scale of 0.6. This finding is not farfetched from the findings of Qureshi and Velde (2007) who had decreasing returns to scale of 0.72 for Zambian firms using the Levinsohn and Petrin (2003) estimation approach, Gatti and Love (2008) who had 0.71 for Bulgarian firms and Eberhardt and Helmers (2010) who had 0.55 for UK firms.

The estimation of TFP used as the regressand in the second stage regression was carried out mainly using the Levinsohn and Petrin (2003) method because it supposedly addresses all the major productivity estimation concerns as indicated in the methodology section. The Random effects which gave similar result as the OLS is used for robustness check.

4.4 Discussion of summary statistic of variables used in regression analysis

Table 4.3: Summary Statistic of regressors

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Age	2830	17.54311	14.33397	1	108
Power outage	2827	9.249027	18.28688	0	500
Managerial Experience	2830	15.23604	10.00909	0	61
Certification	2830	0.1208481	0.3260082	0	1
Overdraft	2830	0.2975265	0.4572509	0	1
Line of Credit	2830	0.239576	0.4269001	0	1
Exporter	2830	0.1890459	0.3916143	0	1
Foreign owned	2830	0.159364	0.3660798	0	1
Large-size	2830	0.0159011	0.1251149	0	1
Medium-size	2830	0.024735	0.1553438	0	1
Location	2830	0.1477032	0.3548682	0	1
Female Manager	2830	0.0229682	0.1498285	0	1

Source: Author's computation from data (2016)

The descriptive statistics of variables used in the second model are presented in Table 4.3. The average age of the firms used in the analysis is 18 years meaning that the sample of firms used in the study have been in existence for quite a reasonable number of years for which it should be productive. The average power outage is 9 times in a month. This presupposes that firms operate with interrupted power outages averaging 9 times in a typical month which is expected to have an adverse effect on the firms' productivity. Also, the average number of years the top manager has worked in a typical firm is 15 years. This is quite high considering the fact that the labour turnover in most Sub-Sahara African countries is on the high side.

It can also be observed from Table 4.3 that 12% of firms used in this study have an internationally-recognised quality certification for their operation. Also, approximately 19% of these firms export at least 10% of their annual sales whilst 16% have at least 10% foreign ownership in terms of shareholding status. It is expected that these variables should positively impact on the productivity of firms.

In addition to the above, 2% and 2.5% of the sampled firms are large-sized and medium-sized firms respectively, whilst the remaining 95.5% are small-sized firms. 15% of firms are also located and operate in the capital city of their respective countries and 2% have females as the top manager.

Finally, in terms of the variables used as proxy for financial access, 24% of the firms have a line of credit or loan from a financial institution whilst 30% have an overdraft facility. It is the study's expectation that both access to a line of credit/loan and an overdraft facility should impact productivity positively.

4.5 Econometric Issues

4. 5.1 Test of Multicollinearity

Table 4.4: Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13
ln_TFP (1)	1.00												
Age (2)	0.22	1.00											
Overdraft(3)	0.23	0.25	1.00										
LineCredit (4)	0.12	0.21	0.41	1.00									
Cert (5)	0.18	0.19	0.13	0.19	1.00								
Export (6)	0.19	0.24	0.21	0.19	0.24	1.00							
Foreign (7)	0.21	0.16	0.20	0.11	0.23	0.21	1.00						
Large (8)	0.00	0.01	0.03	0.05	0.12	0.02	0.09	1.00					
Medium (9)	-0.02	-0.03	0.02	0.05	0.04	0.00	0.09	-0.02	1.00				
Location(10)	-0.15	-0.16	-0.09	-0.05	-0.04	-0.09	0.00	0.25	0.20	1.00			
Female (11)	-0.07	0.00	-0.00	0.01	0.00	0.03	-0.02	-0.02	0.04	-0.00	1.00		
Powerout(12)	-0.05	-0.00	-0.01	0.00	-0.01	-0.01	-0.02	-0.03	-0.03	-0.01	0.01	1.00	
ManExp (13)	0.11	0.46	0.18	0.15	0.03	0.13	0.06	0.00	-0.00	-0.07	-0.01	0.06	1.00

Source: Author's computation from data (2016)

The correlation matrix of all explanatory variables and dependent variable used in the regression is presented in Table 4.4. The correlation between ln_TFP and the explanatory variables is of no concern and all the variables came out with their expected signs. Also, there is no alarming concern for multicollinearity, high correlation among the explanatory variables, since none of the variables had a correlation value of 0.5 or more.

Overdraft and line of credit which were used as alternative measures of financial access had pairwise correlation of 0.41 which confirms that these variables are quite different in themselves and hence were introduced in the regression model at different times.

4.5.2 Endogeneity concerns

Endogeneity issues may arise as to the direction of causality between TFP and its determinants. For instance, whether access to a line of credit/loan or an overdraft facility is responsible for firms being more productive or instead more productive firms have easy access to credit.

This same analogy of causality applies to foreign owned firms and firms that export. i.e. whether being a foreign owned firm or exporting firm causes them to be more productive or rather productive firms are more able to export and to gain foreign influence in terms of part control. These issues in theory could be rectified with the use of instrumental variables that are correlated with these aforementioned productivity determinants and not with productivity measure (TFP), but are in most cases in practice, are not available (Fernandes, 2006).

However, this study corrects for these endogeneity issues by controlling for firm specific and year effects and using firm controls such as location, age and firm size (large and medium whilst small serves as the reference point).

In summary these variables are introduced in the second stage regression model to take care of unobserved factors that may influence the determinants of productivity and productivity itself measured by the natural log of TFP. This ensures that the effects of firm level determinants such as line of credit, overdraft, export, foreign ownership etc are explained without any caution.

4.6 Empirical Findings

4.6.1 GLS Random-Effects Estimation with Levinsohn and Petrin Method for TFP

Table 4.5: GLS Random-Effects Estimation

Independent Variable: Natural log of TFP			
Dependent Variables	Coefficients	t-values	Robust Standard Errors
Age	0.0213701**	2.35	0.0088083
Age Squared	-0.0000098	-0.08	0.0001168
Line of Credit	0.1914243**	2.00	0.0956006
Overdraft	0.7427995***	7.71	0.0963309
Export	0.5337177***	4.62	0.1153265
Foreign Ownership	0.9212003***	7.39	0.1246501
Large-Sized Firms	-0.0102069	-0.03	0.2750743
Medium-Sized Firms	-0.134728	-0.65	0.2058245
Location in Capital	-0.7558467***	-7.63	0.0991208
Certification	0.6661189***	4.82	0.1381276
Female Manager	-1.170641***	-3.95	0.2963173
Power outage	-0.0069961***	-3.38	0.00207
Managerial Experience	-0.0067634	-0.49	0.0138699
Managerial Experience squared	0.0002803	0.89	0.0003156
Constant	7.418251***	56.34	0.1280878
Number of Firms	2,827	Wald chi² (13)	= 471.94
R-Square: Within	0.0006	Prob > chi²	= 0.0000
Between	0.1271		
Overall	0.1208		

Note: *** indicates significant level at 1% and ** indicates significant level at 5%

Source: Author's computation from data (2016)

The R-squared measures how variation in productivity is explained by the explanatory variables. It is quite low at 12% though consistent with other productivity estimations of other authors which usually falls within the range of 7% - 48%. The more important and

highly significant Wald $\chi^2(13) = 471.94$ (Prob > $\chi^2 = 0.0000$) indicates the overall significance of the model.

Firm access to finance proxied by firm access to a line of credit/loan facility or an overdraft has a significant positive relationship with the firms' total factor productivity. Since these two variables are used as alternative measures of financial access for the sake of robustness, they were introduced at different times in the model.

The main difference in the results is that; overdraft is statistically significant at 1% significant level and has a higher coefficient whilst line of credit is statistically significant at 5% significant level. The probable implication is that, getting access to an overdraft facility tends to make firms a little more productive than line of credit or loan though it equally makes firms productive. This finding means that firms that have easy access to lower cost sources of external finance are more productive than those who do not. It stands to reason that firms that can easily have external sources of finance will quickly tap into it when needed and utilize it well for the firms' benefit. This is so because firms which have access to external finance can be more innovative and it also opens more investment opportunities as indicated by World Bank (2008).

This positive and significant nexus between productivity and finance is in conformity with other empirical findings (Chauvet & Jacolin, 2015; Gati & Love, 2008; Goedhuys et al., 2006). However, whilst Gati and love (2008) studied Bulgarian firms, Goedhuys et al., (2006) studied Tanzanian manufacturing firms and Chauvet and Jacolin (2015) researched on developing and emerging countries as indicated in the literature.

The age of the firm has a positive relationship with productivity as in conformity with a priori expectations and is also statistically significant at 5% significant level. Age-squared although has the negative expected sign, is insignificant. This means that as

firms' age or get older, they tend to be more productive, probably taking advantage of learning by doing techniques, goodwill through enhanced reputation and economies of scale. The increment in productivity as a firm gets older is only up to a point in time and hence, the need to introduce the age-squared which supposedly takes care of the non-linearity as indicated by Osei-Assibey (2013).

Export orientation is another important determinant of firms' productivity. Export has a positive sign as expected and is highly significant at 1% significant level. The implication is that, firms that export at least 10% of their annual sales are more productive than those that do not. The well known theoretical justification for this phenomenon (Chen & Guariglia, 2011) is that only firms that are more productive do export and can compete on the international market and can also take advantage of "learning by doing". i.e. exporting firms learn from internationally best practices which has a bearing on their productivity. Ackah et al. (2012) had similar findings with age and export in relation to productivity measured by TFP.

Foreign ownership just like exporting firms is statistically and highly significant with a positive sign as expected, implying that firms that have at least 10% foreign stake are more productive than those that are wholly domestically owned or with less foreign control. The intuition behind this is that, foreign-owned firms bring foreign expertise and skills to bear on the local scene and make firms more productive, not neglecting the fact that foreign-owned firms enjoy certain preferential treatments and facilities that local firms may not enjoy. The positive nexus for age, export and foreign ownership discussed in the above paragraphs are completely in line with the findings of Arnold, Mattoo and Narcisso (2008), whose study is based on 10 Sub-Saharan African countries.

Another very important variable that seems to surprisingly impact negatively on firms' productivity and is also highly significant even at the 1% significant level is location in capital city. Firms that are located in the capital city or town are less productive than those that are located in a city which is not the capital or any rural area. This result is quite amazing and unexpected since firms located in the capital city have access to more developed infrastructure and enhanced conditions of service even among Sub-Saharan African countries. Arnold, Mattoo and Narcisso (2008) found a positive effect of location in capital city on productivity contrary to this finding.

Female manager is another significant determinant of productivity of firms but with inverse relationship. This indicates that firms that have their top manager as female are far less productive than those that are managed by males. The possible reasoning could be that, there is work-family conflict as women are challenged with combining home-keeping responsibilities as well as meeting demands at the work place unlike their male counterparts. This is in conformity to the findings of Naude and Nagler (2014) who stated that, this could be the time-consuming nature of running businesses of which women are constrained with, due to pressures from home duties. This finding is however, contrary to the findings of Ahiakpor and Dasmani (2012) who found a positive nexus between efficiency and female-owned firms with their study on Ghanaian firms.

Being internationally certified is undisputedly a statistically significant determinant of productivity of firms in Sub-Saharan Africa. Manufacturing firms that have received and still have an internationally-recognized quality certification such as ISO certification are more productive than those who are not certified or yet to be certified. The intuition for this phenomenon (see Goedhuys et al., 2006) is that, being certified is a good indicator of the quality of the firm's products and grants firms access to international markets and also enables them to charge higher prices, hence inducing productivity. Increasing prices

in conjunction with improved productivity is in line with economic theory; marginal product should be equal to price. So the higher the marginal product, the higher the price should be.

The last but not the least determinant of firm productivity which was statistically and highly significant even at 1% and had the expected negative sign is power outage. The negative nexus on power outage measured by the average number of days in a month a firm experienced power outage during the fiscal year implies that firms are adversely affected when they experience frequent outages during operation due to losses in production and more so, when there are no alternative sources of power or the alternative sources could be too costly. Qureshi and Velde (2007) also discovered power outages adversely affecting productivity among 200 Zambian firms.

It has been mentioned in the methodology section that empirical theory on productivity does not indicate any particular determinant to be included in the empirical model and hence this study used the stepwise approach of adding as many significant variables as the data provided, although all these variables are backed by the empirical literature.

The significant determinants of TFP as identified above are line of credit/loan, overdraft, foreign ownership, export, certification, female manager and power outage. And the firm controls are age and location in capital city.

Turning briefly to the other variables which turned out to be insignificant, it can be observed from Table 4.3 that age squared, large-sized firms, medium-sized firms, managerial experience and managerial experience squared are all insignificant determinants of productivity. This means that whether the firm is large or medium in size and whether the top manager is more experienced or not somewhat has no bearing on the firms' productivity.

Ali and Najman (2015) and Chauvet and Jacolin (2015) findings' are contrary to this study's findings. They found managerial experience and medium sized firms to play a highly significant role in firms' productivity, whilst Gatti and Love (2008) and Ahiakpor and Dasmani (2012) found an insignificant negative relationship between medium sized firms and productivity.

4.7 Robustness checks

4.7.1 Robust OLS Estimation

Presented in Table 4.6 is the regression result using the simple but robust ordinary least square estimation technique with Levinsohn and Petrin (2003) method used in estimating TFP. This is used mainly as a means for robustness check to confirm or otherwise the main results in Table 4.5 using GLS random-effects. As can be seen, the results are highly consistent with the random-effect estimation results with the signs as expected, coefficients as well as the level of statistical significance. The only negligible difference is the robust standard errors which seem slightly different but also consistent.

In a nutshell, overdraft, line of credit, export, foreign ownership, female manager, certification and power outage are statistically significant determinants of firms' productivity whilst age squared, large, medium, managerial experience and managerial experience square are not.

Table 4.6: Robust OLS Estimation with Levinsohn and Petrin for TFP

Independent Variable: Natural log of TFP			
Dependent Variables	Coefficients	t-values	Robust Standard Errors
Age	0.0213701**	2.43	0.0087977
Age Squared	-0.0000098	-0.08	0.0001165
Line of Credit	0.1914243**	2.00	0.0954307
Overdraft	0.7427995***	7.72	0.0962682
Export	0.5337177***	4.63	0.1152402
Foreign Ownership	0.9212003***	7.44	0.1236894
Large-Sized Firms	-0.0102069	-0.04	0.2741215
Medium-Sized Firms	-0.134728	-0.67	0.2016896
Location in Capital	-0.7558467***	-7.59	0.0995211
Certification	0.6661189***	4.82	0.1381301
Female Manager	-1.170641***	-3.94	0.296793
Power outage	-0.0069961***	-3.38	0.002068
Managerial Experience	-0.0067634	-0.49	0.0139279
Managerial Experience squared	0.0002803	0.89	0.0003162
Constant	7.418251***	57.97	0.1279643
Number of Firms	2,827	F (13, 2813) = 36.63	
R-Square	0.1208	Prob > F = 0.0000	

Note: *** indicates significant level at 1% and ** indicates significant level at 5%

4.7.2 GLS - Random Effects with Random Effects (OLS) used for TFP

The second stage regression result presented in Table 4.5 used Levinsohn and Petrin (2003) approach to estimate TFP, the regressand. But as mentioned earlier, the random-effects and OLS are alternative ways of estimating TFP as depicted in Table 4.2. The output of this was used therefore in estimating TFP and this was regressed on the various determinants using GLS- Random-Effects and the results are presented in Table 4.7.

The results shown in Table 4.7 below indicate that the main variables of concern, overdraft and line of credit are still statistically significant. Line of credit however had a negative sign. Other consistent and significant results with earlier findings are foreign ownership, certification and location in capital. “Large” surprisingly came out highly significant and with the expected positive sign though not consistent with earlier findings. The outputs that came out insignificant are age, age squared, medium power outage, female manager, export, managerial experience and managerial experience squared.

The probable reason for the difference between this result (Random effects and OLS) and that of the Levinsohn and Petrin (2003) method is the econometric issues, specifically, simultaneity of using OLS and Random-Effects in estimating productivity (TFP).

Table 4.7: GLS Random-Effects Estimation with Random-Effects (OLS) Method for TFP

Independent Variable: Natural log of TFP			
Dependent Variables	Coefficients	t-values	Robust Standard Errors
Age	0.0003634	0.08	0.0041716
Age Squared	0.000056	1.01	0.0000552
Line of Credit	-0.0901634**	-2.16	0.0416924
Overdraft	0.0706772*	1.70	0.0414859
Export	0.0131646	0.28	0.0473463
Foreign Ownership	0.2786048***	4.23	0.0658876
Large-Sized Firms	0.859152***	3.04	0.2827679
Medium-Sized Firms	0.3314536	1.60	0.2065908
Location in Capital	0.1457267*	1.72	0.0847
Certification	0.3416123***	5.21	0.0655827
Female Manager	0.2067444	1.57	0.1317822
Power outage	0.0029322	1.21	0.0024203
Managerial Experience	0.0085554	1.43	0.0059729
Managerial Exp squared	-.0001936	-1.62	0.0001192
Constant	0.7356368***	14.52	0.0506764
Number of Firms	2,822	Wald chi² (13) = 130.91	
R-Square: Within	0.0520	Prob > chi² = 0.0000	
Between	0.0697		
Overall	0.0582		

Note: *** indicates significant level at 1%, ** indicates significant level at 5% and * 10%

4.8 Conclusion

This study sought to find out the effect of access to finance on firms' productivity and also to find out other firm-level determinants of TFP in Sub-Saharan Africa. The results using Levinsohn and Petrin (2003) method of estimating TFP and Random-Effects regression shows that, financial access measured by access to a line of credit/loan or an overdraft facility positively impacts productivity. Other statistically significant determinants of firm level productivity identified after controlling for age, size and location are, certification, export, foreign ownership, female manager and power outage. These findings are consistent with robustness checks and other alternative measures of productivity.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

This is the last chapter of the study and it is of essence because it summarizes the whole study in few paragraphs, draws relevant conclusion and suggests plausible and sound policy recommendations for stakeholders.

5.2 Summary

There exist enough and abundant literature to show that finance plays a very significant role in the economic growth and development of nations across the globe. Studies have been conducted starting with the study by Schumpeter way back in 1911. Ever since then, many more researches have been done whose result do not differ from earlier ones, but for changes in variable measurements, methodology and time periods.

The precise channels and linkages through which the broad measures of finance such as financial development, financial deepening and financial inclusion affects economic growth is in high dearth though few recent studies have attempted to explore it.

One such channel is the nexus between financial access and firm productivity. Many of the studies that explored this however, mainly used data set constructed in their respective countries which are cross-sectional in nature with its inherent limitations of estimating productivity over time. This subject matter is also not in abundance on the African continent probably due to data collection issues, though the continent has been known to be the least productive and policies emanating from research done in the developed world might be of little relevance to the developing economies.

In addition to the above issues of concern is the fact that most of the studies that attempted estimating productivity used the single factor productivity mainly labour productivity as a proxy for firm productivity which also raises issues. There is also the need to identify the precise firm-level determinants of productivity in Africa which seems to be the focus of this study.

This study sought to find the effect of financial access on the productivity of firms in Sub-Saharan Africa and the firm-level determinants of productivity measured by the more robust total factor productivity.

The operational definition of financial access is easy availability and cost effectiveness of financial products and services to firms. i.e. how easy it is for firms to get external credit from financial institutions. Firms' access to a line of credit/loan and access to an overdraft facility are the two alternative proxies used to measure financial access.

Productivity on the other hand, is how efficient firms can be with the least amount of resources at their disposal and total factor productivity was used to measure productivity at the expense of labour productivity which is a partial measure. Also, rooted in the growth accounting framework is the theory of production which is the theoretical foundation for the study. The neoclassical growth models and the new growth models explain the drivers of productivity growth.

Large strand of literature was reviewed which basically revealed that aside the firm-level determinants of productivity, there are also country-level, industry level and macroeconomic determinants of productivity. The dominant firm-level determinants identified were managerial experience, education of the workforce, size, age, export orientation, ownership structure, quality certification, service inputs such as financial services, utilities such as electricity, and telecommunications services.

Data for the study was sourced from the more reliable World Bank Enterprise Surveys which collects firm-level panel data set. The period for consideration was 2003-2014 for 15 Sub-Saharan African countries for which panel data was made available and the firms under study are mainly manufacturing firms.

Using the Cobb-Douglass production function, total factor productivity was estimated with the Semi-parametric approach by Levinsohn and Petrin (2003), Random Effects and OLS. The latter two were used mainly for robustness checks. The input factor elasticities revealed the usage of large quantities of labour and intermediate inputs in production than capital. Labour and capital accounted for 96% variation in sales whilst capital usage was only 2%, signifying the high usage of labour intensive techniques on the African continent in manufacturing.

Financial access and other potential determinants were regressed on the natural logarithm of TFP using the Error Components Model. The results indicate that access to a line of credit/loan and an overdraft facility are statistically significant and positively related to productivity of firms in Sub-Saharan Africa.

Also, after controlling for firm size, age and location, exporting firms, firms that have foreign ownership and having an internationally recognised quality certification have been identified to have positive effect on productivity whilst being headed by females and having frequent power outages adversely affects productivity. Other variables such as age squared, managerial experience, large-sized and medium-sized firms do not seem to have any meaningful effect on productivity.

These results are consistent with various forms of alternative measures and robustness checks.

5.3 Conclusion

The study concludes that, consistent with previous findings, access to a line of credit/loan and an overdraft facility are known to be positively related to firm productivity to the extent that any measure to enhance access is imperative. Also, firms should broaden their scope of annual sales by exporting more of their products to take advantage of economies of scale and learning by exporting.

In addition, broadening their horizon by granting part ownership to foreigners and working hard to gain access to an internationally recognised quality certification will not be a wrong step.

5.4 Policy Recommendations

The study humbly recommends the following based on its findings;

- ❖ Governments should provide a conducive business environment for firms to thrive especially with regards to relaxing credit constraint. This can be achieved by reducing the prime rates which serves as the basis for on-lending to firms. This suggestion stems from the positive effect of overdraft and line of credit/loan on productivity.
- ❖ Policy should be geared towards diversifying credit towards long term credit facilities to firms at moderate interest rates since this seems to be more reliable and gives firms a longer operation period.
- ❖ Manufacturing firms should try as much as possible to acquire internationally recognised quality certification since this translates into the firms' products being viewed as quality and serves as a basis for increasing prices.

- ❖ Firms should also take advantage of economies of scale by exporting part of their annual sales. This exposes them to learn from international best practice which will translate into productivity.
- ❖ In conformity with the World Development Report of the World Bank (2013), that access to finance is the most severe form of constraint to firms operation in less developing countries, and stemming from this study's findings that access to finance is paramount to firms productivity, any policy to remove credit constraint, such as lowering interest rate and specifically designing credit for local manufacturing firms is welcome and a step in the right direction.
- ❖ Policies to integrate African economies into the world economy and market shouldn't be hampered. This is because exporters and access to foreign knowledge is of paramount significance.
- ❖ Policies to enhance usage of capital are of essence among manufacturing firms in SSA. The study found SSA countries to rely highly on intermediates inputs and labour for production than capital, though capital's significance in literature to output is more pronounced.

REFERENCES

- Ackah, C., Aryeetey, E., & Morrissey, O. (2012). Tariffs and Total Factor Productivity: The Case of Ghanaian Manufacturing Firms. *Modern Economy*, 3, 275 – 283.
- Akerberg, D., Benkard, C. L., Berry, S. & Pakes, A. (2007). Econometric tools for analyzing market outcomes. In J. Heckman and E. Leamer (eds), *Handbook of Econometrics*, 6(1), 4171–4276. Amsterdam: North-Holland.
- Ahiakpor, F. & Dasmani, I. (2012). Access to Finance and Efficiency of Firms in Ghana. Draft report, University of Cape Coast.
- Akinlo, A. E. (2005). Impact of Macroeconomic Factors on Total Factor Productivity in Sub-Saharan African Countries. World Institute for Development Economics Research. Research Paper No. 2005/09.
- Ali, N. & Najman, B. (2015). Informal Competition and Productivity in Sub-Saharan Africa. Draft of University of Paris, France.
- Arnold, J. M., Mattoo, A. & Narciso, G. (2008). Services inputs and firm productivity in Sub-Saharan Africa: Evidence from firm-level data. *Journal of African Economies*, 17(4), 578-599.
- Ayyagari, M., Demirgüç-Kunt, A. & Maksimovic, V. (2007). “Firm Innovation in Emerging Markets: Role of Governance and Finance.” Policy Research Working Paper 4157, World Bank, Washington, DC.
- Beck, T., Demirgüç-Kunt, A., & Maksimovic, V. (2005). “Financial and Legal Constraints to Firm Growth: Does Firm Size Matter?,” *Journal of Finance* 60, 137-177.
- Beck, T., & Laeven, L. (2006). ‘Institution building and growth in transition economies’, *Journal of Economic Growth*, 11, 157–186.
- Besley, T. (1994). Discussion as a Learning Process: Evidence from HYV Cotton, Princeton University Department of Economics Working Paper 5/94.
- Biatour, B., Dumont, M. & Kegels, C. (2011). The determinants of industry-level total factor productivity in Belgium. Federal Planning Bureau working paper 7-11.
- Chauvet, L. & Jacolin, L. (2015). Financial Inclusion and Firms Performance. Seminar paper
- Chen, M., & Guariglia, A. (2011). Financial Constraints and firm productivity in China: Do liquidity and export behaviour make a difference? Research paper series, China and the World Economy, University of Nottingham.

- Demirguc-Kunt, A., & Levine, R. (2008). "Finance, Financial Sector Policies and Long-Run Growth". Washington DC, Commission on Growth and Development, World Bank.
- Du, J. & Garma, S. (2009). Source of Finance, Growth and Firm Size – Evidence from China. UNU-World Institute for Development Economics Research Paper No. 2009/03
- Du, J. & Girma, S. (2012). Firm Size, Source of Finance, and Growth - Evidence from China, *International Journal of the Economics of Business*, 19(3), 397-419.
- Easterly, W., & Levine, R. (2001), "It's not Factor Accumulation: Stylized Facts and Growth Models", *World Bank Economic Review*, 15(2), 177-219.
- Eberhardt, M. & Helmers, C. (2010). Untested Assumptions and Data Slicing: A Critical Review of Firm-Level Production Function Estimators. Discussion paper series. No. 513 University of Oxford.
- Eifert, B., Gelb, A., & Ramachandran, V. (2005). Business Environment and Comparative. Advantage in Africa: Evidence from the Investment Climate Data. Center for Global Development Working Paper 56.
- Fernandes. A. M. (2006). Firm Productivity in Bangladesh Manufacturing Industries. World Bank Policy Research Working Paper Series 3988.
- Gal, P. N. (2013). Measuring Total Factor Productivity at the Firm Level using OECD-ORBIS. Economics Department working Paper No. 1049.
- Gatti, R. & Love, I. (2008). Does access to credit improve productivity? Evidence from Bulgaria. *Economics of transition*, 16(3), 445 – 465.
- Goedhuys, H., Janz, N., & Mohnen, P. (2006). What drives Productivity in Tanzanian Manufacturing Firms: Technology or Institutions? Working Paper Series at United Nations University-Maastricht Economic and Social Research and Training Center on Innovation and Technology, Maastricht Netherlands.
- Gujarati, D. N. (2004). Basic Econometrics, Fourth Edition, McGraw-Hill Companies.
- Hall, R. E., & Jones, C. I. (1999). Why do some countries produce so much more output per worker than others? *Quarterly Journal of Economics* 114, 83–116.
- Haltiwanger, J., & Bartelsman, E. (2011). Developing and Analysing firm-level indicators on productivity and Reallocation. International Growth Centre Policy brief 2024.
- Harrison, A. E., Lin, J. Y., & Xu. L. C. (2014). Explaining Africa's (dis)advantage." *World Development*.
- Hulten, C. R. (2001) "Total Factor Productivity. A Short Biography," in New Developments in Productivity Analysis: National Bureau of Economic Research, Inc, pp. 1–54.

International Finance Corporation (2013). World Bank Group.

King, R. G. & Levine, R. (1993). "Finance, entrepreneurship and growth: theory and evidence", *Journal of Monetary Economics*, 32, 513-42.

Krishnan, K., Nandy, D., K. & Puri, M. (2014). Does Financing Spur Small Business Productivity? Evidence from a Natural Experiment. *The Review of Financial Studies* 28(6). Oxford University Press.

Levine, R. (2005). Finance and growth: Theory and evidence, in Philippe Aghion, and Steven Durlauf, eds.: *Handbook of Economic Growth* (Elsevier, Amsterdam, Netherlands).

Levine, O. & Warusawitharana, M. (2014), Finance and productivity growth: Firm-level evidence. Finance and Economics discussion series. Division of research & Statistics and Monetary affairs Federal Reserve Board, Washington, D.C.

Levinsohn, J. & Petrin, A. (2003) "Estimating Production Functions Using Inputs to Control for Unobservables," *Review of Economic Studies*, 70 (2) 317–341.

Muhammad, Y. (2006), Microfinance.

www.kempton.wordpress.com/2006/10/14/grameenbank-won-2006-nobel-peace-prize 21/02/2005

Maurel, M. & Seghir, M. (2014). The main obstacles to firms' growth in Senegal, implications for the long run. African Development Bank Group Working Paper Series No. 208.

Naude, P. & Nagler, W. (2014). Labour productivity in Rural African Enterprises: Empirical Evidence from the LSMS – ISA. Institute for the study of Labour, discussion paper series No. 8524.

Nin-Pratt, A., Johnson, M., & Bingxin, Y. (2012). "Improved Performance of Agriculture in Africa South of the Sahara: Taking Off or Bouncing Back." IFPRI Discussion Paper 01224. Washington, DC: International Food Policy Research Institute.

Nto, P. O., & Mbanasor, J. A. (2011). Productivity in agribusiness firms and its determinants in Abia State, Nigeria. *Journal of Economics and International Finance*, 3 (12), 662-668.

OECD (2001) "Measuring Productivity, OECD Manual," Technical report, Paris: Organisation for Economic Co-operation and Development.

Olley, G., S. & Pakes, A. (1996). The Dynamics of Productivity in the Telecommunications Equipment Industry. *Econometrica*, 64(6), 1263-1297.

Osei-Assibey, E. (2013). "Source of finance and small enterprise's productivity growth in Ghana", *African Journal of Economic and Management Studies*, 4 (3), 372 – 386

Ospina, S., & Schiffbauer, M. (2010). Competition and firm productivity: Evidence from firm-level data. IMF Working Paper. WP/10/67.

- Qureshi, M. & Velde, D. W. (2007). State-Business Relations and Firm Performance in Zambia. Research Programme Consortium on Improving Institutions for Pro-Poor Growth, University of Manchester.
- Robb, A., & Robinson, D. (2014). The capital structure decisions of new firms. *Review of Financial Studies* 27,153–79.
- Saliola, F. & Seker, M. (2011). Total Factor Productivity across the developing world. World Bank Group, Enterprise Note Series No. 23.
- Schumpeter, J. A. (1911). *The Theory of Economic Development*, Cambridge, MA: Harvard University Press.
- Sheng, Y. & Song, L. (2013). Re-estimating of firms’ total factor productivity in China’s iron and steel industry. *China Economic Review*, 24, 177-188.
- Staal, S. & Brogaard, M. (2011). Development in Total Factor Productivity within the Danish Manufacturing Sector. Reallocation, Technical Efficiency and Capital Structure. Master thesis, Aarhus University.
- Stiroh, K. J. (2001), “What drives productivity growth? *FRBNY Economic Policy Review* pp. 37- 59
- Solow, R. M. (1956), “A contribution to the theory of economic growth”, *Quarterly Journal of Economics*, 70 (1), 56-94
- Solow, R. M. (1957), “Technical Change and the Aggregate Production Function”, *Review of Economics and Statistics*, 39 (3), 312-320.
- Syversen, C. (2011). What Determines Productivity. *Journal of Economic Literature* 49(2), 326 -365
- Teal, F., Habyarimana, J., Thiam, P., & Turner, G. (2009). Ghana: An Analysis of Firm Productivity. Regional Program for Enterprise Development, Africa Private Sector Group.
- Van Beveren, I. (2010). Total Factor Productivity Estimation: A Practical Review. *Journal of Economic Surveys*, forth coming.
- Wolf, S. (2007), “Encouraging innovation for productivity growth in Africa” United Nations Economic Commission for Africa (UNECA), African Trade Policy Centre Working Paper, No. 54.
- World Bank (2008), “Finance for all? Policies and pitfalls in expanding access”, World Bank Group, Washington D.C
- World Bank (2013). *World Development Reports: Jobs*. World Bank, Washington, DC.
- Zheng, J., Bigsten, A., & Hu, A. (2009), Can China’s Growth be Sustained? A Productivity Perspective, *World Development*, 37 (4), 874-889

APPENDIX

Appendix 1: Hausman Specification Test of Total Factor productivity Determinants

----- Coefficients -----

Variables	Fixed effects (b)	Random effect (B)	Difference (b - B)	S.E (sqrt(diag(V_b- V_B)))
Large	0.3576073	-0.0102069	0.3678142	3.564022
Age squared	-0.0036124	-0.0000098	-0.0036026	0.0029518
Line of credit	-0.3459349	0.1914243	-0.5373592	1.156438
Man Exp	0.2216238	-0.0067634	0.2283872	0.16524230
ManExp squared	-0.0055938	0.0002803	-0.0058742	0.0041938
Age	0.1945049	0.0213701	0.1731349	0.1953602
Certification	-1.026623	0.6661189	-1.692742	1.785495
Overdraft	0.3386	0.7412	-0.4025	1.2107
Exporter	-0.5584575	0.5337177	-1.092175	1.498366
Foreign	2.412864	0.9212003	1.491664	1.665916
Location	1.096373	-0.7558467	1.852219	1.661543
Female manager	-0.3313233	-1.170641	0.8393178	1.465496
Power outage	.031086	-.0069961	0.0380821	.0328936

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$$\chi^2(12) = (b-B)'[(V_b-V_B)^{-1}](b-B)$$

$$= 17.14$$

$$\text{Prob}>\chi^2 = 0.1445$$