BANK EFFICIENCY AND FINANCIAL DEVELOPMENT IN AFRICA: AN EMPIRICAL STUDY

PhD THESIS

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

MAY 2015
DECLARATION

I do hereby declare that this thesis is the product of my own work produced from research undertaken under supervision. The thesis has not been produced or presented to this or any other academic institution for any academic award. All references in the work have been duly acknowledged. I also declare my full responsibility for any shortcoming in the document.

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CERTIFICATION

I hereby certify that this work was supervised in accordance with the laid down regulations of the University.

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DEDICATION

To Elizabeth, Esabelle, Elsie and Emily.
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ABSTRACT

This thesis investigates the link between banking sector efficiency and financial development. The study also examines the relationship between financial development and economic growth from the banking efficiency perspective. The thesis discussed extensively the theoretical and the empirical literature on each topic. The study uses the semi-non parametric Fourier flexible functional approach to estimates bank cost efficiency. This method has been found in literature to envelope banking data better than other methods used in estimating banking sector efficiency. To establish the relationship between banking sector efficiency and financial development, the study made use of the Instrumental Variables (IV) 2SLS estimator to test whether bi-causality exist between the two variables. The study also uses the dynamic generalized methods of moments (GMM) technique which is able to address potential endogeneity issues to examine further the link between financial development and economic growth. The study made very important findings and contributions to literature. Firstly, the study concluded that the efficiency level of banks included in the sample averaged 76% over the period, 1999-2008. This means that there is about 24% inefficiency in terms of cost. Thus banks in Africa could actually save up to almost a quarter of their cost if they were to operate efficiently. It also finds that causality runs positively in both directions between bank cost efficiency and financial development. This means that as banks become more cost efficient, financial sector develops further and credit allocation gets more distributed in the real economy. Similarly, it is important that policy makers know that financial sector policies that deepen the financial system also result in cost efficiency in the banking sector by challenging the banking sector to be innovative and efficient in their bit to increase shareholder value. Among the other control variables, inflation is found to destabilize the financial development. Excessive government spending in the financial sector appears to destabilize banking sector efficiency. Also, a good legal environment improves financial development. Other historical variables that impact cross-country variations in financial development are settler mortality and percentage of rural population. These have negatively affected the development of the financial sector. Finally, the evidence of the findings from the study supports the notion that the quality of the financial intermediation measured as banking sector cost efficiency scores significantly affects economic growth positively. The thesis did not find a statistically significant effect of the traditional volume measures of financial sector development and economic growth. Further, the share of domestic savings to GDP is found to be positive and statistically significant reflecting the crucial role private savings play in economic growth. Moreover, concentration of the banking sector is found to be negatively related to economic growth. Lastly, annual rate of population growth is found to be significant and negatively related to economic growth. These results suggest that developing policies to boost the efficiency of the banking sector is a step in the right direction. This is because; it will positively impact on financial development and growth on the continent.
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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The financial sector plays an important role in the economic development process. They channel funds from the surplus units to deficit units in the economy. The best financial systems limit, quantify, gather and negotiate all operational risks and incite the savers to invest, by offering them proportional payment to the scale of the incurred risks. Financial intermediaries, when they are efficient, allow mobilizing saving from diverse sources and allocate it to more productive activities which benefits not only investors and beneficiaries of the investments but also the whole economy (Gulde, Patilo and Christensen, 2006). Indeed a banking system which efficiently channels financial resources to productive use is a powerful mechanism for economic growth (Levine, 1997).

The banking sector worldwide has experienced major transformation in its operating environment. Both external and domestic factors have affected its structure and efficiency. In Sub-Saharan Africa, like many other transitional economies, banks are the main financial intermediaries; therefore restructuring policies have been implemented in order to improve efficiency (Kablan, 2007). These policies were initiated with the view to positioning banks in Africa to compete among themselves in the domestic and international fronts. By so doing it is envisaged that they will efficiently allocate resources to productive areas of the economy thereby accelerating the development of the individual countries and the continent as a whole.

The banking sector in Africa has also been recognized to exhibit wide variations across countries due to some historical development and also the various stages of growth in the countries of Africa.
origin. For example, North African financial systems are dominated by government-owned financial institutions to a much larger extent than systems in Sub-Saharan Africa, where many systems are weighted toward foreign-owned banks. The particular legal environment also affects the extent of development in the various countries. It has been observed by Beck et al (2011) that common law countries typically have a more flexible legal and regulatory framework that offers more room for innovation, while civil code countries rely more steadily on written codes and often take longer to adjust the legislative and regulatory framework to new developments.

Among the many roles of banks in the economy, they ameliorate the information problems between investors and borrowers by monitoring the latter and ensuring a proper use of the depositors’ funds. Second, they provide intertemporal smoothing of risk that cannot be diversified at a given point in time as well as insurance to depositors against unexpected consumption shocks. Third, banks contribute to the growth of the economy and finally, they perform an important role in corporate governance. The relative importance of the different roles of banks varies substantially across countries and times but, banks are always critical to the financial system (See Allen and Carletti, 2008). It is also argued that one important use of x-inefficiency (the inability to produce the maximum output given a set of inputs by a firm) metrics is the early detection of distress in problem banks, which can be used by regulators to initiate prompt early corrective action (see also Maimbo, 2002; Berger and Mester, 1997a). Moreover, some studies suggest that bank management quality is positively related to cost efficiency, which is in turn related to asset quality (De Young, 1998). Banking sector efficiency is thus important for promoting access to financial services as well as gauging the stability of the banking sector as an integral component of the financial system. Banks play essential role in the proper functioning
of payments systems and their efficiency is directly related to improved productivity in the economy (Ikhide, 2009).

It is in this light that bank efficiency studies have raised much interest among researchers. Most of these studies have focused on the developed countries after major changes have been done (see Allen and Rai, 1996; Leighton and Lovell, 1998). At the African level, Peris and Hauner, (2005) measured the efficiency of the Ugandan banks to ascertain the effect of restructuring of the banking system. In the same manner, Kirkpatrick, Murinde and Tefula (2007), conducted a study on African Anglophone banks after the period of banking crisis in the late 80’s and early 90’s to work out possible solutions for managers of banks in Africa and regulators. In recent times, cross country studies on bank efficiency have been performed on WAEMU banks (Kablan, 2007), SSA Middle income countries (Chen, 2009) and 29 SSA countries (Kiyota, 2009).

This thesis investigates the banking sector efficiency on the African continent and differs from all the above studies in that it makes use of Fourier-flexible approach to estimating banking sector efficiency which none of these studies adopted. The study also investigates the role of banking sector efficiency on the overall financial development as well as the economic growth of these African countries.
1.2 Statement of the Problem

A large body of literature studying the efficiency of financial institutions exists, with an increasing focus on X-efficiency. These studies strongly suggest that X-efficiency in banking is large, typically accounting for 20% or more of costs, and dominate scale and scope efficiencies (see Berger and Humphrey, 1997). The amount of attention that banking efficiency research has received is understandable. Their findings have relevant implications for banks’ management, who seek to improve operating performance, and for policymakers, who are concerned about banking competition, bank safety, and soundness. Although many of the studies focused in the developed economies, a handful of studies have been undertaken in the African context. Notable examples are: South Africa (Mlambo and Ncube, 2011), Tanzania (Aikaeli, 2008), Namibia (Ikhide, 2008; Adongo, Stork and Hasheela, 2005) Uganda (Peris and Hauner, 2005) for single countries, Kiyota (2009) for 29 SSA countries, Chen (2009) for 10 SSA middle income countries Kablan (2007) for WAEMU countries and Murinde and Tefula (2007) for Anglophone banks during the banking crisis in the late 80s and early 90s.

Most of these studies estimate the banking sector efficiency by using the non-parametric data envelopment approach (DEA) or the stochastic frontier approach (SFA) stating the bank cost or profit function as the translog form. However, as pointed out by Berger and Mester (1997a), the non-parametric methods generally ignore prices and can, therefore, account only for technical inefficiency in using too many inputs or producing too few outputs. They cannot account for allocative inefficiency in responding to relative prices in choosing inputs and outputs, nor can they compare firms that tend to specialize in different inputs or outputs, because there is no way to compare one input or output with another without the benefit of relative prices. In addition,
similar to the cost function, there is no way to determine whether the output being produced is optimal without value information on the outputs. Thus, the nonparametric techniques typically focus on technological optimization rather than economic optimization.

Also, in using the stochastic frontier approach most of the banking efficiency studies on the continent state the bank cost or profit function in a translog form. However, as pointed out by McAllister and McManus (1993), and Mitchell and Onvural (1996), some of the differences in results on scale economies across studies may be due to the ill-fit of underrepresented translog function across a wide range of bank sizes, some of which may be in the data. In short the translog functional form does not envelop the data correctly as it is too restrictive. A more flexible approach that fits the data correctly is the Fourier flexible approach.

In the first empirical chapter of this study, the thesis estimates the banking sector efficiency in Africa using the stochastic frontier approach and stating the bank cost function using the Fourier flexible approach. Even though, this method has been found to envelop the data correctly in banking sector efficiency estimations, the method has not been applied specifically to studies on the African continent.

The second empirical paper examines the relationship between bank efficiency and financial development. The allocative role of financial institutions was first recognized by Schumpeter (1912), who conjectured that bankers help to identify entrepreneurs with good growth prospects, and therefore help to reallocate resources to their most productive uses (Yu and Gan, 2010). Having established the important role of financial development in economic growth, the frontier of the literature in this field is shifting towards providing answers to the question of why some
countries are more financially developed than others. Studies have been done on banking efficiency and competitiveness to assess the impact of reforms, usually on groups of emerging countries (Grigorian and Manole, 2002; Bonin, Hasan and Wachtel, 2005; Boubakri, Cosset, Fischer and Guedahmi, 2005; Fries and Taci, 2005) and sometimes on a single country (Hauner and Peiris, 2005; Buchs and Mathiesen, 2005) as well.

There is a long and extensive literature on the importance of financial development for an economy. Generally speaking, the consensus view is that financial development improves macroeconomic performance, since it helps allocating scarce financial resources to the most profitable and efficient investment projects (Levine, 2005). Thus, well developed financial institutions and instruments provide a growth-stimulating environment.

To better appreciate why financial sector development, under certain conditions, may be positively related to economic growth, it is necessary to understand the critical function the sector provides to the economy. Stiglitz (1998) argue that the financial sector is unique because of the risk and uncertainty faced by both savers and investors. He suggested that savers are often unable to select the investment project that best matches their personal risk appetite and without pooling their money, savers cannot take advantage of increasing returns to scale in investments. Moreover, individual entrepreneurs or investors commonly lack sufficient capital to proceed with projects on their own. Commercial banks provide an intermediation service that brings savers and investors together, theoretically channeling investment funds to the uses that yield the highest rate of return, thus increasing specialization and the division of labor (Todaro, 2003).
These views are in agreement with economic theory which indicates that the main role of financial markets and institutions is to minimize the costs of information and transactions. Consequently, savings rates, investment decisions, technological innovation, and long-run growth rates depend crucially on the level of financial development. In this regard, it is envisaged that an efficient banking system should serve as a conduit by which entrepreneurs with productive investment opportunities are identified and resourced to enable them realize their goal. Banks can achieve this objective by performing their intermediation role efficiently in mobilizing savings for long-term investments and distributing these to the private sector in the form of credits. However, the role of banking sector efficiency and financial development has not received much attention, especially on the African continent.

Given the importance of financial development to economic growth as established in literature, many hypotheses have evolved to explain what its determinants are. Kablan (2010) for example, enumerated macroeconomic factors such as GDP per capita income and inflation as affecting the level of financial development in Africa. The role of an efficient banking sector in financial development, however, has not received much attention in literature. This study examines the linkages between banking sector efficiency and the overall financial development of the continent. The study does this by estimating at firm level the role an efficient banking sector plays in the financial development of a country. Likewise, a country’s level of financial development should influence the banking sector to develop products to suit business needs, introduce competition and enhance efficiency. Hence the effect between these two variables could be thought of as going in both directions. Thus, in this paper the study tests for bi-causality between banking sector efficiency and financial development. The paper uses the Instrumental
variable (IV) approach to investigate the relationship between bank efficiency and financial development.

The third empirical paper investigates the quality of the banking sector, proxied by the efficiency scores and economic growth on the continent. Over the past 3 decades there has been an enormous research to establish the finance-growth nexus. As pointed out by Lucchetti et al (2001), the main weakness in this strand of literature is the variables used to measure the banking system’s state of development. He contended that these variables are of two types. The first refers to the presence and diffusion of the banking system where the most commonly used indicators are the ratio between liquid liabilities of the banking system and GDP. The second group of variables measures the amount of financing intermediated by banks. Among these variables are the ratio between domestic credit and GDP (Rajan and Zingales, 1998), the share of credit granted to the private sector, or the credit granted to the private sector in ratio to GDP.

These measures give rise to interpretative problems, and they are only partially able to capture the role performed by banks in economic development. Firstly, there is the problem of causality. The growth of the banking system and the amount of credit disbursed are closely influenced by the level of economic development. The wide presence of banks and the importance of bank lending in areas which grow more rapidly than others may be indicative of a reverse causal relation between finance and economic growth. As well as being unable to shed adequate light on the causal relation between the development of the banking system and economic growth, these two types of measures have the further shortcoming that they essentially concentrate on the role of banks in stimulating capital accumulation. Yet, as the recent economic literature has shown, the specific role performed by banks in the economic system is not to intermediate
savings, but rather to certify the quality of borrowers, monetizing liabilities which otherwise would fail to find purchasers in the markets (See Minsky 1986, Fama, 1985; Stiglitz and Weiss, 1988). This thinking suggests the need for a more qualitative measure for the state of the banking sector development. The existing literature has however focused on the impact of the increased volume of financial services on economic growth. The importance of the quality of the financial services has not received much attention in literature. Luccheti et al (2001), Koetter et al (2006) and Kessy (2008) are among the few studies that have used a measure of the quality of the banking sector to explore further the link between finance and growth. Of these three studies the latter was done for Eastern Africa countries.

It has been noted in literature that economic growth variables tend to present endogeneity issues in empirical studies. However, in the study of banking efficiency and economic growth as found in Kessy (2008), the fixed effect model was used to establish the positive independent effect of banking sector efficiency on economic growth. This may present bias in the results due to issues of endogeneity in the financial and the economic growth variables. The current study overcomes this issue by using the dynamic GMM method to investigate the linkages between efficiency and economic growth. The advantage of this GMM methodology is that it takes care of the econometric problems caused by unobserved country-specific effects and endogeneity of the independent variables in lagged-dependent-variable models such as economic growth regressions. The inclusion of both cross-country and time-series data introduces additional information about the over-time change in growth and its determinants, and, thus, helps to get more precise results, Mhadhbi (2014).
Africa banking sector has gone through considerable reforms in the late 1980s and the early 1990s aimed at improving the efficiency of the banking sector. It was envisaged that these reforms will place banks in sound footing and spur growth. However, it is not clear which aspect of the banking sector development matters to growth—the size or the efficiency of intermediation. That is, whether the mere expansion of credit in the economy is the most beneficial on the continent or the efficiency with which the banking sector allocates credits? This study aims to answer this question and further provides evidence on the other determinants of economic growth.

In this third empirical chapter, the thesis examines further the linkages between financial development and its linkage to economic growth from the banking efficiency perspective. This measure is deemed to be free from reverse-causality biased as pertains in most of the traditional finance-growth studies.

1.3 Objectives of the study

This thesis sets out to investigate the link between banking sector efficiency and financial development in Africa. In this light, it estimates the degree of the banking sector efficiency across the continent. The thesis also examines the role the banking sector efficiency plays in the overall financial development of the economies in Africa. Furthermore, the study investigates further the finance-growth nexus on the continents using a qualitative measure of the financial sector as opposed to quantitative measures in many of the previous studies. The specific objectives of this thesis are to:
i) Ascertain the state of the financial development on the continent;

ii) Estimate the extent of banking sector efficiency in Africa;

iii) Examine the relationship between bank efficiency and financial development;

iv) Analyze the determinants of banking sector efficiency and financial development on the continent;

v) Reexamine the finance growth nexus from the perspective of banking sector efficiency.

1.4 Significance of the Study

This thesis helps our understanding of banking sector efficiency and financial development in Africa. This is especially important given the fact that the financial sector plays an important role in the economic growth of any economy. The thesis adds to the scanty literature in this area with regards to studies on Africa. It discusses the various methods of analyzing each of the various aspects of the topic thereby enriching the debate in the banking sector efficiency studies. It also brings to the fore the important steps policy makers should take to boost economic growth on the continent.

1.5 Chapter Disposition

The thesis is made-up of a collection of empirical chapters. It presents 3 empirical chapters which examine the relationship between banking sector efficiency and financial development. This thesis is organized into six chapters as follows:
Chapter one introduces the thesis by providing the background to the study, statement of the problem, listing the objectives of the study and its significant and chapter disposition.

Chapter two examines the state of the banking sector development. It covers the components of the financial development on the continent, the depth, size and the efficiency of the financial sector on the continent and how these compare with other regions of the world.

Chapter three estimates the degree of the banking sector efficiency on the continent.

Chapter four examines the relationship between banking sector efficiency and financial development and whether reverse causality exists

Chapter five examines the relationship between banking sector efficiency and economic growth

Chapter six concludes the study. The findings of the empirical study are summarized here. Major policy recommendations are also discussed in this chapter.

1.6 Chapter Summary

This chapter introduced the thesis. It provided the problem statement, listed the objectives of the study and summarized the significance of the study.
CHAPTER TWO

OVERVIEW OF FINANCIAL DEVELOPMENT IN AFRICA

2.1 Introduction

This chapter gives an overview of financial development in Africa. It gives the trends in the financial development on the continent and provides a comparison with the rest of the world, a brief history of banking on the continent and the environment in which banking operates on the continent. It also examines the depth, size and the efficiency of the financial sector on the Africa continent and how it compares to the rest of the world.

2.2 Brief History of Financial Sector in Africa

To understand better the unevenness of financial sector development in Africa, it may be helpful to recall briefly the history of the continent, in particular Sub-Saharan Africa (SSA). In this region, formal banking began with the establishment of “colonial banks”. These were mostly interested in providing services to colonial enterprises engaged in mining and manufacturing. They were also used as captive banks to finance growing public sectors. The most important banks emerged mainly in Kenya, Nigeria, South Africa, and Zimbabwe.

Following independence in the 1960s, most colonial banks were nationalized and a number of development banks created in particular to finance the agricultural sector. Owing to the then prevailing political ideologies, government intervention and protectionism became the key policies. Banks were largely devoted to channel resources to the Government and preferential
sectors. Central banks were assigned responsibility for credit allocation and economic development rather than safeguarding monetary stability (Ruso and Ugolini, 2008). In the mid-1980s, economic deterioration contributed to bank failures in many SSA countries. Subsequently, reforms were implemented in many of these countries as part of structural adjustment programs supported by international financial institutions. Interest rates were liberalized, credit controls removed, and indirect monetary policy instruments introduced. The early results were mixed, and a new round of reforms was implemented in the mid-1990s. The reforms did not increase the monetization of African economies (Kablan, 2010).

Financial development in sub-Saharan Africa in the post independence period often suffered on account of misguided efforts to speed up economic growth through government intervention. The provision of credit in many countries was seen as a powerful tool for economic development, banking was nationalized and/or state-owned banks were created. The results was often inefficient resource allocation, inflationary refinancing by central bank of commercial bank operations and absorption by government (directly or through the central bank) of banking losses. The banking system provided few satisfactory services, had a high proportion of non-performing loans, often to public enterprises and quickly became undercapitalized. Bank supervision was inadequate and as a result the banking system suffered a number of problems owing to mismanagement.

Underlying these issues was the fact that most sub-Saharan African countries believed that it would be possible to accelerate economic development by identifying promising sectors and using subsidized credit and selective credit controls to promote them. Interest rates were maintained at levels that were negative in real terms and widespread regulations forced banks to
provide credit to priority sectors at subsidized rates. The result was often misallocation of resource and credit rationing. The priority sectors seldom showed a performance that justified the measures taken and growth rates early 1980s were generally insufficient to raise income per capita. Attempts at inflationary financing further damaged economic development in many countries.

The collapse of the interventionist policies in mid-1980s prompted many countries to embark on a reform agenda that included liberalizing interest rates, eliminating credit controls, restructuring and privatizing commercial banks, adopting indirect instruments of monetary policy and developing financial markets. These policies were generally implemented within fund-supported structural adjustment programs. However, not all countries moved quickly enough with the reform process, and in a number of cases financial sector problems were allowed to recur with the result that a new round of financial reforms had to be implemented in the mid-1990s. (see Gelbard and Leite, 1999).

2.2.1 Environmental Challenges and Policy Approach to Financial Sector Reform in Africa

African financial systems are not all the same; they are spread across a spectrum of financial sector performance. But there are sufficient similarities between the underlying economic conditions which face financial firms in most of the countries to allow for several generalizations. In addition to low savings rates, finance in most African countries works within an environment which is extreme in four key dimensions: scale, informality, governance and shocks, (World Bank, 2006).
Scale refers to the small size of the economies, and even more of the national financial systems and firms and their customers. Sparse population resulting in isolation and great distances (at least in terms of travel time) to points of services is another aspect of what is included under the heading of ‘scale.’ Since most financial services involve fixed costs and increasing returns to scale (at least up to a certain point) the problem of scale translates into a problem of high unit costs and even unaffordability of certain services. This has affected most of the banks in the region to be small in size.

Informality refers not just to the status of client enterprises of financial intermediaries but of the markets within which they work; informality reduces the degree to which reliance can be placed on systematic documentation, adherence to a predictable schedule, or even a fixed place of business. Thus banks sometimes have to compromise standards to suit the local conditions.

Governance problems arise at the level of private and public institutions, but are probably relatively more severe in the public sector. This reduces the credibility and stability of government policy and increases the danger that policy goals will be subverted in implementation.

The continent’s history over the past half-century has been marked by a high incidence of occasional economic or political meltdowns (associated with conflict, famine and politico-societal collapse as well as external factors), on the frequency of up to one per decade per country (Arnold, 2005; Meredith, 2005). At the micro or ‘idiosyncratic’ level, risk is also very high for individual households near or below the poverty line, and for small farms and firms.
These shocks increase the uncertainties in the financial sector and also increase the cost of operations for financial firms operating in Africa.

African policy reforms to date have gone some distance towards stabilizing the macroeconomy and removing incoherent administrative controls on wholesale interest rates. Insolvent banks have been intervened; many of them have been recapitalized and placed under better management and ownership. Among many other reforms which have been emphasized, a lot has been done to improve the regulatory framework for banking Aryeetey and Senbet (2004). These reforms have been based mainly on two perspectives—Modernist and Activist views. These views are discussed below according to the World Bank (2006).

The modernist perspective sees finance as an anonymous, atomistic market oriented mechanism which disregards the pedigree or power of its users save only to the extent that power influences the remuneration of each financial contract. This perspective casts a suspicious eye on the integration of industrial and financial power, because the emergence of concentrated industrial-financial groups can have the effect of blocking entrepreneurship by those outside the main power-groups. Integration of finance and government is also questioned for similar reasons (hence the low standing, from the modernist perspective, of State-owned banks).

The modernist perspective concerns itself mainly with large scale finance—deepening the resource mobilization of the banking system, ensuring that banks want to and can safely on-lend these resources; enabling productive formal sector firms to find the mix of equity and debt finance they need to grow, as well as sophisticated tools for risk management.
Governments have a central role here not least in creating the enabling environment. The policy agenda associated with the modernist perspective focuses on the macroeconomic, contractual and information frameworks with the objective of reducing information asymmetries, improving legal certainty and lengthening investors’ planning horizon. This agenda includes updating of laws governing financial contracts and ensuring their proper and reliable enforcement through judicial reforms in order to ensure that property rights are clearly defined and enforceable, both in general terms and as they apply to specific modern financial instruments. It also focuses on defining and updating accounting rules and procedures to ensure that enterprise accounts are a reliable basis for investment and other financial relationships, as well as on improving systems of credit information sharing to allow borrowers to use their reputation as collateral. Increasing the predictability and stability of government policies as they affect the overall macroeconomic environment is also an important hallmark for the modernist, as systemic risk impedes the functioning of finance – even if integration with global finance can mitigate this problem.

The touchstone for the modernist is “best practice” of the advanced market economies. Transplanting best practice is acknowledged as likely to take time, but any move in that direction is inclined to be seen as progress by the modernist. Modernists sometimes neglect real world constraints. Disappointing results can be expected from a mindless transplantation of overambitious structures from the advanced economies.

The activist perspective to finance is concerned to achieve results in areas where the anonymous private financial sector is not conspicuously successful. Finance for agriculture and the rural
economy; for micro and small enterprises, for low income households; long-term finance in
general. Inherent difficulties, risks and costs impede the effectiveness of finance in each of these
areas. The occasional collapse of financial intermediaries and the economic dislocation which
often accompanies such crises are also the target of the activist perspective.

The activist perspective sees the need for special interventions to help correct the market failures
here. This includes restrictive legislation and the establishment of competent and politically
independent prudential regulators to guard against weak, reckless or corrupt management of
financial intermediaries which could cause their collapse. Protection of the consumer from
predatory practices is also high on the activist agenda.

A variety of special public, charitable or otherwise privileged intermediaries is sometimes
advocated by the activist perspective. Because of the disappointing performance of many
publicly-owned financial firms (all too often subverted through a politicized management, or
through corruption), the risk of over-reach in this regard is well-known. Even though the
deficiencies which gave rise to state ownership in the past persist today, few close observers of
financial systems around the world now recommend the establishment of government-owned
development banks in African countries. Effective governments will have learnt the lessons of
the past and, in order to avoid counterproductive interventions resulting from weak governance,
will support, but will not themselves take the lead in implementing the activist agenda by
increasing their direct engagement in financial service provision. To fill this gap, the potential for
regional entities and partnerships with local and international NGOs and the private sector needs
to be explored; donors too can have a potentially valuable role as *disinterested* activists in bolstering specific initiatives.

### 2.3 The State of Financial Development in Africa

A first step in the analysis of Africa’s financial systems is an assessment and exploration of key statistics on the depth, breadth, efficiency, stability, and components of the systems. Such an analysis has to compare Africa with other regions, but also within a historical African perspective over the past, while focusing as much on similarities across the continent as on differences among countries within the continent. Critically, such an analysis has to benchmark Africa’s financial systems by considering the low income level of most African economies and other country characteristics. Such an analysis is a first, though important step in better understanding Africa’s financial systems, Beck et al (2011).

Africa’s financial systems are based heavily on banks, and banks are therefore a large emphasis in the following analysis.

#### 2.3.1 Banking Depth

Standard indicators of banking system development show that Africa’s banking systems are small in absolute and relative size. Many African banking systems would be mid-sized banks in high-income countries. Using a sample of banks included in Bankscope, which typically covers 90 percent of a country’s banking system, Beck et al (2011) find that the average African bank has total assets of US$220 million, while the total balance sheet size of a non-African bank is, on average, almost US$1 billion. Behind this average, however, is a large variation. Standard Bank
of South Africa has total assets of over US$100 billion, while the average bank in Madagascar has assets below US$200 million.

Banking depth is generally measured by reference either to the deposit resources mobilized by the system or by credit extended. Although these two measures of depth are closely correlated, there are differences, both in terms of their impact and in terms of measurement. The deposit side is central to analysis of monetary policy, inasmuch as it measures an important component of liquid spending power in the economy, and fluctuations in money and bank deposits may help predict inflation. But it is the level of bank credit to the private sector that is most closely correlated with medium-term growth, and poverty reduction (Beck, Levine and Loayza, 2000; Beck, Demirgüç-Kunt and Levine, 2004; Honohan, 2004), essentially because it captures the degree to which banks are channeling society’s savings to productive uses.

Two standard indicators of financial depth and development are the ratio of Liquid Liabilities to GDP; a broad measure of monetary resources (currency plus demand and interest-bearing liabilities) mobilized by banks and near-bank intermediaries relative to economic activity. The ratio of Private Credit to GDP gets us closer to the growth potential of financial intermediation, measuring the claims of financial institutions on the private sector relative to economic activity.

Liabilities to GDP averages 29 per cent in sub-Saharan Africa compared to 61 per cent in East Asia and Pacific and 97 per cent in high-income countries over the period 1990-2011. Similarly, Private Credit to GDP averages 17 per cent in sub-Saharan Africa, compared to 44 per cent in East
Asia and Pacific and 102 per cent in high-income countries over the same period (See Figure 2.1 and 2.2).

**Figure 2.1: Liquid Liability/GDP: Africa Compared to Other Regions**

![Banking Depth Graph](source)

*Source: Beck et al (2011) and author’s own Calculations*

Figure 2.1 shows banks Liquid Liability as a ratio of GDP for Africa and the rest of the world. The ratio of Liquid Liability to GDP is captured on the vertical axis whilst the horizontal axis shows the year.
Figure 2.2: Banking Depth: Private Credit/GDP

![Graph showing Banking Depth](image)

**Source:** Beck et al (2011) and author’s own Calculations

Figure 2.2 captures the yearly trend of Private Credit as a ratio of GDP for African banks compared to the rest of the world. The ratio of the Private Credit to GDP is captured on the vertical axis and the horizontal axis captures the time variable. Another measure of the extent of banking sector intermediation efficiency is loan to deposit ratio. Banks have funding sources other than deposits and other purposes besides lending to the private sector, but the loan-deposit ratio gives a good, though crude indication of intermediation efficiency. The loan-deposit ratio
ultimately captures one of the core tasks of financial intermediaries, that is, putting society’s savings to its best use: private sector development. In sub-Saharan Africa the banking sector intermediate on average 69% of deposits, whiles banks in East Asia and Pacific intermediates 108 percent (fig 2.3).

**Figure 2.3: Banking Sector Depth: Bank Credit to Deposit Ratio**

![Bank Deposit to Credit Ratio](image)

*Source: Beck et al (2012) and author’s own calculations*

Figure 2.3 shows the growth in bank deposit to customer credit of African banks compared to the rest of the world. The vertical axis captures the bank deposit to credit ratio whilst the horizontal axis captures time. As pointed out by Honohan and Beck (2007), countries in Africa showing
lower levels of deposits intermediate an even lower share of these scarce deposit resources into private sector loans. While in the Republic of Congo the ratio of liquid liabilities to GDP is 33 percent and the loan-deposit ratio is 17 percent, the corresponding ratios in Tunisia are 62 and 107 percent, respectively. It seems that, for most banking systems in Africa, especially in Sub-Saharan Africa, the resource constraint is not currently binding; yet, these systems suffer from an intermediation constraint. The low intermediation ratios point to a critical problem in African banking: while the lack of resources might be a longer-term impediment to the economic growth of the continent, a more immediate problem is the fact that existing resources are not intermediated efficiently into the private sector, where they are needed most. This is consistent with the observation across the African region that banks prefer to invest in government securities rather than private sector loans and that the credit channel of monetary policy only functions weakly. Banks react little to the changes in interest rates set by monetary authorities by lending more or less to the private sector, but, rather, they shift assets among government bonds and foreign asset holdings.

The relatively limited intermediation efficiency is confirmed if one digs deeper into the asset side of bank balance sheets to explore where banks invest their resources. Unlike banks in other regions of the world and banks in high-income countries, African banks hold a much smaller share of their assets in private sector loans and a much larger share in government securities, foreign assets, and liquid assets.
2.3.2 Banking Sector Competition and Efficiency

Africa’s banking systems are characterized not only by low levels of intermediation but also by high interest rates, intermediation spreads, and bank profitability. High lending interest rates, whether caused by inefficiency or lack of competition, do more than add to borrower’s costs. By pricing the safer borrowers out of the market, high interest rates can increase the risk of lending, making banks less willing to lend and potentially resulting (as has been recognized since the pioneering work of Stiglitz and Weiss, 1981) in credit rationing combined with high bank liquidity. One source of high lending rates is high wholesale interest rates, which reflect currency and other macroeconomic uncertainties, as well as the demand by government for domestic loanable funds. The degree of efficiency and competition in the banking system is another factor explaining variation in lending rates.

a) Efficiency

The intermediation spread (the gap between average deposit and average lending rates) or the intermediation margin (net interest income as a percentage of total earning assets) are often taken as measures of banking (in-)efficiency. In interpreting these numbers it should be recalled that the gap between interest received and interest paid by the banks goes to pay for staff and other non-interest costs, and to make provisions for loan losses, as well as contributing to profits. Thus, a high spread could result from an uncompetitive banking environment (implying higher profits) or factors such as a higher risk of default. Some elements of default risk may in turn be considered system-wide and outside the control of the banks, but some banks may deliberately choose a high-yield, high risk portfolio. Banks in some countries may also face different unit
prices for skilled staff and other inputs—though within a particular market variations in unit staff costs are likely to reflect skill differentials rather than exogenous factors. Foreign banks, however, often draw on expatriate staff, which can increase intermediation costs considerably. Taking all of these considerations into account, it is clear that the variation across countries and across banks in intermediation spreads and margins needs to be interpreted with care.

**Table 2.1: Efficiency Indicators of Africa’s Banking Sector Compared to the Rest of the World**

<table>
<thead>
<tr>
<th>Region</th>
<th>NIM (Basis point)</th>
<th>O/H Cost to TA (Basis point)</th>
<th>Cost/Income Ratio (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>655</td>
<td>528</td>
<td>58</td>
</tr>
<tr>
<td>East Asia &amp; Pacific</td>
<td>380</td>
<td>301</td>
<td>50</td>
</tr>
<tr>
<td>South Asia</td>
<td>405</td>
<td>243</td>
<td>59</td>
</tr>
<tr>
<td>High Income</td>
<td>211</td>
<td>156</td>
<td>55</td>
</tr>
<tr>
<td>Latin America</td>
<td>568</td>
<td>479</td>
<td>64</td>
</tr>
<tr>
<td>Eastern Europe &amp; C. Asia</td>
<td>632</td>
<td>491</td>
<td>59</td>
</tr>
</tbody>
</table>

*Source: GFD and author’s own calculations*

*NIM= Net Interest Margin and measures the Gap between the lending and the deposit rates, O/H=Overhead Cost, is the total cost incurred by the bank, TA=Total assets, Cost/Income=Total Cost incurred by a bank as a ratio of its total income earned.*

Table 2.1 shows that African banking systems tend to have higher net interest margins than banks in many other parts of the world. On average, the net interest margin in African banks for the period 1999-2011 was 655 basis points, compared with 448 basis points for the rest of the world. The high net interest margin is not a good sign for the Africa banking sector as it shows lack of better competition and a better financial intermediation. It also means that the cost of credit is high and depositors are not well compensated for their funds. However, banks in many Latin American and Eastern European countries have at least as high margins as African banks. Africa also has the highest overhead costs to total assets compared to the rest of the world reflecting perhaps the difficult environment banks operate in Africa. All is not a gloomy picture
for Africa banks though. As can be seen in fig 2.4, there has been some improvement in the NIM and the Overhead cost ratios especially since 2010.

**Fig 2.4: Selected Efficiency Indicators of the Africa’s Banking Sector**

![Efficiency of African Banks](source)

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Source: author’s calculation
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**b) Competition**

Consistent with their small size, Africa’s banking systems are mostly concentrated, and few banks share the small universe of clients. Herfindahl index, which is the sum of the squares of market shares; higher numbers thus indicate a more concentrated banking system. Of the
countries with a Herfindahl index above 2,000, 50 percent are in Africa, while only a fifth of the countries with a Herfindahl index below 2,000 are in Africa. The high concentration of African banking systems is also captured by cruder measures such as CR3 concentration measures, that is, the market share of the largest three banks, which, on average, stands at 68 percent. Behind this average is a large cross-country variation. While the CR3 concentration ratio is well below 50 percent in larger financial systems, such as Kenya, Nigeria, and South Africa, it is above 85 percent in Algeria, Angola, Malawi, Mauritius, and Sudan. This concentration can be related to the absolute and relative size of African banking systems. The fixed cost element in banking limits the possibility for a large number of players in markets with a low deposit and lending volume and, accordingly, a small potential customer base for spreading the costs. Similarly, the low income level and limited depth of African financial systems constrain the space for a large number of banks in the banking systems. In recent years, there has been a trend toward consolidation in some banking markets, as regulatory authorities have increased minimum capital requirements, Beck et al (2011).

2.3.3 Access to Banking Services

African banking systems lack not only depth, but also breadth. The number of branches per capita shows the limited outreach of African banking systems compared with systems in other regions. While Benin has less than one branch per 100,000 people, Bolivia has almost seven. While Egypt has four branches per 100,000 adults, Malaysia has 11. Data on the penetration of automated teller machines and point-of-sale systems shows a similar picture. While Morocco has nine automated teller machines per 100,000 adults, Malaysia has 47.5.
African banking is mostly short term, as evidenced by the maturity structure on the asset and liability sides of bank balance sheets. More than 80 percent of deposits are sight deposits or are deposits with a maturity of less than one year; less than 2 percent of deposits have a maturity of more than 10 years. The maturity distribution is not as extreme on the loan side, though it is biased toward the short end. Almost 60 percent of loans are for less than one year, and less than 2 percent of loans are for more than 10 years. This maturity structure of African banks is consistent with the low level of financial development in the countries and the focus of African financial systems on transaction services and short-term finance. It is also consistent with a banking system that focuses on Finance for Market services rather than Finance for Growth services. African banks do not extend loans equally across sectors. This is not surprising because different economic sectors have different needs for external finance. Even within specific sectors, different industries have different financing needs, as documented by Rajan and Zingales (1998) for Canada and the United States. That a specific sector gets less than its “fair” share of bank loans, that is, a lower share in lending than in GDP, may thus be driven as much by lack of demand as by supply constraints.

2.4 Integration of the Africa’s Banking Sector

Africa’s banking systems are small, concentrated, and mostly foreign owned. This last has not always been a characteristic. Rather, the ownership structure has undergone significant changes over the past 50 years since independence. At the time of independence, Africa’s banking systems were mostly dominated by colonial banks, many of which were subsequently nationalized (or “Africanized,” though the result—state ownership—was often the same). Structural adjustment and privatization programs in the 1980s saw a return to private ownership
among many of these banks, sometimes in favor of the same European banks that had once been the proprietors. Now, Africa is the region with the highest share of foreign-owned banks with the exception of the transition economies of Europe and Central Asia, Beck et al (2011). The last 10 to 15 years saw yet another new trend: the transition from international to regional banks. After the end of Apartheid, several South African banks, most notably Absa and Standard Bank, started expanding throughout the continent. More recently, two West African banks—Bank of Africa and Ecobank—have started expanding throughout Sub-Saharan Africa. Similarly, Moroccan banks started to expand south. Finally and as consequence of the recent consolidation wave in Nigeria, Nigerian banks started expanding throughout West Africa, but increasingly also throughout the rest of the continent. In addition to an increase in foreign bank ownership, there has thus been a marked increase in the share of regional, that is, African, banks among foreign banks, reaching 45 percent in the median country in 2009, while, in the mid-1990s, such banks had constituted only around a third of all foreign banks and less than 15 percent of total banking assets in the median African country. It is important to note that most international and regional banks have expanded throughout the region in the form of subsidiaries, which implies higher costs, but can have positive repercussions for supervisors in case of trouble because subsidiaries are somewhat easier than branches (though not perfectly) to ring-fence.

Foreign bank entry seems to have several advantages that are specific to Africa: international banks can help foster governance; they can bring in much-needed technology and experience from other regional economies that should translate into increased efficiency in financial intermediation (in the case of South African or West African banks); and they can help exploit scale economies in small host countries.
Nonetheless, especially in Africa, with its many small, risky, and opaque enterprises, the dark side of foreign bank entry can become obvious. Specifically, the greater reliance of foreign banks on hard information about borrowers as opposed to soft information can have negative repercussions for riskier and more opaque borrowers if foreign banks crowd out domestic banks (for example, see Gormley 2007; Sengupta 2007; Detragiache, Tressel, and Gupta 2008). In addition, there are many factors that can prevent countries from reaping the potential benefits of foreign bank ownership. The presence of dominant government-owned banks can reduce competitive pressures and allow other banks—be they domestic or foreign owned—to earn rents from the inefficiency of government-owned banks, as the example of Kenya in the early 2000s shows. The absence of a sound contractual and informational framework reduces the feasibility of small business lending further. The small size of many financial markets in Sub-Saharan Africa may make foreign banks reluctant to incur the fixed costs of introducing new products and technologies. The small size of many markets also does not allow for the necessary competitive pressure. The result in many African countries has been the concentration of domestic and foreign bank portfolios on government paper and international assets. However, the diversity among the international banks in Africa suggests that there are differential and context-specific variations in the effects. This diversity is reflected in the finding of Čihák and Podpiera (2005) that foreign banks in Tanzania and Uganda lend more and charge lower spreads than domestic banks, while foreign banks in Kenya lend less than their domestic counterparts. This might reflect differences in policies.
2.5 Chapter Summary

This chapter looked at the overview of the financial markets development in Africa with greater emphasis on the banking sector development. It was found that generally, Africa lags behind most of the banking sector development indicators to the rest of the world. Liabilities to GDP averages 29 per cent in sub-Saharan Africa compared to 61 per cent in East Asia and Pacific and 97 per cent in high-income countries over the period 1990-2011. Similarly, Private Credit to GDP averages 17 per cent in sub-Saharan Africa, compared to 44 per cent in East Asia and Pacific and 102 per cent in high-income countries over the same period. The loan-deposit ratio ultimately captures one of the core tasks of financial intermediaries, that is, putting society’s savings to its best use: private sector development. In sub-Saharan Africa the banking sector intermediate on average 69% of deposits, whilst banks in East Asia and Pacific intermediates 108 percent and 126 percent for banks in high income countries.

On efficiency ratios, the average the net interest margin in African banks for the period 1999-2011 was 655 basis points, compared with 448 basis points for the rest of the world. However, banks in many Latin American and Eastern European countries have at least as high margins as African banks. Africa also has the highest overhead costs to total assets compared to the rest of the world reflecting perhaps the difficult environment banks operate in Africa. All is not a gloomy picture for Africa bank’s though as there has been some improvement in the NIM and the Overhead cost ratios especially since 2010.
CHAPTER THREE
ESTIMATING THE DEGREE OF BANKING SECTOR EFFICIENCY IN AFRICA

3.1 Introduction

The financial sector plays an important role in the economic development process. They channel funds from the surplus units to deficit units in the economy. The best financial systems limit, quantify, gather and negotiate all operational risks and incite savers to invest, by offering them a proportional payment to the scale of the incurred risks. Financial intermediaries when they are efficient allow mobilizing saving from diverse sources and allocate it to more productive activities that benefits not only investors and beneficiaries of the investments but also the whole economy (Gulde, Patilo and Christensen, 2006). Indeed a banking system which efficiently channels financial resources to productive use is a powerful mechanism for economic growth (Levine, 1997).

The banking sector worldwide has experienced major transformation in its operating environment. Both external and domestic factors have affected its structure and efficiency. In Sub-Saharan Africa like many other transitional economies, banks are the main financial intermediaries; therefore restructuring policies have been led in order to improve efficiency (Kablan, 2007). These reforms were conducted mainly in the late 1980s and 90s in many African countries with the view of enhancing their domestic banks to better compete in the global market. These reforms came on the back of years of financial distress for many African countries. Interest rate control policy as well as the intervention of the governments in the management of the state owned banks introduced biases in the economic criteria for credit distribution. For instance, a productive project in a non priority sector could not find funds for
financing, while a non productive project in a priority sector could be financed. In those conditions, market mechanisms which should play a regulatory role through the interest rate equilibrium, by allowing good financial resources allowance within the economy, could not be effective (Kablan, 2007).

The reforms embarked on by many of the African countries were aimed at intervening in three areas: the refitting of the grid of the directing rates, the establishment of a renovated money market and the liberalization of bank conditions which results in the suppression of several directing rates floors and the removal of the upper limit of banks debtor conditions. The liberalization of banks conditions were implemented for the mobilization of domestic resources and their optimal allowance for financing the economy. This measure is supposed to give credit institutions a greater room for manoeuvre in the determination of their costs and their prices. It would also lead to a better competition within the banking system through a greater transparency in the invoicing of banking services costs.

Indeed, bank efficiency studies have raised much interest among researchers. Most of these studies have focused on the developed countries after major changes have been done (see Allen et Rai, 1996; Leigthner and Lovell, 1998). At the African level, Peris and Hauner (2005) measured the efficiency of the Ugandan banks to ascertain the effect of restructuring of the banking system. In the same manner, Kirkpatrick, Murinde and Tefula (2007) conducted a study on African Anglophone banks after the period of banking crisis in the late 1980s and early 1990s to work out possible solutions for managers of banks in Africa and regulators. In recent times, cross country studies on bank efficiency have been performed on WAEMU banks (Kablan, 2007), SSA Middle income countries (Chen, 2009) and 29 SSA countries (Kiyota, 2009).
Many of these banking sector efficiency studies adopted various methods in estimating efficiency across banks including the parametric and the non-parametric methods. However, in recent times it has been found that the parametric SFA method which states the bank profits or cost as a Fourier flexible functional form envelopes the data better (see Mitchell and Onvural (1996), Holo and Nagy (2006), etc). The Fourier flexible functional form is a global approximation which is able to eliminate distortions arising from the heterogeneity with the help of normalizing size and other variables. It is particularly a useful method in estimating the banking sector efficiency for a sample of banks which exhibits a wide range of variations in size. As discussed in chapter two of this thesis, Africa’s banking sector exhibits wide variations in size. Therefore, for a cross-country study of this nature on the continent it is important to normalize size in order to eliminate heterogeneity. To date however, studies’ using this method is limited to the advanced countries. Thus it is this gap that this paper seeks to bridge. That is, the first empirical chapter estimates the banking sector efficiency using the SFA approach and stating the bank cost function in the Fourier functional form.

The study is structured as follows: section 3.2 provides the literature review whiles section 3.3 deals with the various methods of estimating efficiency in the banking sector. Section 3.4 presents the results of the study and section 3.5 provides the conclusions to the study.

3.2 The Concept of Efficiency

The concept of economic (productive) efficiency is rooted in neoclassical microeconomic theory, which focuses on resource allocation and utilisation. It advocates for non-wastage of resources
by emphasizing cost reduction while producing the maximum possible level of output for a given technology and available inputs. Thus, a firm that is economically efficient may possess competitive advantage over rival firms producing less efficiently in the same industry. The main driving force behind economic efficiency is value creation (Musonda, 2008). Accordingly, in the process of transforming inputs into some output value, a change that increases value is an efficient change and one that decreases value is an inefficient change. For purposes of policy intervention efficiency has often been used to evaluate the effectiveness of policy alternatives. A related concept of economic efficiency is Pareto optimality, which has foundations in welfare economics. Pareto efficiency occurs when an allocation of resources from one economic agent to the other makes one agent better off without compromising the welfare of another economic agent (that is without making the other individual worse off). Therefore Pareto efficiency has important implications for public policy, especially in the redistribution of income. Although theoretically plausible, Pareto efficiency is difficult to measure in practice. Economic efficiency is better explained by profit maximization (or analogously, cost minimization) but is often associated with perfectly competitive markets than with monopoly because of deadweight loss associated with monopoly pricing and output restrictions. For firms operating in a competitive industry, efficiency gains accrue when firms earn only normal profits in the long-run and respond to changes in consumer preferences by increasing output. Whether this output is sold at the same, higher or lower price depends in large measure on the position of the cost curves in the long-run (See Griffiths & Wall, 2000 and Musonda, 2008). In general however, efficiency is associated with welfare improvements.
Economic efficiency also encompasses allocative efficiency, which occurs when a firm’s inputs are allocated in such a way as to maximise its benefits (profits, revenue and output) depending on the firm’s objective function. Allocative efficiency is thus concerned with informing resource allocation decisions by taking into account both productive efficiency as well as Pareto efficiency. However, it is still possible to achieve Pareto efficiency without allocative efficiency. At firm level, allocative efficient outcomes occur when price is equal to marginal costs in a perfectly competitive market. Allocative efficiency also addresses the issue of the right mix of inputs and quality of output produced, Musonda (2008).

Finally, X-efficiency, introduced by Leibenstein (1966) refers to efficiency in production by linking inputs to outputs. It is an economic expression for the effectiveness with which an organisation uses its given set of inputs to produce outputs. Specifically, it refers to the internal organisation of firms and its response to external factors. Under such circumstances, both motivational factors (e.g., moral and bureaucratic inertia and human errors) and competitive pressures may affect X-efficiency. In many of his writings, Leibenstein repeatedly argued that X-efficiency was superior to allocative efficiency, implying that the latter effect was trivial. Evidently, the concept of efficiency is broad and has been assigned different interpretations. The concept of X-efficiency is especially controversial. Since Leibenstein first proposed the term, analysts have sought to evaluate its meaning and in the process, different interpretations have merged. It is therefore important to be clear when the term X-efficiency is used in analysing an economic problem. In contrast to Leibenstein’s construct of the concept, Peel (1974) contends that X-efficiency can actually be attained even with a lazy or hardworking work force only if effort and efficiency dimensions of inputs that translate into maximum output are taken into
consideration. Furthermore, Peel (1974) posits that cost reduction can be observed in a movement from monopoly to perfect competition, not due to X-efficiency but because managers are forced to give up goals inconsistent with cost minimisation as the environment becomes more competitive.

Like many other critics of the theory of X-efficiency, Stigler (1976) cautions that failure to recognise that higher than minimum cost levels are mainly due to rationally calculated utility maximising strategies (including leisure) by workers rather than by X-efficiency. This criticism may imply that firms are always producing at the production frontier in which only allocative efficiency would then be relevant. The above efficiency definitions refer to static efficiency.

One form of efficiency with time dimension is dynamic efficiency (Jameson, 1972). Dynamic efficiency takes into account changes in technology as a main source of productivity, so that over time, the production frontier shifts due to technological advancements. One would associate dynamic efficiency with long-run economic growth arising from productivity change through capital accumulation (Abel, Mankiw, Summers, & Zeckhauser, 1989). Scale economies and economies of scope provide another perspective for analysing firm efficiency. Economies of scale occur when more units of a good or service can be produced on a larger scale, yet with less input costs. Therefore, economies of scale are associated with size of the firm, implying that larger firms enjoy economies of scale due to larger production technology. For a long time, economic growth has been explained by the theory of economies of scale. At firm level, Adam Smith showed that specialisation and division of labour are the two most important pillars behind productivity growth and increase in efficiency. Marshall (1961) distinguished between internal
and external economies of scale, attributing the former to lower costs which lead to higher production and the latter as emanating from external forces such as improvements in transportation network. External economies of scale may thus benefit all firms in the industry by lowering costs and stimulating firm growth. In contrast, economies of scope relate to a reduction in costs resulting from joint production. Thus, a firm which decreases its average costs because of changes in production of different products (related or unrelated) is said to be enjoying economies of scope. Economies of scope also provide firms with means to generate operational efficiencies, especially when these are driven by diversification. In the case of banking, for instance, it may be economical for a bank to diversify into different areas of financial services such as to lower costs which lead to higher production and the latter as emanating from external forces such as improvements in transportation network. External economies of scale may thus benefit all firms in the industry by lowering costs and stimulating firm growth. In contrast, economies of scope relate to a reduction in costs resulting from joint production. Thus, a firm which decreases its average costs because of changes in production of different products (related or unrelated) is said to be enjoying economies of scope.

Such a strategy may be driven by synergies of knowledge of commercial banking and investment banking of particular corporate customers. For larger banks, diversification may be an important business strategy aimed at reducing portfolio risk and hence gain efficiency. However, empirical evidence for the United States does not support this hypothesis (Demsetz and Stratan, 1997). Although scale economies may be important, bigger may not necessarily be better in the sense that when firms expand in size, the chain of command also becomes cumbersome. Therefore decisions taken at the top may take longer and information distorted by the time it reaches the
bottom ladder of the firm. When this happens, the firm may not be realising cost reductions as predicted by the theory. Accordingly, diseconomies of scale may set in. Thus, smaller firms may be more efficient than larger firms in this regard. A similar interpretation may be offered for economies of scope. While economies of scope often provide an incentive to expand product lines, the creation of new products is often less efficient than expected, resulting in diseconomies of scope. This is because the introduction of new product brands may entail additional managerial expertise or personnel, higher raw material costs, a reduction in competitive focus, and the need for additional facilities, which collectively could result in an increase of a firm’s per-unit costs. Therefore, economies of scope may not be obvious. For the banking example above, managers may find it challenging to manage insurance business while also trying to provide commercial banking services to a wide range of customers. For this reason, the envisaged synergies may actually lead to huge cost increases.

3.3 Measuring Efficiency

The idea of efficiency of a production unit was first introduced by seminal works of Debreu (1951) and Farrell (1957), under the concept of “input oriented measure”. Studies of efficiency of commercial banks have generally evolved around explaining a performance measure of efficiency by a vector of variables that capture the key components determining the efficiency. Two broad approaches are generally used in the literature: structural and nonstructural. Structural approaches are based on theoretical models of banking behaviour, and involve such optimization problems as cost minimization or profit maximization. Nonstructural approaches choose different performance measures, and focus on explaining these measures by a variety of financial
ratios or other factors considered appropriate (Chen, 2009). Structural approaches to bank efficiency have basically focused on estimating an efficient frontier and measuring differences between the point at which the bank is operating and the efficiency frontier.

There are five common techniques for estimating efficiency frontiers: data envelopment analysis (DEA), free disposable hull analysis (FDH), stochastic frontier analysis (SFA), thick frontier approach (TFA), and distribution free approach (DFA). The first two are nonparametric, and the latter three are parametric techniques in that assumptions are needed for a specific functional form of the unobservable inefficiency process. These methods are discussed below:

3.3.1 Non-Parametric Methods

The non-parametric method is a mathematical programming approach known as DEA (Data Envelopment Analysis). Data Envelopment Analysis (DEA) is a mathematical programming approach for the construction of production frontiers and the measurement of efficiency relative to the constructed frontiers. DEA is based on a concept of efficiency very similar to the microeconomic one; the main difference is that the DEA production frontier is not determined by some specific functional form, but it is generated from the actual data for the evaluated firms. In other words, the DEA frontier is formed as the piecewise linear combination that connects the set of ‘best-practice observations’ in the data set under analysis, yielding a convex Production Possibility Set (PPS). As a consequence, the DEA efficiency score for a specific Decision-Making Unit (DMU) is not defined by an absolute standard, but it is defined relative to the other DMUs in the specific data set under consideration. This feature differentiates DEA from the parametric approaches which require a specific pre-specified functional form of the modeled
production or cost function, (Molyneux and Casu, 2003). Two different assumptions could be made whilst computing efficiency scores using DEA-constant returns to scale (CRS) and variable returns to scale (VRS). The assumption of CRS is said to prevail when an increase of all inputs by 1 percent leads to an increase of all outputs by 1 percent (Golany and Thore, 1997).

The CRS assumption is appropriate when all banks are operating at an optimal scale. This was the original assumption under which the DEA was first applied (Charnes, Cooper and Rhodes, 1978). Factors that can cause banks not to operate at an optimal scale include imperfect competition, leverage concerns, certain prudential requirements, etc (Grigorian and Manole, 2002). Thus banks operate in an imperfect environment and face non-constant returns to scale as documented empirically by McAllister and McManus (1993) and Whelock and Wilson (1997).

This phenomenon led Banker et al (1984) to suggest an extension of the CRS DEA method to account for a variable returns to scale (VRS). The VRS method ensures that an inefficient bank is benchmarked against similar sized banks. The approach forms a convex hull of intersecting planes which envelope the data points more tightly than the conical hull and thus provide technical efficiency scores that are greater than or equal to those obtained using the CRS model (Molyneux and Casu, 2003). The advantages of the VRS method outweighs the additional computational requirements making it the preferred method of studies on banking efficiency (Fried et al, 1993; Coelli et al, 1998; Cooper et al, 2000). VRS efficiency of a DMU measures its pure technical efficiency, whilst CRS efficiency accounts for both technical efficiency and the efficiency loss when the DMU does not operate in its most productive scale size (Charnes et al, 1994). The ratio of CRS to VRS efficiency scores is called scale efficiency (Ramanathan, 2006).
There are two basic models which have been used by researchers using the DEA method as a model for efficiency estimation. These are the input-oriented models and the output-oriented models. In the input-oriented models, the DEA seeks to identify technical inefficiency as a proportional reduction in the input usage. It is also possible to measure technical inefficiency as a proportional increase in output. The two measures provide the same value under CRS, but do not equate when VRS is assumed. The choice of orientation has both practical and theoretical implications. In some studies, the choice of orientation is clear; for example, in industries where the emphasis is on cost-control, the most appropriate choice would be an input-oriented measure (Ferrier and Valdmanis, 1996). There is no conclusive evidence as to which of the two models is the best choice among the alternative orientations of measurements.

Among the strengths of the DEA is that it is less data demanding as it works fine with small sample size (Sufian, 2006). Also, DEA does not require a preconceived structure or specific functional form to be imposed on the data in identifying and determining the efficient frontier, error and inefficiency structures of the DMUs (Evanoff and Israelvich, 1991; Grifell-Tatje and Lovell, 1997; Bauer et al, 1998). Hababou (2002) further adds that it is better to adopt the DEA technique when it has been shown that a commonly functional form relating inputs to output is truly difficult to prove or find. Such specific functional form is truly difficult to show for financial services entities. Avkiran (1999) noted that the edge of the DEA by stating that the technique allows the researchers to choose any kind of input and output of managerial interest, regardless of different measurement units. In other words, there is no need for standardization. Two useful features of DEA are first, each DMU is assigned a single efficiency score, hence allowing ranking among DMUs in the sample. Second, it highlights the areas of improvement for each single DMU. The mathematical construction of the DEA method is explained below:
Assume that there are N DMUs, and that the DMUs under consideration convert $I$ inputs to $J$ outputs. Specifically, let the $m$th DMU produces outputs $y_{mj}$ using $x_{mi}$ inputs. The objective of the DEA exercise is to identify the DMUs that produce the largest amount of outputs by consuming the least amounts of inputs, subject to the limits imposed by the performance of other similar DMUs. A DMU is said to be the most efficient if the ratio of weighted sum of outputs to the weighted sum of the inputs is the highest. Hence, the DEA program maximizes the ratio of weighted outputs to weighted inputs for the DMU under consideration subject to the condition that similar ratios for all DMUs is less than or equal to one. Hence according to Ramanathan (2006), the model for calculating the efficiency of the $m$th DMU (called the base DMU) can be stated below:

$$\max \frac{\sum_{j=1}^{J} v_{mj} y_{mj}}{\sum_{i=1}^{I} u_{mi} x_{mi}}$$

(Model 1)

Subject to the following constraints,

$$0 \leq \frac{\sum_{j=1}^{J} v_{mj} y_{nj}}{\sum_{i=1}^{I} u_{mi} x_{ni}} \leq 1, \quad n = 1, 2, \ldots, N$$

$$v_{mj}, u_{mi} \geq 0; \quad i = 1, 2, \ldots, I; \quad j = 1, 2, \ldots, J$$
where the subscript \( i \) stands for \( I \) inputs, \( j \) stands for \( J \) outputs and \( n \) stands for \( DMUs \). The variables \( v_{mj} \) and \( u_{mi} \) are the weights (also called the multipliers) to be determined by the above mathematical program, and the subscripts \( m \) indicates the base DMU. In practice the non-negativity constraint is replaced with strict positivity constraints to ensure that all the known inputs and outputs have positive weight values as suggested by Charnes et al (1979). The optimal value of the objective function is the DEA efficient score assigned to the \( m \)th DMU. If the efficiency score is 1 the \( m \)th DMU satisfies the necessary condition to be DEA efficient and is said to be located on the efficient frontier, otherwise it is DEA inefficient.

Model 1 is difficult to solve because of its fractional objective function. However, if either the denominator or the numerator of the ratio is set to unity, then the objective function will become linear and a linear programming problem can be obtained. Thus, setting the denominator in model 1 to unity the following model is obtained.

\[
\max \sum_{j=1}^{J} v_{mj} y_{mj} \quad \text{subject to} \quad \sum_{i=1}^{I} u_{mi} x_{mi} = 1
\]

(Model 2)

Subject to the following constraints,

\[
\sum_{i=1}^{I} u_{mi} x_{mi} = 1
\]

\[
\sum_{j=1}^{J} v_{mj} y_{mj} - \sum_{i=1}^{I} u_{mi} x_{mi} \leq 0; \quad n = 1, 2, \ldots, N
\]

\[
v_{mj}, u_{mi} \geq 0; \quad i = 1, 2, \ldots, I; \quad j = 1, 2, \ldots, J
\]
Model 2 is called the output maximizing multiplier version in the DEA literature. A complete DEA model involves solving N such programs as depicted in Model 2 for each base DMU (m=1,2,…,N) to get the efficiency scores of all the DMUs. The objective function and the first constraint in each of the program in Model 2 are changed while the remaining constraints are the same.

Efficiency scores are computed using the dual version of Model 2. The dual constructs a piecewise linear approximation to the true frontier by minimizing the quantities of the different inputs to meet the stated levels of the different outputs. The dual is given below;

Minimize,

\[ \theta_m \] \hspace{1cm} \text{(Model 3)}

subject to

\[ \sum_{n=1}^{N} y_{mj} \lambda_n \geq y_{mj}; \hspace{0.1cm} j = 1,2,..., J \]

and

\[ \sum_{n=1}^{N} x_{mi} \lambda_n \leq \theta_m x_{mi}; \hspace{0.1cm} i = 1,2,..., I \]

\[ \lambda_n \geq 0; n = 1,2,..., N; \theta_m \text{ free} \]
The model above (Model 3) is usually called input oriented envelopment version in the DEA literature. Similarly, an output oriented envelopment version could be developed as the dual of input minimization linear programming problem. Model 3 rates a particular DMU (mth DMU) and this is efficient if and only if the optimal values of its efficiency ratio, $\theta_m$, equals unity.

### 3.3.2 Empirical Studies Using DEA Method

Over the past decades, DEA has frequently been applied to the banking industry studies in many countries. The first application analysed efficiencies of different branches of a single bank (Sufian, 2006). Sherman and Gold (1985) studied the overall efficiency of 14 branches of US savings banks. DEA results showed that six branches were operating inefficiently compared to others. Similar study by Parkan (1987) suggested that eleven out of 35 were relatively inefficient. The unit of assessment of efficiency was shifted from branches to consolidated banking institutions by Rangan et al (1988). They applied DEA to a larger sample of 215 US banks and attempted to break down inefficiency to that stemming from pure technical inefficiency and scale inefficiency. Apart from the US, DEA has also been applied to studies on bank efficiency in other countries. Fukuyama (1993, 1995) employed DEA to investigate efficiency among 143 Japanese banks in 1990. He found pure technical efficiency to average around 0.86 and scale efficiency around 0.98 implying that the major source of overall technical inefficiency is pure technical inefficiency. The scale inefficiency is found to mainly due to increasing returns to scale. He also found that banks of different organizational status perform differently with respect to all efficiency measures (overall, scale, pure technical).
Grigorian and Manole (2002) estimated the indicators of commercial bank efficiency by applying a version of Data Envelopment Analysis (DEA) to bank-level data from a wide range of transition countries. They extended their analysis by explaining the differences in efficiency between financial institutions and countries by a variety of macroeconomic, prudential, and institutional variables. Overall, their results confirm the usefulness of DEA for transition-related applications.

Molyneux and Casu (2003) employing the non-parametric DEA approach, investigated whether the productive efficiency of European banking systems has improved and converged towards a common European frontier between 1993 and 1997, following the process of EU legislative harmonization. They found average efficiency levels of the European banking system to be 65%. Overall, their results indicated that since the EU’s Single Market Programme there has been a small improvement in bank efficiency levels, although there is little evidence to suggest that these have converged. Webb (2003) utilized DEA window analysis to investigate the relative efficiency levels of large UK retail banks during the period of transition 1982-1995. It finds that for the entire sample, the mean inefficiency levels are low in comparison to past studies, that the overall long run average efficiency trend is falling and that all banks in the study show reducing levels of efficiency over the entire time period.

Drake and Hall (2003) analysed the technical and scale efficiency in Japanese banking using the data envelopment analysis. Efficiency analysis was conducted across individual banks, bank types and bank size groups. Powerful size-efficiency relationships were established with respect to both technical and scale efficiency. Necmi (2004) used Data envelopment analysis (DEA) and window analysis to examine the changes in Australian trading banks' pure technical efficiency,
scale efficiency, and the nature of returns to scale. The main findings indicate declining average efficiency scores until 1991, followed by a steady rise thereafter. Pure technical inefficiency emerges as a greater source of inefficiency than scale inefficiency.

Furthermore, Ramanathan (2006) studied the performance of 55 banks operating in countries of the GCC using data envelopment analysis (DEA) and Malmquist productivity index (MPI) for the period 2000-2004. DEA efficiencies were calculated for the year 2004. Results show that only 15 of the 55 banks are rated as efficient under constant returns to scale (CRS) assumption, and all the GCC countries have at least one efficient bank. Their analysis using MPI showed that banks in four of the six GCC countries (Bahrain, Kuwait, Saudi Arabia and the UAE) registered productivity improvements during 2000-2004.

Regarding African studies on the issue, Peiris and Hauner (2005), make use of DEA to analyze Ugandan banks efficiency after the restructuring period. They show that the improvement of the competitiveness of the Ugandan banks after the reforms period could be linked to that of efficiency. Kablan (2007) studied the technical efficiency of the banking system in the WAEMU countries using DEA. He concluded that despite the technological changes that occurred in the banking system, Malmquist index shows that the increase of technical efficiency is much more the fact of scale efficiency change than that of the incorporation of technological innovations.
3.3.3 Parametric Methods

The main criticism of the DEA method is that it does not allow for identification of random errors, caused by luck, data problems or other measurement errors (Fries and Taci, 2004) compelling some researchers to seek parametric analysis of efficiency. There are two main parametric approaches to measuring efficiency of individual banks, the Stochastic frontier approach (SFA) and the Distribution-free approach (DFA). A third parametric approach, thick frontier approach (TFA), does not provide point estimates of the inefficiencies for the individual banks (Fries and Taci, 2004). The main difference between DFA and the SFA techniques is how they separate the measure of inefficiency for an individual bank from random errors.

The SFA was first developed independently by Aigher et al (1977) and Meeusen and van den Broeck (1977) and was later introduced into banking by Ferrier and Lovell (1990). It is based on the economics of cost minimization or profit maximization by banks and thus starts with a standard cost or profit function with factors of input, output and their respective prices. It estimates the minimal cost or maximum profit based on these functions and generates an efficiency frontier for the sample. The efficiency of each bank is then measured as the distance of its cost or profit to the frontier value (Chen, 2009). The approach treats the observed inefficiency of a bank as a combination of the inefficiency specific to the bank and a random error and tries to disentangle the two components by making explicit assumptions about the underlying inefficiency process. The random error is usually assumed to be a normally distributed variable and can affect the overall inefficiency in either way, but the inefficiency term is assumed to be only one-sided and can affect the overall efficiency from one direction. For a cost frontier, this inefficiency factor should be non-negative, as banks operate on or above the
minimum cost, and for a profit frontier, it is always non-positive as banks can only achieve profit levels lower than the maximum profit in the same sample.

3.3.4 Empirical Studies Using the SFA Method

Studies which have used the SFA model includes English et al (1993), who used a distance function with a translogarithmic form and found that on average US banks were inefficient after mergers and consolidations of the US banking system in the 90s. Allen and Rai (1996) in an international study of bank comparison used stochastic frontier analysis (SFA) and Distribution Free Approach (DEA) and show that the inefficiency level displayed by universal banks is smaller than that of separate activities banks. The authors then analyse the determining factors of efficiency without taking into account the environmental variables such in the explanation of efficiency. Lozano-Vivas and Dietsch (2000) depicted this in their study of comparing French and Spanish banks. The comparison was made integrating in cost frontier environmental specificities.

On the African level Chen (2009) used bank level data for Sub-Saharan African middle-income countries and found that on average banks could save 20-30 percent of their total costs if they were operating efficiently and foreign banks are more efficient than public banks and domestic private banks. Kiyota (2009), used the SFA to study banks in 29 SSA countries and found that SSA foreign banks are more profit efficient than non-SSA foreign banks. However, non-SSA foreign banks are more cost efficient than domestic banks.

The DFA as applied to banks by Berger (1993) also assumes a functional form for the cost frontier but separates the inefficiencies from random errors in a different way. The approach
assumes that the inefficiency of each bank in panel data set is constant over time, whereas the random errors tend to average out over time. The estimate of the inefficiency of each bank is then measured as the difference between its average residual from the estimated cost function and that of the bank on the cost efficiency frontier. The distribution of inefficiencies can follow almost any form as long as they are non-negative. However the assumption of persistent inefficiency over time is strong and is not suitable for environments where change is rapid.

3.4 Methodology and Data Description

3.4.1 Methodology

As noted earlier, several methods are found in literature which has been used to estimate bank efficiency scores. In this study the SFA approach is used to estimate the banking sector efficiency on the assumption that an efficient frontier in the banking sector follows a certain functional form. In the literature there is no consensus about this functional form (Hollo and Nagy, 2006).

In estimating cost function and measuring banks’ X-efficiency a certain relationship between operational cost, input prices and output quantities has to be assumed. The general form of the cost function is the following:

\[ \ln C_i^* = f(w_i^*, y_i^*, \xi_i^*) + \varepsilon_i \]  

E.q. (1)

The cost function represents the bank’s desire to minimize its cost with respect to its input and output. \( C_i^* \) is the total cost bank \( i \) incurs at time \( t \), \( w_i^* \) is the vector of input prices bank \( i \) faces at
time $t$, $y_{it}$ is the vector of outputs, and $z_{it}$ is a vector of semi-fixed netput, such as physical capital and equity. The error term $\epsilon_{it}$ is composed of two parts $\epsilon_{it} = u_i + v_i$

Where $u_i$ represents the inefficiency factor pertaining to bank $i$ and is constant across time. $v_i$ is the random error term. That is $u_i$ can be modeled to follow a half-normal, truncated normal exponential distribution which take only positive values with variance $\delta^2_u$, stated mathematically as

$$u_i \sim N^+(0, \sigma^2_u),$$

whereas $v_{it}$ follows a normal distribution with variance $\delta^2_v$. That is, $v_{it} \sim N(0, \sigma^2_v)_{iid}$

$u_i$ measures the difference of bank $i$’s cost compared with that of the frontier $f(w_{it}, y_{it}, z_{it})$.

The inefficiency can then be obtained by

$$E(u_i / \epsilon_{it}) = \frac{\sigma \lambda}{(1 + \lambda^2)} \left[ \frac{\phi(\epsilon_{it} \lambda / \sigma)}{\Phi(\epsilon_{it} \lambda / \sigma)} - \frac{\epsilon_{it} \lambda}{\sigma} \right] \text{ E.q. (2)}$$

Where $\lambda = \frac{\sigma_u}{\sigma_v}$, and $\sigma^2 = \sigma^2_u + \sigma^2_v \lambda$ measures the ratio of the standard deviation of the inefficiency component to the standard deviation of the random error. If $\sigma_u = 0$, then there is no inefficiency and all deviations from the efficiency frontier are due to random error. The cost efficiency of bank $i$ can then be defined as a ratio between two costs: the estimated cost needed to produce the same output mix if the bank were producing on the efficiency frontier (where $u = 0$) divided by the actual cost as stated below;
\[
\text{CostEFF}_i = \frac{\hat{C}_{\text{frontier}}}{\hat{C}_i} = \frac{\exp(f(w_i, y_i, z_i))}{\exp(f(w_i, y_i, z_i) + \hat{u}_i)} = \exp(-\hat{u}_i) \text{ ......................... E.q. (3)}
\]

As \( u_i \geq 0, \text{CostEFF} \in (0,1] \)

A prior assumption about the form of cost function has to be made. Most studies of X-efficiency compute efficiency scores from translog cost equations.

The translog functional form was first introduced by Christensen, Jorgenson and Lau (1971) and when applied to the efficiency studies can be functionally stated as;

\[
\ln(C_{i,t} / z_{i,t} w_{i,3i}) = \alpha_0 + \sum_l \beta_l \ln(y_{i,lt} / z_{i,lt}) + 1/2 \sum_{m} \sum_{n} \beta_{mn} \ln(y_{i,mt} / z_{i,mt}) \ln(y_{i,nt} / z_{i,nt}) + \]

\[
\sum_{j} \gamma_j \ln(w_{i,jt} / w_{i,3it}) + 1/2 \sum_{h} \sum_{k} \gamma_{hk} \ln(w_{i,ht} / w_{i,3it}) \ln(w_{i,kt} / w_{i,3it}) + \]

\[
+ 1/2 \sum_{l} \sum_{j} \delta_{lj} \ln(y_{i,lt} / z_{i,lt}) \ln(w_{i,jt} / w_{i,3it}) + u_i + v_i \text{ ....................... E.q. (4)}
\]

This form has several advantages a) it is compatible with multiple output production without violating the curvature conditions of the cost function; b) it provides a second-order Taylor series approximation of an arbitrary function at the mean of the data. The main disadvantage of this functional form as pointed out by White (1980) is that it is a local approximation method and the least squares estimates of the translog polynomial might produce biased estimates of the series expansions. McAllister and McManus (1993) found that the high level of sample heterogeneity (the sample includes small, medium and large banks) causes White-type bias. Furthermore, the multi-collinearity between independent variables limits the accuracy of parameter estimates, likely to also affect those which we use in the process of decomposing error components. Thus, the cost of flexible application is statistically insignificant parameter estimates. For the above
reason, the translog cost (profit) frontier is seldom applied as a single equation method; parameters are rather estimated within a system, jointly with factor demand functions derived with the help of the Shepard lemma. However, multiple-equation estimation does not treat the problem of sample’s heterogeneity and may produce the aforementioned White-type bias.

An alternative to the translog is the Fourier-flexible functional form. The flexible Fourier form represents a semi-nonparametric approach to the problem of using the data to infer interrelationships among the variables when the true functional form of the relationships is unknown (Mitchell and Onvural, 1996). Another advantage of Fourier-flexible form compared to the translog is that this is a global approximation estimation method. The estimation procedure adjusts distortions arising from heterogeneity with the help of normalizing size and other selected variables.

An exact representation of a function may require a Fourier series having an infinite number of trigonometric terms, but the coefficient of these terms could only be estimated with a data set having an infinite number of observations. Given a finite number of observations, a researcher is forced to choose a subset of the trigonometric terms with which to represent a cost function. Gallant (1981) designed the combination of second-ordered polynomials and truncated Fourier-series as Fourier-flexible functional form. The most substantial criticism formulated in relation to the procedure is that an infinite number of trigonometric terms are required for the exact representation, requiring an infinite number of observations. Given a finite number of observations the optimal subset of trigonometric terms should be found. Gallant (1981) asserts that a Fourier series representation of an unknown function can achieve a given level of
approximation error with fewer trigonometric terms when it includes a second-order polynomial in the explanatory variables. In the article of Mitchell and Onvural (1996), several estimates were performed by changing the number of trigonometric components. Their findings suggested that the cost function of the banking industry cannot have the translog form. The conclusions question the credibility of earlier translog based approaches.

Despite its superior properties, the flexible Fourier form has not been used much in the study of banking efficiency especially on the continent. Following from Berger and Mester (1997), Giradone et al (2004) and Hollo and Nagy (2006) the Fourier flexible form is stated below as:

\[
\ln \left( \frac{TC}{w_3} \right) = \beta_0 + \sum_m \alpha_m \ln y_m + \sum_n \beta_n \ln \left( \frac{w_n}{w_3} \right) + \frac{1}{2} \sum_m \sum_p \alpha_{mp} \ln y_m \ln y_p + \frac{1}{2} \sum_n \sum_r \beta_{nr} \ln \left( \frac{w_n}{w_3} \right) \ln \left( \frac{w_r}{w_3} \right) + \sum_n \sum_m \gamma_{nm} \ln \left( \frac{w_n}{w_3} \right) \ln y_m + \sum_m [\delta_m \cos z_m + \theta_m \sin z_m] + \sum_m \sum_p [\epsilon_m \cos (z_m + z_p) + \theta_m \sin (z_m + z_p)] + \epsilon
\]

E.q. (5).

Where \( TC \) is the total cost (including interest cost), \( y_m \) is the \( m \)th output with \( m=1, 2, 3 \), \( w_n \) is the \( n \)th input price \( (n=1,2) \), \( w_3 \) is the price of financial input and \( \epsilon \) is the error term. \( p, r \) equal to 1, 2, 3 based on the number of output and inputs. For this equation, symmetry and linear homogeneity require the following parameter restrictions:

\[
\alpha_{mp} = \alpha_{pm}, \beta_{nr} = \beta_{rn}, \sum_{n=1}^{3} \beta_n = 1, \sum_{r=1}^{3} \beta_{nr} = 0, \sum_{n=1}^{3} \gamma_{nm} = 0.
\]

Due to the periodic nature of the Fourier function, the application of this function requires the scaling of the data. Following from Altunbas et al (2001) the study scaled the banking outputs by the formula stated below:
\[ z_m = 0.2\pi + (1.6\pi) \frac{\ln y_m - \ln y_{m,\text{min}}}{\ln y_{m,\text{max}} - \ln y_{m,\text{min}}}, \] \quad \text{E.q. (6)}

where \( y_m \) is the \( m^{th} \) output (\( m=1, 2, 3 \)). This formula ensures that the scaled variables satisfy the condition \( 0 < \min z_m < \max z_m < 2\pi \).

3.4.2 Variables Used in Estimating Banking Sector Efficiency

The first difficulty encountered in selecting variables for the estimation of the banking sector efficiency is the definition of costs, input prices and outputs, i.e. the components of bank production. Two approaches in literature have been adopted: “the intermediation approach” and the “production approach”. The intermediation approach considers banks’ deposits as inputs in the production process. Contrary to the above, the production approach claims that deposits and various bank liabilities are also outputs.

Hughes and Mester (1993) formulated an empirical test for determining whether deposits act as an input or output. Consider variable cost, \( VC \), which is the cost of non deposit inputs and is a function of the prices of non deposit inputs, \( w \), output levels, \( q \), other variables affecting the technology, \( \tau \), and the level of deposits, \( x \). If deposits are an input, then \( \frac{\partial VC}{\partial x} < 0 \), increasing the use of some input should decrease the expenditures on other inputs. If deposits are an output, then \( \frac{\partial VC}{\partial x} > 0 \), output can be increased only if expenditures on inputs are increased. Hughes and Mester’s empirical results indicate insured and uninsured deposits are inputs at banks in all size categories. Thus following from Sealey and Lindley (1977) and Hughes and Mester (1993), the intermediation approach is used in this study.
Consistent with the intermediation approach, three outputs were specified; net loans \( (y_1) \), other earning assets \( (y_2) \) noninterest revenue \( (y_3) \). Input prices include price of labour measured as personnel expenses divided by total assets \( (w_1) \), deposit cost measured as interest expense divided by deposit \( (w_2) \) and price of physical capital defined as non-interest expense divided by physical capital. In addition to the selection of output and input variables, the other major challenge is linked to the selection of the auxiliary variable serving to reduce the heterogeneity arising between countries and banks. The application of a Fourier-flexible functional form can moderate the heterogeneity related to size. For the purpose of further reducing the distorting effect of varying size and other operational bias (macro and regulatory environment, market structure), the use of environmental variables, such as inflation, depth of financial intermediation, market concentration, level of liberalisation and banking reform is also recommended (Hollo and Nagy, 2006).

### 3.4.3 Data Description

The study uses secondary data obtained from the *Bankscope* database for the period 1999-2008. 307 banks from 33 African countries were used in the study. The choice of this period stemmed from the fact that most of the banking sector reforms in Africa had come to an end by the year 1999 and therefore a ten year period is a reasonable time to investigate the efficiency levels in the Africa’s banking sector. Only commercial banks are included in this study. Central banks as well as rural banks were excluded from the sample. Therefore, it enables one to study the banking sector without having to adjust data as a result of regulatory changes occasioned by the reforms. A ten–year period after the reforms is a long enough to assess its benefits. Availability
of data is key in choosing a bank to be included in the sample. The country by country breakdown of the sample is shown in Appendix 1. Data was then obtained on net loans, other earning assets, noninterest revenue, personnel expenses, deposits, interest expenses, total assets, bank capital and other operating expense. Country specific variables were obtained from the African Development Indicators of the World Bank.

3.5 Empirical Findings

The bank efficiency scores variables were estimated based on the model presented in eq. (5) by maximum likelihood approach. Cost efficiency is the main efficiency variable estimated in this study. Table 3.1 shows the results of the efficiency estimates. Two versions of equation (5) were estimated-uncontrolled and the controlled. The uncontrolled model estimate efficiency scores by ignoring the country specific factors whilst the controlled model estimate the model by including some selected country variables by assuming time invariant distribution for the inefficiency term. To check on the robustness of the inefficiency estimates, various distribution (i.e. half-normal, truncated normal) of the inefficiency term were assumed and the equation re-estimated. The translog for both models were also assumed and estimated in each case. The results of these estimations are presented in Appendix 2. The result of the controlled model is presented first.
Table 3.1: Results of Fourier Flexible Cost Function Specification for the period 1999-2008 (Controlled)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>z-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\ln y_1$</td>
<td>-3.1159</td>
<td>-7.07</td>
<td>0.000</td>
</tr>
<tr>
<td>$\ln y_2$</td>
<td>-0.3462</td>
<td>-1.38</td>
<td>0.167</td>
</tr>
<tr>
<td>$\ln y_3$</td>
<td>0.374</td>
<td>0.73</td>
<td>0.466</td>
</tr>
<tr>
<td>$\ln (w_1/w_3)$</td>
<td>-7.6216</td>
<td>-6.79</td>
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</tr>
<tr>
<td>$\ln (w_2/w_3)$</td>
<td>-0.2383</td>
<td>-2.19</td>
<td>0.029</td>
</tr>
<tr>
<td>$\ln (y_1) \times \ln (y_1)$</td>
<td>0.2</td>
<td>3.72</td>
<td>0.000</td>
</tr>
<tr>
<td>$\ln (y_2) \times \ln (y_2)$</td>
<td>0.0303</td>
<td>1.26</td>
<td>0.209</td>
</tr>
<tr>
<td>$\ln (y_3) \times \ln (y_3)$</td>
<td>-0.0566</td>
<td>-0.82</td>
<td>0.413</td>
</tr>
<tr>
<td>$\ln (w_1/w_3) \times \ln (w_1/w_3)$</td>
<td>44.0194</td>
<td>4.46</td>
<td>0.000</td>
</tr>
<tr>
<td>$\ln (w_2/w_3) \times \ln (w_2/w_3)$</td>
<td>-0.0263</td>
<td>-2.12</td>
<td>0.034</td>
</tr>
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<td>$\ln (y_1) \times \ln (y_2)$</td>
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<td>8.2</td>
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<tr>
<td>$\ln (y_1) \times \ln (y_3)$</td>
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<td>4.32</td>
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<td>$\ln (y_1) \times \ln (w_1/w_3)$</td>
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<td>4.35</td>
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<tr>
<td>$\ln (y_1) \times \ln (w_2/w_3)$</td>
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<td>1.8</td>
<td>0.072</td>
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<td>$\ln (y_2) \times \ln (y_3)$</td>
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<td>$\ln (y_2) \times \ln (w_1/w_3)$</td>
<td>1.4787</td>
<td>2.53</td>
<td>0.011</td>
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<tr>
<td>$\ln (y_2) \times \ln (w_2/w_3)$</td>
<td>0.1115</td>
<td>1.79</td>
<td>0.073</td>
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<td>2.0295</td>
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<td>z-value</td>
<td>p-value</td>
</tr>
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<td>-------------------</td>
<td>--------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>sinz1</td>
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<td>0.721</td>
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<tr>
<td>sinz2</td>
<td>0.3483</td>
<td>1.53</td>
<td>0.127</td>
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<tr>
<td>sinz3</td>
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<td>-0.62</td>
<td>0.532</td>
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<tr>
<td>cosz1</td>
<td>-4.7683</td>
<td>-6.71</td>
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</tr>
<tr>
<td>cosz2</td>
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<td>-0.04</td>
<td>0.970</td>
</tr>
<tr>
<td>cosz3</td>
<td>0.7845</td>
<td>1.1</td>
<td>0.270</td>
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<td>cos(z1+z1)</td>
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<tr>
<td>cos(z1+z2)</td>
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<td>0.000</td>
</tr>
<tr>
<td>cos(z1+z3)</td>
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<td>0.000</td>
</tr>
<tr>
<td>cos(z2+z2)</td>
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<td>0.67</td>
<td>0.503</td>
</tr>
<tr>
<td>cos(z2+z3)</td>
<td>0.567</td>
<td>3.04</td>
<td>0.002</td>
</tr>
<tr>
<td>cos(z3+z3)</td>
<td>0.1084</td>
<td>0.92</td>
<td>0.357</td>
</tr>
<tr>
<td>sin(z1+z1)</td>
<td>0.7736</td>
<td>6.23</td>
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<tr>
<td>sin(z1+z2)</td>
<td>-0.4415</td>
<td>-7.69</td>
<td>0.000</td>
</tr>
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<td>sin(z1+z3)</td>
<td>-0.1894</td>
<td>-2.01</td>
<td>0.044</td>
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<td>sin(z2+z2)</td>
<td>0.0267</td>
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<td>0.852</td>
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<tr>
<td>m2gdp</td>
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<td>-1.22</td>
<td>0.222</td>
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<tr>
<td>rgu</td>
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<td>0.032</td>
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<td>governance</td>
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<td>0.47</td>
<td>0.635</td>
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<td>hef</td>
<td>0.0903</td>
<td>3.39</td>
<td>0.001</td>
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<tr>
<td>constant</td>
<td>4.2687</td>
<td>6.15</td>
<td>0.000</td>
</tr>
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<td>gamma</td>
<td>0.9692</td>
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</table>

Log Likelihood 1220.400
Wald Chi 2 (38) 8765.25
No. Of observations 2,973

(bank outputs are \( y_1 = \text{net loans}, y_2 = \text{investment} \) and \( y_3 = \text{non-interest earnings} \)
earnings are \( w_1 = \text{price of labour measured as personal expenses divided by total assets} \), \( w_2 = \text{deposit cost, measured as interest expense divided by deposit} \) and \( w_3 = \text{price of financial capital} \), \( z_1, z_2 \) and \( z_3 \) are standardized values of bank outputs)
Table 3.1 presents the results of the estimation of the bank cost function stated in equation 5. The equation was estimated by including some macroeconomic variables to control for the various economies the different banks operate in. The cost function in equation (5) was estimated using the *Stata version 11* econometric software. The gamma coefficient, \( \gamma = \frac{\delta_u^2}{(\delta_u^2 + \delta_c^2)} \), is significant indicating the existence of the cost frontier function. Therefore, the null hypothesis that the inefficiency term \( \delta_u^2 \) is zero is rejected. This means the inefficiency term can be isolated from the regression, and the cost frontier does exist. The thesis then proceeded to calculate the cost efficiency scores by individual banks in each country and in each year. After this the study calculated the overall efficiency score for the period by averaging all the efficiency scores giving us the average efficiency score over the entire period of 0.76. The efficiency estimate means that banks can typically save about 24% of total cost if they were operating efficiently. This compares with the findings of Chen (2009) who found that on average SSA middle income countries can typically save between 20-30% of their cost if they were to operate efficiently. The result of the uncontrolled model is presented next.
Table 3.2: Results of Fourier Flexible Cost Function Specification for the period 1999-2008 (Uncontrolled)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>z-value</th>
<th>p-value</th>
</tr>
</thead>
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<tr>
<td>lny1</td>
<td>-3.204</td>
<td>-7.420</td>
<td>0.000</td>
</tr>
<tr>
<td>lny2</td>
<td>-0.359</td>
<td>-1.460</td>
<td>0.143</td>
</tr>
<tr>
<td>lny3</td>
<td>0.500</td>
<td>0.990</td>
<td>0.320</td>
</tr>
<tr>
<td>ln(w1/w3)</td>
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<td>-6.960</td>
<td>0.000</td>
</tr>
<tr>
<td>ln(w2/w3)</td>
<td>-0.246</td>
<td>-2.290</td>
<td>0.022</td>
</tr>
<tr>
<td>ln(y1)*ln(y1)</td>
<td>0.203</td>
<td>3.850</td>
<td>0.000</td>
</tr>
<tr>
<td>ln(y2)*ln(y2)</td>
<td>0.031</td>
<td>1.320</td>
<td>0.186</td>
</tr>
<tr>
<td>ln(y3)*ln(y3)</td>
<td>-0.072</td>
<td>-1.070</td>
<td>0.286</td>
</tr>
<tr>
<td>ln(w1/w3)*ln(w1/w3)</td>
<td>44.953</td>
<td>4.630</td>
<td>0.000</td>
</tr>
<tr>
<td>ln(w2/w3)*ln(w2/w3)</td>
<td>-0.026</td>
<td>-2.170</td>
<td>0.030</td>
</tr>
<tr>
<td>ln(y1)*ln(y2)</td>
<td>0.111</td>
<td>8.610</td>
<td>0.000</td>
</tr>
<tr>
<td>ln(y2)*ln(y3)</td>
<td>0.136</td>
<td>4.770</td>
<td>0.000</td>
</tr>
<tr>
<td>ln(y1)*ln(w1/w3)</td>
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<td>4.560</td>
<td>0.000</td>
</tr>
<tr>
<td>ln(y1)*ln(w2/w3)</td>
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<td>1.710</td>
<td>0.087</td>
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<tr>
<td>ln(y2)*ln(y3)</td>
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<td>-4.230</td>
<td>0.000</td>
</tr>
<tr>
<td>ln(y2)*ln(w1/w3)</td>
<td>1.563</td>
<td>2.730</td>
<td>0.006</td>
</tr>
<tr>
<td>ln(y2)*ln(w2/w3)</td>
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<td>1.880</td>
<td>0.060</td>
</tr>
<tr>
<td>ln(y3)*ln(w1/w3)</td>
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<td>0.880</td>
<td>0.380</td>
</tr>
<tr>
<td>ln(y3)*ln(w2/w3)</td>
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<td>0.173</td>
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<td>sinz1</td>
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<td>sinz2</td>
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<td>0.121</td>
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<td>sinz3</td>
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<td>-7.060</td>
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<td>cosz2</td>
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<tr>
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<tr>
<td>Variables</td>
<td>Coefficients</td>
<td>z-value</td>
<td>p-value</td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>( \cos(z_1+z_1) )</td>
<td>-0.283</td>
<td>-2.910</td>
<td>0.004</td>
</tr>
<tr>
<td>( \cos(z_1+z_2) )</td>
<td>-0.656</td>
<td>-6.320</td>
<td>0.000</td>
</tr>
<tr>
<td>( \cos(z_1+z_3) )</td>
<td>-0.793</td>
<td>-5.050</td>
<td>0.000</td>
</tr>
<tr>
<td>( \cos(z_2+z_2) )</td>
<td>0.041</td>
<td>0.580</td>
<td>0.565</td>
</tr>
<tr>
<td>( \cos(z_2+z_3) )</td>
<td>0.631</td>
<td>3.440</td>
<td>0.001</td>
</tr>
<tr>
<td>( \cos(z_3+z_3) )</td>
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<td>1.210</td>
<td>0.227</td>
</tr>
<tr>
<td>( \sin(z_1+z_1) )</td>
<td>0.820</td>
<td>6.740</td>
<td>0.000</td>
</tr>
<tr>
<td>( \sin(z_1+z_2) )</td>
<td>-0.442</td>
<td>-7.900</td>
<td>0.000</td>
</tr>
<tr>
<td>( \sin(z_1+z_3) )</td>
<td>-0.221</td>
<td>-2.410</td>
<td>0.016</td>
</tr>
<tr>
<td>( \sin(z_2+z_2) )</td>
<td>0.026</td>
<td>0.340</td>
<td>0.731</td>
</tr>
<tr>
<td>( \sin(z_2+z_3) )</td>
<td>-0.113</td>
<td>-1.110</td>
<td>0.269</td>
</tr>
<tr>
<td>( \sin(z_3+z_3) )</td>
<td>-0.173</td>
<td>-1.580</td>
<td>0.113</td>
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<tr>
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<td>6.350</td>
<td>0.000</td>
</tr>
<tr>
<td>gamma</td>
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</table>

Log Likelihood 1296.98
Wald Chi 2 (38) 9290.43
No. Of observations 3,069

Table 3.2 is the results of the estimation of the cost function presented in equation 5. In estimating the equation in this case, an assumption was made to the effect that the banks in the sample all operate in homogenous economies. Thus, this result does not control for differences in macroeconomic environment. The average efficiency scores from this model is also 0.76. However, it has the added disadvantage that the efficiency scores from two or more countries cannot be compared since they operate in different environment (see Lozano-Vivas and Dietsch, 2000).
Table 3.3: Average Efficiency Scores per each Country in the sample for the period 1999-2008

<table>
<thead>
<tr>
<th>Country</th>
<th>Uncontrolled Model</th>
<th>Controlled model</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALGERIA</td>
<td>0.7840</td>
<td>0.7740</td>
</tr>
<tr>
<td>ANGOLA</td>
<td>0.7310</td>
<td>0.7300</td>
</tr>
<tr>
<td>BENIN</td>
<td>0.7200</td>
<td>0.7170</td>
</tr>
<tr>
<td>BOTSWANA</td>
<td>0.8070</td>
<td>0.8200</td>
</tr>
<tr>
<td>BURKINA FASO</td>
<td>0.7920</td>
<td>0.7910</td>
</tr>
<tr>
<td>BURUNDI</td>
<td>0.7730</td>
<td>0.7740</td>
</tr>
<tr>
<td>CAMEROON</td>
<td>0.7720</td>
<td>0.7620</td>
</tr>
<tr>
<td>CAPE VERDE</td>
<td>0.7470</td>
<td>0.7570</td>
</tr>
<tr>
<td>CHAD</td>
<td>0.6990</td>
<td>0.6910</td>
</tr>
<tr>
<td>CONGO</td>
<td>0.7490</td>
<td>0.7330</td>
</tr>
<tr>
<td>ETHIOPIA</td>
<td>0.8250</td>
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<td>GABON</td>
<td>0.7910</td>
<td>0.7900</td>
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</tr>
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<td>GHANA</td>
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<td>IVORY COAST</td>
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<td>0.7710</td>
</tr>
<tr>
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<td>0.7640</td>
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<td>LESOTHO</td>
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<td>0.7470</td>
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<tr>
<td>MAURITIUS</td>
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<td>0.7490</td>
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<tr>
<td>MOROCCO</td>
<td>0.8070</td>
<td>0.8200</td>
</tr>
<tr>
<td>MOZAMBIQUE</td>
<td>0.7420</td>
<td>0.7390</td>
</tr>
<tr>
<td>NIGER</td>
<td>0.7640</td>
<td>0.7580</td>
</tr>
<tr>
<td>NIGERIA</td>
<td>0.7240</td>
<td>0.7100</td>
</tr>
<tr>
<td>RWANDA</td>
<td>0.7580</td>
<td>0.7920</td>
</tr>
<tr>
<td>SENEGAL</td>
<td>0.7830</td>
<td>0.7800</td>
</tr>
<tr>
<td>SIERRA LEONE</td>
<td>0.8000</td>
<td>0.7940</td>
</tr>
<tr>
<td>SUDAN</td>
<td>0.7260</td>
<td>0.7470</td>
</tr>
<tr>
<td>SWAZILAND</td>
<td>0.7410</td>
<td>0.7310</td>
</tr>
<tr>
<td>TANZANIA</td>
<td>0.7000</td>
<td>0.6950</td>
</tr>
<tr>
<td>TOGO</td>
<td>0.7590</td>
<td>0.7560</td>
</tr>
<tr>
<td>SOUTH AFRICA</td>
<td>0.8630</td>
<td>0.8760</td>
</tr>
</tbody>
</table>

Source: Author's own calculations
Table 3.3 shows that the lowest efficiency score using the controlled model is 0.613 and the highest score is 0.876. Hence the efficiency scores for the countries in the chosen sample are fairly closed. On the regional level, the efficiency scores are evenly distributed as shown in the table 3.4 below.

**Table 3.4: Efficiency Scores by Region**

<table>
<thead>
<tr>
<th>Region</th>
<th>Central</th>
<th>Eastern</th>
<th>Northern</th>
<th>Southern</th>
<th>Western</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency</td>
<td>0.74</td>
<td>0.77</td>
<td>0.78</td>
<td>0.8</td>
<td>0.76</td>
</tr>
</tbody>
</table>

*Source: Author’s own calculations*

### 3.6 Chapter Summary

This chapter looked at the estimation of efficiency across Africa. It discussed the various efficiency estimation techniques found in literature as well as the functional forms usually used. The study adopted the semi non parametric Fourier flexible approach in estimating banking sector efficiency which has been found to envelope banking data better. Using the intermediation approach to studying banks, it concluded that the efficiency level of the sample included in the study average 0.76 over the period, 1999-2008. This means that there is about 24% inefficiency in terms of cost for the banks in the sample. Thus, banks in Africa could actually save up to almost a quarter of their cost if they were to operate efficiently.
CHAPTER FOUR

BANK EFFICIENCY AND FINANCIAL DEVELOPMENT

4.1 Introduction

In this chapter, the thesis use the efficiency scores estimated in the previous chapter to investigate the relationship between banking sector efficiency and financial development. Determinants of both financial development and banking sector efficiency are also analysed.

The allocation role of financial institutions was first recognized by Schumpeter (1912), who conjectured that bankers help to identify entrepreneurs with good growth prospects, and therefore help to reallocate resources to their most productive uses (Yu and Gan, 2010). Having established the important role of financial development in economic growth, the frontier of the literature in this field is shifting towards providing answers to the question of why some countries are more financially developed than others. Studies have been done on banking efficiency and competitiveness to assess the impact of reforms, usually on groups of emerging countries (Grigorian and Manole, 2002; Bonin, Hasan and Wachtel, 2005; Boubakri, Cosset, Fischer and Guedahmi, 2005; Fries and Taci, 2005) and sometimes on a single country (Hauner and Peiris, 2005; Buchs and Mathiesen, 2005) as well. However these studies have not explicitly focused on the link between bank efficiency and financial development.

Given the importance of financial development to economic growth as established in literature, many hypotheses have evolved to explain what its determinants are. Kablan (2010) for example,

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1 A version of a paper based on this chapter was presented at the First Global Development Finance Conference, Spier Hotel, Cape Town, South Africa, 24-26 Nov, 2010 and 2nd Global Development Finance Conference at Dubai, November, 6-8, 2011
enumerated macroeconomic factors such as GDP per capita income and inflation as affecting the level of financial development in Africa. The role of an efficient banking sector in financial development, however, has not received much attention in literature. This study examines the linkages between banking sector efficiency and the overall financial development of the continent. The paper uses the Instrumental variable (IV) approach to investigate the relationship between bank efficiency and financial development.

In what follows, section 4.2 reviews extensively the available literature, section 4.3 provides the methodology and description of the data, section 4.4 presents the results whilst section 4.5 present the conclusion of the study.

4.2 LITERATURE REVIEW

In this section the thesis discuss the theoretical and the empirical literature underpinning financial development and banking sector efficiency.

4.2.1 Financial Development

Financial development may be defined as the process that marks the improvement in quantity, quality and efficiency of financial intermediary services. Also, a developed financial sector can gauge, subdivide, and spread difficult risks, letting them rest where they can best be borne. All these are done at low cost (see Rajan and Zingales, 2003). According to Yongfu (2005), research on the role of financial development in growth can be traced back at least to Bagehot (1873) who claims that large and well-organized capital markets in England enhanced resource allocation towards more productive investment. Other historical antecedents before 1970 include, among others, Schumpeter (1912), Hicks (1969) and Goldsmith (1969). Schumpeter (1912) emphasizes
the critical role of a country’s banking system for economic development in mobilizing savings and encouraging productive investment. Hicks (1969) highlight the importance of financial markets in the process of industrial revolution with an observation that the development of financial systems facilitates the applications of new technologies and innovations. Goldsmith (1969) finds evidence of a positive link between financial development and economic growth from a comparative study with data for 35 countries over the period 1860–1963. Over the past three decades, the financial repression and financial development framework proposed by McKinnon (1973) and Shaw (1973) has been the main intellectual basis of financial market analysis and policy advice. Before the 1970s most developing countries had been financially repressed in the sense that their financial systems had imposed upon them discriminatory taxation in the form of low interest rate policies, high reserve requirements and high inflation rates. Keynes (1936) and Tobin (1956) are among the various justifications for maintaining these policies. The McKinnon-Shaw model of financial repression formulates the phenomenon of financial repression and points out that financial repression reduces both the quantity and quality of aggregate investment in the economy in the sense that a lower deposit rate of interest discourages households from holding deposits that would be used to finance productive investment. The policy implication of the McKinnon-Shaw model is that government’s repressive policies towards financial systems (such as interest rate ceilings, high reserve requirements and credit control) retard financial development, and therefore economic growth. On the contrary, financial liberalization and financial development can stimulate investment and its productivity, and ultimately foster economic growth. Since 1973, the McKinnon-Shaw model has influenced financial sector policies in many developing countries considerably.
Motivated by the McKinnon-Shaw model, a number of studies in this area have been undertaken, such as Kapur (1976) among others. However, these works in general treat financial intermediation and financial institutions as exogenous. The last two decades have witnessed a resurgence of interest in the relationship between financial development and economic growth which incorporates the insights of endogenous growth models. These works include Townsend (1979), Diamond (1984), Gale and Hellwig (1985), Williamson (1986, 1987), Bencivenga and Smith (1991), Greenwood and Jovanovic (1990), Saint-Paul (1992), King and Levine (1993) and Bernanke et al. (1999) among others. Given the established empirical evidence on financial development and economic growth, the question is why cross country differences exist in the level of financial development. Literature on financial development has identified extensively various factors which have contributed to various in a country’s level of financial development. These factors are explained the sections that follow.

4.2.2 Determinants of Financial Development

Economists still have an insufficient understanding of what brings about the emergence and development of financial markets, what are the reasons why different financial structures, bank-based or market-based, exist in countries where similar levels of economic development have been reached and what accounts for the differences in the level of financial development in countries like the OECD member countries which have similar income levels and geographic conditions, Yongfu (2005). In literature however, some researchers have grouped the possible determinants of financial development into four main categories. These are institutional factors, policy or macroeconomic factors, geographical factors and others. These factors are discussed briefly in this section.
4.2.2.1 Institutional Factors

There exists a considerable research on the role of institutions in financial development. The strand of literature in this direction relates to the law and finance theory, openness theory and the endowment theory applied to the study of financial development. We briefly explained these theories;

Law and Finance Theory

According to Eryigit (2010), legal systems are institutions that regulate social and commercial relationships and reduce uncertainty. In recent years, since the pioneer study of La Porta et al (1997), the effects of different legal systems on financial development have been intensely investigated. The legal systems of many countries originate from those of England or France. Legal systems based on the laws of England are typically described as belonging to the common law tradition, while those based on the laws of France are described as belonging to the civil or Roman law tradition. Structurally, the two legal systems operate in very different ways: civil law relies on professional judges, legal codes, and written records, while common law relies on judges, broader legal principles, and oral arguments (Glaeser and Shleifer, 2002). The civil law tradition itself is divided into French, German and Scandinavian systems. The civil and common legal traditions have spread around the world through a combination of conquest, imperialism, outright borrowing, and imitation.

According to the law and finance theory of La Porta et al (1997), the differences in the legal protections of investors and creditors and the quality of enforcement of laws can explain why
levels of financial development differ among countries. With regard to this, they found that: a) shareholders and creditors are protected most in common law countries and in French civil law countries the least, with German and Scandinavian civil law countries falling somewhere in the middle in terms of these protections; b) the quality of law enforcement is highest in Scandinavian and German civil law countries, next highest in common law countries and again the lowest in French civil law countries.

The literature emphasizes that legal systems influence financial development through two channels: the political and the adaptability channels. The political channel, which is the “static” view of law and finance, stresses that legal traditions differ in terms of the priority that they give to private property rights, which form the basis of financial development, versus the rights of state. For instance, the civil law tradition gives priority to state power. Civil law has evolved to eliminate increasing corruption in and mistrust of courts. To establish and strengthen trust in courts, legislature tried to be clear and precise in wording laws. By so doing it was believed that any need for interpreting laws by judges would be avoided. With this codification, the judiciary has produced legal traditions that concentrate on the power of the state rather than the rights of individual investors. This situation has relegated judges to a relatively minor bureaucratic role while enhancing the power of the state (Eryigit, 2010; Mahoney, 2001; Meryman, 1985; Beck, et. al., 2001, 2003). On the other hand, common law evolved to protect private property owners against the crown. English common law developed as it did because landed aristocrats and merchants wanted a system of law that would provide strong protections for property and contract rights and limit the crown's ability to interfere in markets. The crown attempted to reassert feudal prerogatives and sell monopolies to raise revenues (Mahoney, 2001). Parliament,
which was composed mostly of landowners and wealthy merchants, along with the courts, took
the side of the property owners against the crown (Beck and Levine, 2003b). Thus, English legal
origin tends to place great emphasis on the rights of individuals than the rights of the state.

Hayek expressed that common law is superior to civil law, not because of substantive differences
in legal rules, but because of differing assumptions about the roles of the individual and the state.

In general, Hayek believed that common law was associated with fewer government restrictions
on economic and other liberties (Mahoney, 2001).

The legal-adaptability literature focuses on the differences between legal traditions in terms of
their abilities to evolve with changing economic conditions and needs. The legal adaptability
channel is a dynamic view of law and finance. However, French civil law reflects a static view of
law. The reason for this is to impede interpretation by judges in decision processes to eliminate
mistrust of the court. In this situation, the legislature inherently does not respond to changing
economic and social circumstances and necessities quickly. On the other hand, German legal
scholars reject the static nature of French law and give importance to cases. The English
common law tradition is almost synonymous with judges having broad interpretation powers and
with courts moulding and creating law as circumstances change. The common law is obsessed
with facts and deciding concrete cases, rather than adhering to the logical principles of codified
law (Beck et al., 2003b). According to the findings of La Porta et al. (1997), the legal adaptability
channel operates ideally in German civil law countries, close to ideally in common law countries,
and poorly in French civil law countries. La Porta et al. (1997) also show that countries with
poorer investor protections, measured by both the character of legal rules and the quality of law
enforcement, have smaller and narrower capital markets. Additionally, they present that civil
law, and particularly French civil law, has both the weakest investor protections and the least developed capital markets. In another study, La Porta et al. (1998) found that common law countries provide companies with better access to equity finance than civil law countries and French civil law countries in particular. The findings of Beck et al. (2001) provide considerable support to law and finance theory. In addition, they show that differences in legal origin help explain the differences in development of financial markets among countries today even after controlling for the level of economic development, regional dummy variables, religious composition, ethnic diversity, openness to international trade, initial endowments, and the political environment.

In another study, Beck et al. (2003) argue that legal adaptability explains cross-country differences in financial development, but political channel does not. Law and Azman-Saini (2008) also found such significance for the rule of law in determining banking sector development. Their findings were consistent with those of La Porta et al. (1997). However, they found that none of the institutional quality variables, including rule of law variables, were statistically significant determinants of stock market development. They therefore suggested that economic development must reach a threshold level in order for a stock market to respond.
**Openness Theory**

According to Rajan and Zingales, the strength of political incumbents is a major variable as an institution that promotes or implements financial development. They propose an “interest group” theory that emphasises the interests of incumbents in shaping policies and institutions. Incumbents in the financial sector or in industry may not always be able to benefit from financial development because of growing competition and diminishing rents. They show that simultaneous openness of both trade and capital accounts provide financial development by controlling incumbents and enhancing competition. Consider, for instance, industrial incumbents can finance new projects with their own capital without recourse to external finance or can find the funds by using reputation. For such a loan, there is no need for a developed financial system. Large firms can access funds using their power. However, it is difficult to obtain fund in the primitive financial system for potential firms. This situation prevents the entry of potential firms into the markets and hence increased competition, and this situation provides rents to industrial incumbents (see Eryigit, 2010; Rajan and Zingales, 2003).

Similarly, trade openness without financial openness will lead to increased competition with the entry of foreign firms into the market. In this situation, domestic firms need to improve their technologies and make more investments to compete with foreign firms. To satisfy their increasing financial needs, industrial incumbents can press for greater financial repression so that the available finance flows their way, or they can petition the government for loan subsidies in the face of foreign competition instead of improving the quality of the domestic financial system. The reason why the incumbents do not prefer financial development is to prevent potential firms
from finding funds easily. While financial development provides new earnings field for financial incumbents, increasing competition may also diminish their rents, impairing their comparative advantages. In an undeveloped financial system, financing is typically relationship-based. The financier uses connections to obtain information to monitor loans and uses various informal levers of power to cajole repayment. The key, therefore, to the ability to lend is relationships with those who have influence over the firm (managers, other lenders, suppliers, politicians, etc.) and the ability to monopolise the provision of finances to a client (either through a monopoly over firm-specific information or through a friendly cartel amongst financiers).

Disclosure and impartial enforcement tend to level the playing field and reduce barriers to entrance into the financial sector. The incumbent financier’s old skills become redundant, while new ones of credit evaluation and risk management become necessary (Rajan and Zingales, 2003). Moreover, financial openness without trade openness allows large firms access to foreign capital while small or new firms cannot access foreign capital because of asymmetric information among the markets.

Consequently, financial incumbents impede financial liberalisation that decreases their rents because industrial incumbents can gain access to foreign funds easily. Baltagi et al. (2008) find that trade and financial openness are statistically significant determinants of banking development in their study by using dynamic panel data techniques. Their findings show that the marginal effects of trade (financial) openness are negatively related to the degree of financial(trade) openness. Hence, closed economies can benefit more by opening up both their trade and capital accounts. However, they do not find any evidence to suggest that opening up
one without the other could have a negative impact on financial sector development. On the other hand, they present that both trade and financial openness will have a larger impact on financial development than opening one of them.

Law (2007) tested the theory of Rajan and Zingales, using data from 68 countries for the period 1980-2001. He found that the simultaneous opening of both trade and capital accounts will promote financial development, mainly in the middle-income countries, and that this effect is much lower in low-income and high-income countries. Their findings also suggest that trade openness affects countries’ financial development differently. Trade stimulates financial development in middle-income and high-income countries, and the effect is smaller in low-income economies. On the other hand, capital inflows have a positive effect on financial development, and particularly on capital market development, regardless of which stage of economic development the country’s economy is in. Their findings demonstrate that simultaneously stimulating capital and trade openness, improving institutions and economic development will encourage financial development, especially in middle-income and low-income economies. Besides this, Ito and Chinn (2006) also suggest that a higher level of financial openness contributes to the development of equity markets only if a threshold level of general legal systems and institutions is attained, but they do not test the simultaneous openness hypothesis.

Do and Levchenko (2004; 2007) analysed the effect of comparative advantage in international trade on a country’s level of financial development. They assessed this matter in terms of the demand approach. According to them, opening to trade will affect the demand for external
finance, and thus financial depth, in the trading countries. In particular, when a wealthy and a poor country open to trade, this situation will naturally increase production and export the financially dependent good, leading to growth of the financial system in the wealthy country. On the other hand, in the poor country, the financially dependent sector will shrink, leading to decreased demand for external finance and deterioration of the domestic financial system. In summary, Do and Levchenko (2004; 2007) demonstrate that trade openness is associated with faster financial development in wealthier countries and with slower financial development in poorer ones.

**Endowment Theory**

The importance of institutional quality has been accepted by many economists in explaining cross country differences in per capita income and financial development. In the endowment theory developed by Acemoglu et al. (2001), the authors focus on the initial endowment encountered by the colonisers and how these endowments shaped both colonisation strategy and construction of long-lasting institutions. Their arguments rest on three premises: i) Europeans adopted very different colonization policies, which created different sets of institutions. At one extreme, as in the case of the United States, Australia, Canada, and New Zealand, Europeans migrated and settled in the colonies and tried to set up institutions that protected private property, encouraged investment and checked power of government. At the other extreme, as in the Congo and much of Latin America, the main aim of colonisation strategy was to transfer as much of the resources of the colony to the colonisers. In these “extractive states”, Europeans set up institutions that empowered the elite to extract gold, silver, etc. (Beck at al., 2003).
Therefore, the main purpose of institutions in these colonies was not the protection of private property rights or control of the expropriation power of the government. For this reason, these institutions had detrimental effects on investment and hence economic growth.  

ii) The colonisation strategy, in part, depended on countries being appropriate for European settlement, in other words, on the living conditions in the colonies. Europeans did not prefer the places where mortality rates were high due to disease environment. The disease environment encountered by colonisers affected the formation of institutions.  

iii) The institutions shaped by colonisation strategies have survived, even after the independences of the colonies, because the factors determining formation of colonisation strategy still have an important effect on institutions today.

In their study, Acemoglu et al. (2001) show that a strong negative relationship exists between GDP per capita and settler mortality rates. Their regression results show that the mortality rates faced by the settlers more than 100 years ago explains over 25 percent of the variation in current institutions. Drawing from their findings, they hypothesise that (potential) settlers' mortality rates were a major determinant of settlements, that settlements were a major determinant of early institutions(in practice, institutions in 1900), and that there is a strong correlation between early institutions and institutions today.

According to Beck et al.(2003), endowment theory focuses on institutional development in general, but their theory is also applicable to examine cross-country differences in financial development. In an extractive environment, colonisers will not construct institutions that favour the development of free, competitive financial markets because competitive markets may
threaten the position of the extractors. In settler colonies, however, colonisers will be much more likely to construct institutions that protect private property rights and hence foster financial development. Thus, according to endowment theory, differences in endowments have shaped early institutions, and these initial institutions have had long lasting repercussions on the protection of private property rights and financial development (Beck, et. al, 2003a). In their study, they analysed both law and finance theory and endowment theory and found strong evidence for the validity of endowment theory. According to their results, countries with poor geographical endowments, as measured by settler mortality, tend to have less-developed financial intermediaries and stock markets and weaker protection of property rights. Additionally, in comparing law and finance theory and endowment theory, they found that initial endowments explain more of the cross-country variation in financial intermediary and stock market development than does legal origin. Furthermore, they demonstrated that initial endowments are more robustly associated with financial intermediary development than is legal origin.

Other Institutional Factors

Recently, ‘informal institutions’ such as trust, social capital, culture, and religion and their impacts on financial markets have been investigated intensively by many economists. Informal institutions are complementary factors of formal institutions such as legal systems. The effects of informal institutions on financial operations have been observed to be larger in underdeveloped financial markets than in developed ones (Knack and Keefer, 1997; La Porta et al., 1997). Because of its structure, the financial system may face problems, such as moral hazards, and adverse selection, that stem from asymmetric information. Therefore, trust becomes one of the
most important factors in financial markets. According to Guiso et al. (2004), financial contracts are trust intensive contracts par excellence. In a financial contract, the lender transfers money to the borrower in the present, expecting that the borrower will return it in the future. In order to avoid opportunistic behaviour, additional clauses, such as collateral requirements, are added to the contracts (Calderon et al, 2002). In this situation, however, there is a need for not only an appropriate legal system but also the enforcement of law for the proper functioning of financial system. According to Fukuyama (1995), the level of trust inherent in a national culture can reduce transaction costs and thus promote financial market efficiency and economic development.

According to Coleman (1990), in communities that have high social capital, people may trust each other more because the community’s networks provide better opportunities to punish deviants. Guiso et al (2004) analyse the effect of social capital on households’ portfolio allocations by considering use of checks, availability of loans and reliance on informal lending. They find that, in high social capital areas, households invest a smaller proportion of their financial wealth in cash and a bigger proportion in stocks. These findings also demonstrate that, in areas with high social capital, households are also more likely to use personal checks and obtain credit more easily. Additionally, they stress that the effect of social capital is stronger when legal enforcement is weaker or education levels are lower. The other source of trust may be environment. The importance of the environment cannot be neglected in shaping the behaviour of people. The environment also reflects cultural features of a region. Stulz and Williamson (2003) define “culture” as a system of beliefs that shape the actions of individuals in society. Since the work of Weber (1930), “culture” has been considered an important determinant of
economic institutions. Hence, culture may be the cause of differences in investor rights protections and financial development in countries. Stulz and Williamson (2003), using religion and language as a proxy for culture, find that investor protection, and hence financial development, is related to culture. They show that religion is important for creditor rights but not for shareholder rights. Additionally, they point out that stock market developments depend on a country’s legal origin, while debt markets and the banking system depend on culture. Furthermore, according to their findings, the principal religion of a country helps predict the cross-sectional variation in creditor rights better than its language, per capita income, legal origin, and trade openness. For example, creditor rights are the strongest in countries where the main religion is Protestant, regardless of legal origin. In other words, there is no difference between common law Protestant countries and civil law Protestant countries in terms of in creditor rights. They also show that Catholic countries have significantly weaker creditor rights than other countries. On the other hand, they find that openness reduces the influence of religion on creditor rights. They also suggest that culture is related to the enforcement of rights, with Catholic, and especially Spanish-speaking Catholic, countries having weaker enforcement rights.

4.2.2.2 Policy Factors

The policy view highlights the importance of some macroeconomic policies, openness of goods markets and financial liberalization in promoting financial development. The significant effect of policy on financial development could be working through either its demand side or its supply side. Some major national macroeconomic policies such as maintaining lower inflation and higher investment have been documented as being conducive to financial development. Huybens and Smith (1999) theoretically and Boyd et al. (2001) empirically investigate the effects of
inflation on financial development and conclude that economies with higher inflation rates are likely to have smaller, less active and less efficient banks and equity markets. As put forward by Khan et al. (2001), if inflation affects the development of the financial system, it will have long-run real effects. The effects of an increase in the rate of inflation potentially can be quite different depending on whether the rate of inflation is above or below some threshold level. The theoretical and empirical findings suggest that there are thresholds – possibly more than one – in the relationship between inflation and financial activity and, therefore, in the relationship between inflation and real activity. This negative relationship can be explained by two theoretical mechanisms; adverse selection or moral hazard problems, and costly state verification frictions in credit markets (Khan et al., 2001). Higher rates of inflation make more costly holding required reserves. For the bank the latter is equivalent to more costs incurred when attracting additional external funds. Therefore, banks try to reduce these costs and lower real price they pay to depositors. Another reason, which may entail negative relationship between the rate of inflation and the rate of return, is nominal interest rate rigidity caused by regulatory measures. Whatever the reason of lower real interest rates at higher rates of inflation, a fall in returns may lead to the outflow of funds from the financial system and hence, to lower availability of investment capital. The latter limits the quantity of credits granted by financial system, depress activity in financial markets and thus, lower financial depth (Kulyk, 2002).

The theoretical literature on the relationship between inflation and financial markets – that is, both in terms of credit markets and equity markets, postulates following consequences of higher long run or permanent rates of inflation (Boyd et al., 2001):

1. Higher rates of inflation are associated with greater inflation and stock return volatility.
2. Higher inflation implies less long-run financial activity, and equity markets will be smaller and less liquid.

3. Several inflation thresholds may characterize the relationship between inflation and financial sector conditions. That is, over a critical level, incremental increases in the (long-run) rate of inflation may have no additional impact on financial sector activity.

Huybens and Smith (1999) theoretically argue that in a steady state with relatively low capital stock in which both banks and equity markets are active, inflation and real activity must be negatively correlated. This negative relationship will become more pronounced at relatively high levels of inflation. Additionally, under the specific conditions real activity and the volume of financial market activity are positively correlated in the high activity steady state. In this case, inflation and financial market activity will be inversely related as well. Finally, they have illustrated that the high-capital-stock steady state may be a saddle for low rates of money growth.

However, once the rate of money creation (inflation) exceeds some critical level, the high activity steady state can be transformed from a saddle to a source. Thus, thresholds can easily exist; the behavior of the economy must differ dramatically depending on whether the steady state rate of inflation is above or below a certain threshold. In their pioneering work, Boyd et al. (1996, 2001) concentrate on the links between sustained inflation and financial sector performance, regarding their substantial impact on the long run rates of economic growth. Employing various indicators for financial sector performance, they found that there is a significant, and economically important, negative relationship between inflation and financial development. This correlation emerges essentially independently of the time period considered,
the empirical procedure employed, or the set of variables that appear in the conditioning information set. It is also not sensitive to inclusion or exclusion of countries that have experienced extraordinarily high rates of inflation. Finally, the negative relationship between inflation and financial sector performance emerges even after controlling for simultaneity and omitted variable biases. Thus, a preponderance of evidence indicates that sustained inflation and financial sector performance display a strongly negative association. They also found that the empirical relationship between inflation and financial sector activity is highly nonlinear. Furthermore, their findings reveal thresholds effect. The data suggest that for economies with annual inflation rates above about 15 percent, there is a large discrete drop in financial development relative to countries with inflation rates below this threshold. The inferences of Boyd et al. (1996, 2001) rely on a cross-sectional data.

Barnes (2000) reinvestigated the said trivariate relationship and the threshold effect within a panel framework. He has specified different models in order to separately test for thresholds in the relationship between banking sector development and inflation besides the other two. The results show positive and often significant relationships between growth and the financial market development measures in the single threshold specifications. In the presence of an interaction term between inflation and financial market development, this relationship becomes larger and more significant after the threshold level of inflation is reached.

Using financial depth as a proxy for the degree of financial development, Khan et al. (2001) investigated the impact of several factors on financial activity. Among them there are GDP per capita, the degree of openness, the share of public consumption in GDP, and inflation rate. They
constructed an econometric specification which explicitly allowed for inflation threshold effects. Their findings reveal that a rise in inflation has a weak positive effect when initial rate of inflation is low and a negative effect at initially high inflation. It is also found that threshold rates of inflation lie in the range 3-6 percent a year depending on the specific measure of financial depth.

Naceur and Ghazouani (2005) examined the impact of inflation on the financial sector performance in the case of 11 MENA countries. Using the dynamic panel data with the Hansen’s (1999) methodology to estimate threshold levels, they found that inflation has a negative and significant incidence on the financial sector development but with no evidence of thresholds levels even after controlling for simultaneity and omitted variable biases. In other words, they have shown that a marginal increase of inflation is harmless to stock market performance and banking sector development whatever the rate of inflation. Interaction between inflation and financial development is of great interest for the less developed countries. In the way to reach higher growth pace, these countries have to keep a low inflation rate in order to create the conditions for sustainable growth. If inflation really affects financial development adversely, then the anti-inflationary policy within these countries is welcome.

Keho (2009) empirically investigated the long run and causality relationship between inflation and financial development for the seven countries of the West African Economic and Monetary Union. The Bounds testing approach to cointegration showed no evidence of long-run relationship between inflation and financial development for six countries. Results from causality tests are mixed across the countries. In two cases he did not find any causality between inflation
and financial development. In three cases, financial development contributes to inflation. There is only one case where inflation depresses financial development.

Rousseau and Wachtel (2002) tried to answer whether inflation inhibits the economic growth via negatively affecting the financial development, and in what extend varying level of inflation does affect the finance – growth nexus. Their findings indicate that inflation inhibits economic growth both directly and indirectly through its effect on financial development. However, the direct effects are due to high inflation situations and largely disappear when inflation rate is moderate. Secondly, they found that the strong and robust effect of financial sector depth on economic growth is largely unaffected by the presence of the inflation rate. However, the effect of financial depth is much weaker in high inflation environment.

Do and Levchenko (2004) supported the view that policies which encourage openness to external trade tend to boost financial development (Do and Levchenko, 2004). Opening to trade will affect demand for external finance, and thus financial depth, in the trading countries. In particular, when a wealthy country starts trading with a poor one, it will naturally increase production of the financially dependent good, and its financial system will deepen. In the poor country, on the other hand, the financially dependent sector will shrink, leading to deterioration in the size of the country’s financial system, as well as its quality.

The bottom line is that when a poor country no longer needs to produce the financially dependent good, demand for external finance will decrease as a result of trade, and the domestic financial systems will suffer. This could induce losses from trade to the poor country, as could be expected.
given that the financially dependent industry exhibits external effects, and thus economy-wide increasing returns to scale (see Helpman and Krugman, 1985).

In addition, research has been carried out to study the effects of financial liberalization on financial development over the past three decades, following the McKinnon-Shaw model (McKinnon, 1973; Shaw, 1973), which concludes that while financial repression reduces the quantity and quality of aggregate investment, financial liberalization can foster economic growth by increasing investment and its productivity. The positive link between domestic financial liberalization and financial development is supported by evidence (World Bank, 1989), although domestic financial liberalization is not without risks (Demirgüç-Kunt and Detragiache, 1998). Research on the positive correlation between external financial liberalization, especially capital account openness, and financial development is discussed in the panel data studies of Bailliu (2000) and Chinn and Ito (2006), although potential destabilizing effects may also exist. Claessens et al. (1998) present evidence that opening banking markets improves the functioning of national banking systems and the quality of financial services, with positive implications for banking customers and lower profitability for domestic banks. Laeven (2000) examines whether the liberalization of the banking sector may help to reduce financial restrictions and the external cost of the capital premium, stimulating investment and financial development.

4.2.2.3 Geographical Factors

Most of the research in this area has paid attention to the importance of geography for general economic development, emphasizing three aspects in particular. The first group is concerned with the correlation between latitude and economic development. Countries closer to the equator
typically have a more tropical climate. On the one hand, research by Kamarck (1976), Diamond (1997), Gallup et al. (1999) and Sachs (2003a, 2003b) suggests that tropical location may lead directly to poor crop yields and production due to adverse ecological conditions such as fragile tropical soils, unstable water supply and prevalence of crop pests. On the other hand, tropical location can be characterized as an inhospitable disease environment, which is believed to be a primary cause for “extractive” institutions (Acemoglu et al., 2001).

A second strand of research relates to countries being landlocked, distant from large markets or having only limited access to coasts and rivers navigable to the ocean (Sachs and Warner, 1995a, 1995b, 1997; Easterly and Levine, 2003; Malik and Temple, 2009). As natural barriers to external trade and knowledge dissemination, geographic isolation and remoteness to some extent determine the scale and structure of external trade in which countries engage. The potential to enter a large economic market and exploit economies of scale may be limited by particular geographic circumstances. The ability to develop a competitive manufacturing sector may be constrained when some intermediate inputs for the production of manufactured goods need to be imported from distant markets. As the main feature of external trade for these countries, the limited range of primary commodities exported determines the vulnerability of these countries to external shocks.

The last strand of research focuses on the link between resource endowment and economic development. Diamond (1997) suggests that countries with a richer endowment of grain species have more potential for high-yielding food crops and technological development. Isham et al. (2005) argue that a developing country’s natural resource endowment affects its economic
development through an unique channel in which natural resource endowment is linked to different export structures, different export structures determine institutional capacities towards coping with external shocks and finally institutional quality is reflected in the level of GDP per capita. Easterly and Levine (2003) argue that the natural endowment of tropics, germs and crops indirectly influences income through the impacts of these on institutions. In general, geography is likely to work mainly through the demand side of financial development, although it may affect its supply side by influencing the quality of institutions. For instance, the production of particular agricultural products or primary goods and exploitation of some natural resources could reduce the demand for external finance, relative to other countries at a similar level of GDP per capita.

The institutional and the geographical factors, by emphasizing historical factors that are time invariant can, at best, only explain some of the cross-country variation in financial development. The policy factors could go some way in explaining both the cross-country and the time series variation in financial development, since they are both dynamical in nature, in that they emphasize factors that may be changing over time.

In the light of the discussions above, this thesis place banks as part of economic institutions whose quality as measured by its efficiency is crucial to financial development.

### 4.2.3 Determinants of Banking Sector Efficiency

Following Harker and Zenios (2000) and Kablan (2010), the drivers of bank performance are grouped into three broad categories: strategy, execution of strategy, and environment.
4.2.3.1 Strategy

The articulation of a strategy is a key driver for success in dynamic, competitive environments like that of the financial services industry. The main strategic choices banks face concern product mix, client mix, geographical location, distribution channels, and form of organization. Choosing a product mix not only defines the strategy of the institution in providing services but is also a strategic decision in risk management—it is in effect the choice of financial risks the institution plans to manage. SSA banks for example have adopted a strategy that gives deposits a large share in the outputs combination they offer. The intermediation ratio (claims on the private sector relative to total deposits) of SSA banks is smaller than in other developing countries, suggesting that African banks have difficulty transforming collected deposits into loans to the private sector. For example, in 2003 SSA as a whole displayed an intermediation ratio of 57 percent, compared to 91 percent for Asia and 75 percent for Latin America.

After the two choices of product and client mix, regulatory restrictions may determine the geographical scope of the institution. The choice of location again implies strategic choices related to risk management in bank operations. SSA banks tend to locate their branches in more economically developed regions at the expense of rural ones. There are more businesses in areas like towns, so banks can find economic activities to finance for a profit.

4.2.3.2 Execution of strategy

A strategy can be implemented through human resource management, use of technology, and process design. X-efficiency is a measure of how well management aligns technology, human resource management, and other resources to produce a given level of output. It views banks as a
factory that consumes various resources to produce several products and establishes the efficiency with which this transformation takes place. The X-efficiency of banks can be assessed through indicators of financial soundness. Changes in those indicators are noticeable for SSA since the banking reforms of the 1990s. For instance, total problem loans as percent of assets decreased by 0.9 percent after the restructuring; they equaled 8.3 percent in 2003. SSA banks increased their capital as share of assets to 18.9 percent the same year against 14.5 percent during the 1990s. They also became more liquid, with the ratio of liquid assets to total assets reaching 28.8 percent. The effort the authorities made to align the regulatory framework with international standards like the Basel principles seem to have produced improvements. Banks are using information technology more and more in delivering transactions. As elsewhere in the world, SSA banking systems have seen many technological changes. Most of them—for example, computerization of bank processes and using Automated Teller Machines (ATMs)—were introduced by foreign banks, who imported them from their headquarters. Anglophone countries like Kenya, Nigeria, and South Africa seem to have more ATMs than Francophone countries. The creation of mobile banking units in Kenya and the use of chip/fingerprint technology in Malawi to increase access to financial services are other examples of technology adoption. The differences between Francophone and Anglophone countries could be due to the degree of development of their financial sectors; they seem to be deeper in Anglophone countries with more banks and more branches (Kablan, 2010).

4.2.3.3 Environment

The environmental factors that explain efficiency are information technology, client tastes, and regulation. Banks try to influence environmental factors through lobbying activities, marketing
efforts, research and development. Although Africa was not protected from technological changes, technological progress has been slow to spread because of factors that limit access, such as illiteracy and high costs. As an example, many banks in SSA offer services through the Internet, but the Internet is not widely used because of its cost but also because people are not used to this means of communication. Also the relative cost for people to access ATMs in Africa is high—because they are not widely used, the cost to banks may also be high.

After the banking crisis of the 1980s, monetary authorities in SSA tightened the regulation of banks. In each of the two Communauté Financière Africaine (CFA) subzones, a single supervisory institution was formed (Commission Bancaire de l’UMOA, for WAEMU countries and Commission Bancaire de la CEMAC, for Central Africa). Non-CFA countries gradually shifted powers of regulation and supervision solely to central banks; previously they had been shared between central banks and government ministries. By the late 1990s most countries had strengthened banking supervision. Prudential regulations were aligned with the Basel core principles and monitoring and inspections were instituted, although implementation is still weak.

Hauner and Peiris (2005) investigated whether the banking sector reforms undertaken in Uganda to improve competition and efficiency have been effective. Using the model of Panzar and Rosse (1987) to assess competitiveness and data envelopment analysis (DEA) to assess efficiency, they found that competition has increased significantly and has been associated with a rise in efficiency. Using the same model, Buchs and Mathiesen (2005), found that bank size is a determining factor of bank revenue in Ghana, and foreign banks are more efficient in generating revenue (interest, commissions, and fees). Cihak and Podpiera (2005), studying East African
banking reforms, found that the banking systems of Kenya, Tanzania, and Uganda were inefficient and had only a limited intermediation role, despite recent reforms and even with international banks present. Other studies pinpoint the impact of foreign bank entry into developing countries. In SSA, foreign banks hold a large share of banking system assets. They bring expertise and help enhance banking system efficiency.

Kirkpatrick, Murinde and Tefula (2008) found in their study of Anglophone SSA countries that the degree of foreign bank penetration is inversely related to X-inefficiency, suggesting that foreign bank ownership in Africa has contributed to better management and performance of commercial banks. Similarly, in a study of 11 transition economies, Bonin, Hasan and Wachtel (2005) provide evidence that foreign–owned banks collect more deposits and make more loans than domestic private banks, and are more efficient in the distribution of financial services in those countries. Boubakri, Cosset, Fischer and Guedhami (2005), examining the post-privatization performance of 81 banks in 22 developing countries, found that foreign bank entry is highly beneficial, because they have more cautious risk-taking strategies.

4.2.4 Indicators of Financial Development

Several measures have been used to measure financial development in literature. The most common measures have been that of banking development indicators such as ratio of bank liquid liabilities (M2) to GDP, credit to the private sector to GDP and bank deposit to GDP. The second group of financial development indicators is linked to stock market development such as stock market capitalization to GDP, number of listed firms on an exchange and volume of shares.
traded on an exchange. This study concentrates on the indicators of the banking sector development and how it is linked to bank efficiency.

The ratio of M2 to GDP is generally used to measure financial deepening with higher ratios indicating deeper markets (Chen, 2009). However, some authors have criticized the use of this ratio as a measure of financial deepening. For example, Pill and Pradhan (1995) assert that it overlooks important factors, such as openness of the country to capital flows, the extent of public borrowing from the domestic financial system, the development of nonbank financial intermediation, and the competitiveness of the banking sector.

The ratio of deposits (commercial banks plus savings banks) to GDP as a measure of the development of the banking sector captures only the liability side of banks, ignoring differences in the composition of the banks’ assets. It looks at how successful the financial institutions are able to mobilize funds for long term projects by investors. Apart from only capturing the liability side of financial institutions, this measure cannot indicate if banks operate as a cartel, forming a closed shop to new industrial entrants. Despite this shortcoming, the measure has the virtue that it is available for a long time-series and for a large cross-section of countries (Rajan and Zingales, 2003).

In recent times many authors have considered the ratio of credit to the private sector to GDP as a more appropriate indicator of financial development. It is a measure of the extent to which the private sector relies on banks to finance consumption, working capital, and investment. Despite its advantages, the ratio of credit to the private sector to GDP also has imperfections. Its relationship to financial development may be affected by financial innovations, in particular by...
the emergence of nonbank credit, and by commercial bank lending to other financial intermediaries.

Most studies of financial development investigate its impact on economic growth, and vice versa: Gurley and Shaw (1955); King and Levine (1993); Berthelemy and Varoudakis (1996); Greenwood and Smith (1997). However, others like Detragiache, Gupta, and Tressel (2005) study its determinants. They found that corruption, inflation, and foreign bank penetration have a negative impact on financial development. By contrast, better contract enforcement and information about borrowers are associated with more private sector credit. This thesis however investigates the relationship between financial development and banking sector efficiency.

4.2.5 Bank Efficiency and Financial Development

There is a long and extensive literature on the importance of financial development for an economy. Generally speaking, the consensus view is that financial development improves macroeconomic performance, since it helps allocating scarce financial resources to the most profitable and efficient investment projects (Levine, 2005). Thus, well developed financial institutions and instruments provide a growth-stimulating environment.

To better appreciate why financial sector development, under certain conditions, may be positively related to economic growth, it is necessary to understand the critical function the sector provides to the economy. Stiglitz (1998) argue that the financial sector is unique because of the risk and uncertainty faced by both savers and investors. He suggested that savers are often unable to select the investment project that best matches their personal risk appetite and without pooling their money, savers cannot take advantage of increasing returns to scale in investments.
Moreover, individual entrepreneurs or investors commonly lack sufficient capital to proceed with projects on their own. Commercial banks provide an intermediation service that brings savers and investors together, theoretically channeling investment funds to the uses that yield the highest rate of return, thus increasing specialization and the division of labor (Todaro, 2003).

These views are in agreement with economic theory which indicates that the main role of financial markets and institutions is to minimize the costs of information and transactions. Consequently, savings rates, investment decisions, technological innovation, and long-run growth rates depend crucially on the level of financial development. In this regard, it is envisaged that an efficient banking system should serve as a conduit by which entrepreneurs with productive investment opportunities are identified and resourced to enable them realize their goal. Banks can achieve this objective by performing their intermediation role efficiently in mobilizing savings for long-term investments and distributing these to the private sector in the form of credits.

Empirical evidence on the effect of banking sector efficiency and financial development is scanty. Kablan (2010) was among the first to investigate the relationship between financial development and bank efficiency. Using the generalized methods of moments systems, the study assessed the factors affecting the financial development for some 27 SSA countries. The result shows a negative relationship between bank cost efficiency and financial development even though this was not statistically significant. However, it is generally agreed that financial markets variables are endogenous. To deal with the potential issue of endogeneity, this thesis make use of the Baltagi EC Two Stage Least Squares (2SLS) estimator with the Baltagi-Chang estimation of the variance components. This approach is adopted because the study hypothesized
a bi-causal relationship between financial development and banking sector efficiency. The instrumental variable (IV) approach also enables us to deal with potential measurement errors and omitted variable bias. The IV approach further enables us to consistently estimate the coefficients of the potentially endogenous variables whether caused by measurement error, omitted variables or simultaneous causality bias.

4.3 Methodology

This section discusses in detail the empirical methodology adopted for this study. The data and the variables used in the study are also explained.

4.3.1 Modeling Banking Sector Efficiency and Financial Development

Empirical literature shows a positive relationship between financial development and economic growth. The quality of the banking sector could have a significant impact on the level of financial development and explains some of the variations observed in financial development across countries. Likewise, a country’s level of financial development should influence the banking sector to develop products to suit business needs, introduce competition and enhance efficiency. Hence the effect between these two variables could be thought of as going in both directions. Thus, the thesis states the following simultaneous equations to be tested;

\[ FD_{it} = \beta_1 + \beta_1 BankEff_{it} + \beta_2 X_{it} + \epsilon_{it} \] .................. (4.1)

\[ BankEff_{it} = \alpha_1 + \alpha_1 FD_{it} + \alpha_2 Z_{it} + u_{it} \] .................. (4.2)

where,
\(FD_u\) is an indicator of financial development stated in logarithmic form;

\(BankEff_i = \text{Bank efficiency score of bank } i \text{ at time } t;\)

\(X_{it} = \text{set of control variables affecting financial development;}\)

\(Z_{it} = \text{set of control variables affecting banking sector efficiency;}\)

\(\varepsilon_{it}\) and \(\mu_{it}\) = error terms

4.3.2 Estimation Methodology

The above equations were estimated using the instrumental variables approach. Instrumental Variables (IV) estimation is used when the model has endogenous \(X\)'s. It is usually used to address the following important threats to internal validity: omitted variable bias from a variable that is correlated with \(X\) but is unobserved, so cannot be included in the regression; simultaneous causality bias (endogenous explanatory variables; \(X\) causes \(Y\), \(Y\) causes \(X\)); errors-in-variables bias (\(X\) is measured with error).

Consider the model below:

\[y = \beta_1 + \beta_2 x_2 + \beta_3 x_3 + \ldots + \beta_k x_k + u,\]

where \(E[u] = 0\) and \(Cov(x_j,u) = 0\), for \(j = 1,2,3,\ldots,k-1\).

If \(x_k\) is connected with \(u\), then \(x_k\) are potentially endogenous and OLS estimator is inconsistent.

If an instrument is available, the method of an instrumental variable (IV) can be used to address the endogeneity problem and provide consistent estimates of the structural parameter \(\beta_j\). For the IV estimator to be consistent an instrument \(z_i\) must satisfy two conditions. The first condition is that the instrument must be exogenous; i.e. \(Cov(z_1,u)=0\). This is referred to as the exclusion
restriction. The second condition is that the instrument must be informative or relevant. That is, the instrument \( z_i \) must be correlated with the endogenous regressor \( x_k \), conditional on all exogenous variables in the model (i.e. \( x_1, x_2, \ldots, x_{k-1} \)).

That is, if \( x_k = \theta_0 + \theta_1 x_1 + \theta_2 x_2 + \ldots + \theta_{k-1} x_{k-1} + \theta z_i + r \),

for the second condition to be achieved we require that \( \theta_i \neq 0 \). These two conditions imply that, if the instrument is valid and informative (relevant) and \( \beta_k \neq 0 \), \( z_i \) impacts on \( y \) but only indirectly through the variable \( x_k \). The two conditions are equally important, in practice however, the validity condition cannot be tested because the condition involves unobservable residual \( u \). The relevance condition is tested by computing t-statistic associated with the instrumental variable when regressed with the endogenous variable. This is usually called the first stage regression.

An IV estimator with one endogenous explanatory variable and one instrument is said to be exactly identified. If the number of instruments is less than the endogenous variables, the model is said to be under-identified. In the case where the number of instruments is more that the number of endogenous variables in model, we have an over-identified model. If the model is over-identified, Woodridge (2002) asserts that the two-stage least squares (2SLS) estimator is the most efficient IV estimator.

The 2SLS estimator is obtained by using all the instruments simultaneously in the first stage regression

\[
x_k = \hat{\beta}_1 + \hat{\beta}_2 x_2 + \ldots + \hat{\beta}_{k-1} x_{k-1} + \hat{\theta}_1 z_1 + \hat{\theta}_2 z_2 + \ldots + \hat{\theta}_m z_m + r,
\]
where $x_k$ is endogenous and $z_1, z_2, \ldots, z_m$ are instruments. In this instance at least one of the instruments in the first stage regression must be relevant before the model could be identified. In the 2SLS, the validity and the relevance assumption are stated as

$$E[z'u] = 0$$

for validity and

$$\text{rank}(z'x) = K$$

for relevant assumption

Where $Z$ is a $1 \times L$ matrix, and $\text{rank}(z'z) = L$, ruling out collinearity among the instruments. For the relevant condition stated as the rank condition to hold, we need as many instruments as there are explanatory variables, i.e. $L \geq K$. This is known as the order condition. It is however not sufficient for $\text{rank}(z'x) = K$: the elements of $Z$ must also be appropriately correlated with the elements of $X$. The usefulness of the relevant condition in this case is that, it ensures we have as many first stage regressions as there are endogenous explanatory variables and at least one significant instrument in each reduced form regression models for the overall model to be well identified.

This study uses the IV 2SLS estimator to test for bi-causality between financial development and banking sector efficiency.

### 4.3.3 Description of Variables Used

Two financial development indicators were used in the study. They include the ratio of $M2$ to GDP and the ratio of private credit to GDP. The first ratio measures the extent of financial deepening on the continent and the second measure the degree of financial intermediation by banks on the continent. Data for the financial development indicators were obtained at the University of Ghana. http://ugspace.ug.edu.gh

The first independent variable to be included in the study is a measure of the quality of the banking sector intermediation proxied as the banking sector efficiency. An efficient banking system in the financial sector is expected to channel funds from surplus unit to deficit units more efficiently, thereby expanding the level of financial services provided in the country. Businesses will be impacted positively, there will be new innovations for financial products and access to finance should improve dramatically when banks are more efficient. The study therefore expects a positive impact of banking sector efficiency on financial development.

\( X_n \) in equation 4.1 are the other control variables which affect financial development. The variables are carefully selected to reflect the broad factors identified in literature which affect financial development. These variables are grouped as institutional, policy and geographical factors.

The institutional variables are divided into 3 main groups. These are the law and finance, trade openness and endowment variables. Two variables were selected for the law and finance. These are the creditor rights index for the country and the rule of law index. La Porta et al (1998) examines legal rules covering protection of corporate shareholders and creditors, the origin of these rules, and the quality of their enforcement in 49 countries. Their results show that common law countries (i.e countries with English legal origins) generally have the strongest and French civil law countries the weakest, legal protections of investors, with German and Scandinavian civil law countries located in the middle. They also find that concentration of ownership of
shares in the largest public companies is negatively related to investor protections, consistent with the hypothesis that small, diversified shareholders are unlikely to be important in countries that fail to protect their rights. This means in countries where there is a strong creditor protections, investors are more willing to provide funding for corporate activities, thereby deepening the financial sector. The study thus expects a positive relationship between these variables and financial development. In this study the historical origin of the legal system of a country is not tested since most of the African countries have a combination of legal systems (i.e. combination of common law and customary law, etc).

The second institutional variable included in the study is capital account openness index developed by Chinn and Ito (2008). Rajan and Zingales (2003) finds that the simultaneous openness of both trade and capital accounts increase financial development by controlling incumbents and enhancing competition. Similarly, Baltagi et al (2008), using a dynamic panel data technique, found trade and financial openness to be statistically significant determinants of banking development. In another study, Law (2007) found that the simultaneous opening of both trade and capital accounts will promote financial development; mainly in the middle-income countries and that the effect is much lower in low-income and high income countries. In this thesis, we test for only effect of financial openness on financial development. The thesis projects a positive relationship between capital account openness and financial development.

The third institutional variable is the settler mortality rates. This variable seeks to measure the relationship current levels of financial development have with settler mortalities of colonies in the past. Acemoglu et al (2001), show that a strong negative relationship exists between GDP per capita and settler mortality rates. They argued that the mortality rates faced by settlers more than
100 years ago explains about 25 percent of the variations in the current institutions. Beck et al (2003) argues that this does not only apply to institutional development in general, but also the cross-country differences in financial development. That is, in countries where settler mortality was low, it is likely that strong institutions were developed which affect financial development positively. Hence, the study expects a negative relationship between settler mortality and financial development.

Among the policy variables, one macroeconomic variable-inflation was selected. Theoretical models (Huybens and Smith, 1998, 1999) suggest that inflation may aggravate asymmetries of information in credit markets, reducing the real rate of return and the volume of credit. Consistent with these theories, Boyd, Levine, and Smith (2001) find inflation to be negatively associated with measures of financial depth. Kablan (2010) also found inflation to destabilize financial development in a sample of SSA countries. The study thus expects a negative association between inflation and financial development.

The next strand of variables is the geography variables. Among these variable the study make use of density of the rural population. It is expected that the higher the percentage of the rural population to the total population of a country the more difficult it becomes to reach out to them with financial services. Thus the study projects a negative relation between this variable and financial development.

The last control variable to be included in equation 4.2 is the structure of the financial markets in the countries these financial institutions operate. One variable, namely the concentration of the banking system (measured by the ratio of assets of three largest banks as a share of assets of all commercial banks) was selected. This variable could lead to high interest margins and high costs,
and hence a lack of competitiveness (Kablan, 2010). We therefore expect this to have negative impact on financial development. The summary of the definition and the sources for all the above data variables are shown in Appendix 3 of this thesis.

With regards to equation 4.2, the dependent variable is the banking sector efficiency estimated in the previous chapter. On the right hand side of the equation, the first variable included is the financial development indicators; namely the ratio of private credit to GDP and depth of the financial sector measured as the ratio of M2 to GDP. Higher levels of financial development should lead to the banking sector developing new innovative products to serve the market participants. The study therefore expects a positive relationship between banking sector efficiency and these variables.

The \( Z_u \) in equation 4.2 contains other control variables found in literature to affect banking sector efficiency. These variables include the settler mortality ratio. The historical mortality rates should make it difficult for strong banks to emanate from a particular part of the country. It is thus projected that a negative relationship between banking sector efficiency and settler mortality exist. The percentage of the rural population should also have a negative impact on banking sector efficiency as its increases banking cost the higher the percentage of rural population in the economy.

With regards to the trade and financial openness variables; the opening of a country’s market to foreign banks for example should lead to increased competition and lead to higher efficiency. Some other studies have however noted that the opening up of the country’s banking system may lead to instability and hence have negative effect on banking sector efficiency. Hence the
relationship between these variables and banking sector efficiency is uncertain and could be positive or negative.

Concerning government spending, the study expects a negative relationship between this variable and banking sector efficiency in line with economic literature. The concentration variable has been found to negatively impact on the financial sector, (see Kablan (2010)). This is due to the fact that a concentrated banking sector does not provide for competition thereby leading to inefficiency in the sector. The study thus expects a negative relationship with banking sector efficiency. In relation to the governance and business sector variables, the study expects positive relationship with banking sector efficiency.

4.4 Empirical Results

In this section we present the findings of the study starting with the descriptive statistics of the main variables used and the empirical findings on financial development and banking efficiency.

4.4.1 Descriptive Statistics

We begin the discussion with the descriptive statistics. Table 4.1 present the descriptive statistics of the variables used. Two financial development indicators, namely ratio of private credit to GDP \((prcdbofgdp)\) and ratio of M2 to GDP \((M2gdp)\) were used as the dependent variables. From the table the average private credit to GDP over the study period for the selected countries is 23.72% with the minimum of 1.14% and a maximum of 162.42%. Bank deposit to GDP \((bdgdp)\) reported an average of 25.94% with a minimum figure of 2.96% and a maximum of 91.49%. The average figures of these two indicators indicate that financial intermediation is
indeed low among the selected countries. The ratio of M2 to GDP \( (m2gdp) \) measures the extent of financial deepening. Over the study period this ratio reported an average figure of 31.73\% with a minimum figure of 6.95\% and a maximum of 102.78\%. Again this shows a marginal improvement over the one reported by Kablan (2010) during the period 1980-2002 of 25\% but is still far less than the ones reported for Asia and Latin America.

The concentration variable shows that on the average 71.60\% of the banking sectors total asset is attributable to 3 top banks in the respective countries. In some countries the three top banks actually control all of the banking sector assets as indicated by the maximum value of 1 for this variable. With regard to the macroeconomic variables inflation \((infl)\) averaged 10.81\% over the period whilst government spending to GDP averaged 25.94\%
Table 4.1: Descriptive Statistics of the Financial Development and Control Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Observation</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>prcdbofgdp</td>
<td>2945</td>
<td>0.237</td>
<td>0.292</td>
<td>0.011</td>
<td>1.624</td>
</tr>
<tr>
<td>Bdgdp</td>
<td>2945</td>
<td>0.259</td>
<td>0.193</td>
<td>0.030</td>
<td>0.915</td>
</tr>
<tr>
<td>M2gdp (%)</td>
<td>2974</td>
<td>0.317</td>
<td>0.210</td>
<td>0.070</td>
<td>1.028</td>
</tr>
<tr>
<td>concentration</td>
<td>2845</td>
<td>0.716</td>
<td>0.195</td>
<td>0.387</td>
<td>1.000</td>
</tr>
<tr>
<td>Inflation (%)</td>
<td>3070</td>
<td>10.810</td>
<td>24.910</td>
<td>-9.620</td>
<td>325.000</td>
</tr>
<tr>
<td>enfo (days)</td>
<td>1781</td>
<td>633.710</td>
<td>182.880</td>
<td>310.000</td>
<td>1070.000</td>
</tr>
<tr>
<td>rule of law</td>
<td>3058</td>
<td>-0.681</td>
<td>0.641</td>
<td>-2.071</td>
<td>0.940</td>
</tr>
<tr>
<td>creditor right index</td>
<td>2630</td>
<td>2.110</td>
<td>1.540</td>
<td>0.000</td>
<td>4.000</td>
</tr>
<tr>
<td>Settler mortality</td>
<td>2520</td>
<td>574.050</td>
<td>714.080</td>
<td>15.500</td>
<td>2004.000</td>
</tr>
<tr>
<td>kaopen</td>
<td>3055</td>
<td>-0.521</td>
<td>1.064</td>
<td>-1.831</td>
<td>2.500</td>
</tr>
<tr>
<td>trade openness</td>
<td>2976</td>
<td>0.741</td>
<td>0.298</td>
<td>0.235</td>
<td>2.094</td>
</tr>
<tr>
<td>gov’t spend (% of GDP)</td>
<td>2858</td>
<td>25.940</td>
<td>7.670</td>
<td>8.420</td>
<td>58.560</td>
</tr>
<tr>
<td>Ruden (%)</td>
<td>3070</td>
<td>61.360</td>
<td>15.130</td>
<td>14.960</td>
<td>91.920</td>
</tr>
<tr>
<td>Corr</td>
<td>3070</td>
<td>-0.630</td>
<td>0.587</td>
<td>-1.546</td>
<td>1.071</td>
</tr>
<tr>
<td>hef (%)</td>
<td>3070</td>
<td>51.590</td>
<td>0.160</td>
<td>0.000</td>
<td>0.726</td>
</tr>
<tr>
<td>regu</td>
<td>3070</td>
<td>-0.469</td>
<td>0.534</td>
<td>-1.861</td>
<td>0.954</td>
</tr>
<tr>
<td>poli</td>
<td>3070</td>
<td>-0.727</td>
<td>0.195</td>
<td>0.387</td>
<td>1.000</td>
</tr>
<tr>
<td>govetteffec</td>
<td>3070</td>
<td>-0.563</td>
<td>0.570</td>
<td>-1.737</td>
<td>0.951</td>
</tr>
</tbody>
</table>

(prdbpfgdp=private credit/GDP is used as dependent variable, Concentration=Total asset of 3 top banks/Total asset of banking sector, infl=Changes in annual CPI, govt=government spending/GDP, redun=% of population living in rural areas, kaopen=index of capital account openness ranging from -2.5 to 2.5, corr, regu, rule of law = control of corruption , regulatory effectiveness and rule of law indices ranging from -2.5 to 2.5 with higher values indicating favourable outcome, creditor right=creditor right index ranging from 0 (weak) to 4(high), settler mortality=mortality rates of settlers in the various countries, trade openness=((Export+Import)/GDP) and enforcement=no. of days its takes for valid contracts to be enforced)

Regarding the rural density variable, table 4.1 indicate that the average percentage of people living in the rural communities in the selected countries is 60.36% showing largely that the countries are rural in nature. The governance variables (corr, govetteffec, poli and regu) are an index ranging from -2.5 to 2.5 with higher values corresponding to better outcomes. The average of this variable shows that governance outcomes are skewed toward lower levels.
The capital liberalization variable, \((kaopen)\) shows that over the sample period capital account liberalization was on the lower end for the countries sampled. This variable is constructed in such a way that the mean is zero and ranges from -2.5 to +2.5. Thus the countries included in study are really in the early stage of liberalization process. The economic freedom index \((hef)\), averaged 51.63% over the period. This shows that the countries sampled enjoy some level of economic freedom but a lot more need to be done to remove obstacles to economic freedom.

Concerning the legal variables, the creditor right index ranges from 0 to 4, with 0 being weaker creditor right and 4 being higher creditor right. Over the sample space, this variable average 2.11 showing that the countries have legal environments which fairly protects the investor interest. However, it takes about 634 days for valid contracts to be enforced.

4.4.2 Results of the Effect of Bank Efficiency on Financial Development

In this section the study uses the cost efficiency scores obtained in the previous chapter to investigate the link between bank efficiency and financial development. The correlation matrix of the variables included in the regression equations are shown at Appendix 4(a). The table fairly shows that there is no risk of multi-collinearity among the independent variables. To examine the bi-causality between financial development and banking sector efficiency the study makes use of Instrumental variable (2SLS) approach. The use of the IV approach helps to consistently estimate the coefficients of the potentially endogenous variables whether caused by measurement error, omitted variables or simultaneous causality bias. To fully operationalize IV in empirical research one needs to carefully select instruments to use in the estimation of the model. A good instrument is one that is not correlated with the error term and has an association with the instrumented. The regression results are shown in tables 4.2 and 4.3.
Table 4.2: Effect of Bank Efficiency on Financial Development

<table>
<thead>
<tr>
<th>Variables</th>
<th>Private Credit/GDP</th>
<th>M2/GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.2361</td>
<td>0.1822</td>
</tr>
<tr>
<td>Costeff</td>
<td>(0.026)**</td>
<td>(0.000)***</td>
</tr>
<tr>
<td></td>
<td>0.0009</td>
<td>-0.0001</td>
</tr>
<tr>
<td>Creditor Right</td>
<td>(0.933)</td>
<td>(0.979)</td>
</tr>
<tr>
<td></td>
<td>0.0264</td>
<td>0.0204</td>
</tr>
<tr>
<td>Rule of law</td>
<td>(0.000)***</td>
<td>(0.001)***</td>
</tr>
<tr>
<td></td>
<td>-0.0190</td>
<td>-0.0088</td>
</tr>
<tr>
<td>Settler Mortality</td>
<td>(0.040)**</td>
<td>(0.000)***</td>
</tr>
<tr>
<td></td>
<td>0.0135</td>
<td>0.0460</td>
</tr>
<tr>
<td>Capital account openness</td>
<td>(0.040)**</td>
<td>(0.000)***</td>
</tr>
<tr>
<td></td>
<td>-0.0383</td>
<td>-0.0295</td>
</tr>
<tr>
<td>Inflation</td>
<td>(0.000)***</td>
<td>(0.007)***</td>
</tr>
<tr>
<td></td>
<td>-0.4323</td>
<td>-0.3308</td>
</tr>
<tr>
<td>Rural population</td>
<td>(0.000)***</td>
<td>(0.000)***</td>
</tr>
<tr>
<td></td>
<td>0.0271</td>
<td>0.0930</td>
</tr>
<tr>
<td>Concentration</td>
<td>(0.000)***</td>
<td>(0.000)***</td>
</tr>
<tr>
<td></td>
<td>0.3856</td>
<td>0.3461</td>
</tr>
<tr>
<td>Constant</td>
<td>(0.000)***</td>
<td>(0.000)***</td>
</tr>
<tr>
<td></td>
<td>207.07</td>
<td>336.67</td>
</tr>
<tr>
<td>Wald Chi (13)</td>
<td>(0.000)***</td>
<td>(0.000)***</td>
</tr>
</tbody>
</table>

Observations: 2425 2425

*p-values are in parenthesis
***,** and * indicate significant at 1, 5, and 10% respectively

(prdbpfgdp=private credit/GDP is used as dependent variable, Costeff=Bank cost efficiency scores, Concentration=Total asset of 3 top banks/Total asset of banking sector, infl=Changes in annual CPI, govt=government spending/GDP, redun=% of population living in rural areas, kaopen=index of capital account openness ranging from -2.5 to 2.5, creditor right=creditor right index ranging from 0 (weak) to 4(high) and settler mortality=mortality rates of settlers in the various countries

Three governance variables, government effectiveness, regulatory effectiveness and control of corruption were used as instruments. These variables were chosen because it is envisaged that the governance environment should impact positively on the banking sector efficiency in a
particular country. The cost efficiency variable, \textit{costeff} indicates the cost efficiency scores generated in the previous chapter. It enters the three regression equations with positive and significant coefficients. It did have the expected sign as projected in the study. An efficient banking sector in an economy helps in allocation of financial resources to the productive areas of the economy thereby enhancing the financial development. The result is in line with the findings of Ghannouchi and Radic (2010) and means that banking sector productivity is crucial for financial development in Africa. As noted by Kablan (2010), in many of these countries the stock market is either not in existence or is not well developed, hence the banking sector is the main source of finance for development. Thus the reforms which were started in the late 80s and early 90s were in the right direction and it should serve as a catalyst to propel development in the financial sector which is expected to translate to accelerated growth.

Turning to the other determinants of financial development, the legal variable rule of law was found to be positive and significant in all the regressions. This means countries with strong rule of law should have an improved level of financial development as confirmed by the regression results. These findings are in line with that of Laporta et al (1997) and confirm the theory of law and finance.

The settler mortality variable is negative and significant in all the regressions in line with expectations. Thus, the level of financial development in many of the sampled countries seems to have been affected by factors in the past. In countries where the settler mortality was high, the colonial masters could not settle and therefore only extractive industries were established as against institutions that will promote financial development. We thus find support for the endowment theory of financial development in the study.
With regards to capital account openness, the study finds a positive and significant relationship with financial development in all the regressions. This finding is in line with Baltagi et al (2008) and Rajan and Zingales (2003). The finding shows the opening up on a country’s capital markets could lead to improved levels of financial development.

Concerning the macroeconomic variable, inflation has the expected sign in all the models. It enters all the regression models negative and significant. This confirms the findings of Kablan (2010) and Detragiache et al (2005) and suggests that macroeconomic stability is essential for financial development. The finding of the study is also in line with the findings of Huybens and Smith (1998, 1999) who finds that inflation may aggravate asymmetries of information in credit markets, reducing the real rate of return and the volume of credit. Also, inflation reduces the real returns depositors receive on their deposit and thus discourage savings which eventually tighten credit to the private sector because of lower deposit base. Besides this, inflation also slows the intermediation function of financial banks. High inflation means higher interest rates on loans with its attendance increases in non-performing loans which eventually reduces the desire of banks to expand credit to the private sector. The finding also echoes that of Boyd et al (2001) who find a negative association between inflation and banking sector development.

With regards to geographical variables, the percentage of the population in the rural areas is negative in both regressions. This suggest that in areas where there is a large percent of population in the rural areas, the cost of reaching out to these population is high and therefore does not favour a higher level of financial development. It is also a fact that because many of the countries are not developed, basic infrastructural amenities may not be available thereby preventing financial institutions from establishing there. Thus geographical barriers could be a
hindrance to the expansion of financial development. The finding supports the observation made by World Bank (2006), to the effect that sparse population resulting in isolation and great distances (at least in terms of travel time) lead to lack of scale in the financial services sector. Since most financial services involve fixed costs and increasing returns to scale (at least up to a certain point) the problem of scale translates into a problem of high unit costs and even unaffordability of certain services.

Concentration as measured by the ratio of three top banks in the country divided by the total banking sector enters all the models as positive and significant. This finding deviates from that of Kablan (2010) and suggest a concentrated banking sector is better for the financial sector as a whole.

**4.4.3 Results on the Effect of Financial Development on Banking Sector Efficiency**

The next stage of the analysis is to investigate the reverse causality. Here we try to answer the question; to what extent does financial development influence banking sector efficiency? Table 4.3 below shows the results of this.
Table 4.3: Effect of Financial Development on Bank Efficiency

<table>
<thead>
<tr>
<th>Variables</th>
<th>model 1</th>
<th>model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>private credit/GDP</td>
<td>0.3414</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.069)*</td>
<td>0.4278</td>
</tr>
<tr>
<td>M2/GDP</td>
<td></td>
<td>(0.001)***</td>
</tr>
<tr>
<td>Settler mortality</td>
<td>0.0028</td>
<td>0.0018</td>
</tr>
<tr>
<td></td>
<td>(0.557)</td>
<td>(0.572)</td>
</tr>
<tr>
<td>capital account openness</td>
<td>-0.0335</td>
<td>-0.0382</td>
</tr>
<tr>
<td></td>
<td>(0.002)***</td>
<td>(0.000)***</td>
</tr>
<tr>
<td>Trade openness</td>
<td>0.1446***</td>
<td>0.0938***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>Govt spending</td>
<td>-0.2898***</td>
<td>-0.2939***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>rural population</td>
<td>0.3896***</td>
<td>0.2757***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Concentration</td>
<td>0.0045</td>
<td>0.0022</td>
</tr>
<tr>
<td></td>
<td>(0.884)</td>
<td>(0.944)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.4889***</td>
<td>0.5440***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Wald Chi2 (13)</td>
<td>65.03***</td>
<td>56.58***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Observations</td>
<td>2829</td>
<td>2829</td>
</tr>
</tbody>
</table>

(P-values are in parenthesis)

***, ** and * indicate significant at 1, 5 and 10% respectively

(prdbpfgdp = private credit/GDP is used as dependent variable, Costeff = Bank cost efficiency scores, Concentration = Total asset of 3 top banks/Total asset of banking sector, infl = Changes in annual CPI, govt = government spending/GDP, redun = % of population living in rural areas, kaopen = index of capital account openness ranging from -2.5 to 2.5, settler mortality = mortality rates of settlers in the various countries and trade openness = ((Export+Import)/GDP)

Two models were run using both the private credit to GDP and M2/GDP. The first model makes use of private credit to GDP as independent variable and the second makes use of M2/GDP as one of the independent variables. Inflation was used as instrument for the measures of financial development in both models. Literature has strongly established the link between financial
development and inflation. Macroeconomic stability is key if a country’s financial sector is to operate efficiently. From Table 4.3, our measure of financial development, private credit to GDP and M2/GDP are positive and significant in all the regression models. This means that as credit to the private sector expands it affects the efficiency with which it is distributed. Thus a developed financial sector enhances the efficiency with which the banking sector operates in terms of its cost as abnormal profits are reduced and the only source of profits enhancements become the extent to which managers are able to reduce cost inefficiencies. Thus causality between banking sector efficiency and financial development runs positively in both directions.

Among the other control variables which affect the banking sector efficiency government spending stands out. Government spending enters all the regression equations as negative and significant. This means increase in government expenditure in the financial sector destabilizes the banking sector as it has the potential of crowding out credit to the private sector and increase interest rates.

Furthermore, the found evidence suggests that opening up of the country to trade affects positively the efficiency in the banking sector. This is because; the banking sector gets the opportunity to increase its portfolio lines by funding other international businesses. By so doing, they are able to leverage on income from these activities and reduce cost of banking in the local market. However, the same cannot be said of the capital account openness. It appears the proxy for the financial liberalization affects banking sector negatively. This is in line with studies that have found negative association of the share of foreign ownership in the banking sector to bank efficiency.
4.5 Chapter Summary

This chapter sought to establish the link between banking sector efficiency as measured by cost efficiency and financial development. In this light it drew on the various theoretical and empirical literatures for the analysis of each topic. Also, the study sought to investigate the direction of causality between financial development and banking sector efficiency. The study concluded that causality runs positively in both directions between bank cost efficiency and financial development. This means that as banks become more cost efficient, financial sector develops further and credit allocation get more distributed in the real economy.

Similarly, it is important that policy makers know that financial sector policies that deepen the financial system also results in cost efficiency in the banking sector by challenging the banking sector to be innovative and efficient in their bit to increase shareholder value. Among the other control variables, inflation and government spending was found to destabilize the financial development and banking sector efficiency respectively.

Also, a good legal environment for the financial sector improves financial development. Markets that have strong rule of law prevails leads to higher levels of financial development and explains the cross-country differences in the financial sector. Other historical variables that have impacted the cross-country variations in financial development are settler mortality and percentage of rural population. These have negatively affected the development of the financial sector.

In the light of these findings, it is recommended that policy makers can approach financial development from the banking sector efficiency channel. This will position banks to offer
innovative services and thereby deepened the financial sector as the level of financial
development increase.

Also, governments should do well to enact or strengthen existing laws that give confidence to
investors in the financial markets. This will go a long way to improve the level of financial
development as market participants becomes confident.
CHAPTER FIVE
BANK EFFICIENCY AND ECONOMIC GROWTH

5.1 Introduction

This is the last of the empirical chapters of this thesis and takes a look at the relationship between banking sector efficiency and economic growth. The costs of acquiring information, enforcing contracts and making transactions create incentives for the emergence of financial intermediaries to mitigate the negative repercussions of these market frictions, Levine (2001). Financial intermediaries also help in the efficient allocation of resources across space and time. This allocation role of financial institutions was first recognized by Schumpeter (1912), who conjectured that bankers help to identify entrepreneurs with good growth prospects. Banks therefore help to reallocate resources to their most productive uses to promote growth (see Yu and Gan, 2010).

Over the past 3 decades there has been an enormous research to establish this finance-growth nexus. As pointed out by Lucchetti et al (2001), the main weakness in this strand of literature is the variables used to measure the banking system’s state of development. He contended that these variables are of two types. The first refers to the presence and diffusion of the banking system where the most commonly used indicators are the ratio between liquid liabilities of the banking system and GDP. The second group of variables measures the amount of financing intermediated by banks. Among these variables are the ratio between domestic credit and GDP

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2 A version of this paper was published in Research in Accounting in Emerging Economies Volume 12B, Finance and Development in Africa, edited by Kojo Menyah and Joshua Abor, 2012,

3 A version of this paper was also presented at the 1st Accounting and Finance Association Conference, Alisa Hotel, Accra Ghana, Sept. 2011
(Rajan and Zingales, 1998), the share of credit granted to the private sector, or the credit granted to the private sector in ratio to GDP.

These measures give rise to interpretative problems, and they are only partially able to capture the role performed by banks in economic development. Firstly, there is the problem of causality. The growth of the banking system and the amount of credit disbursed are closely influenced by the level of economic development. The wide presence of banks and the importance of bank lending in areas which grow more rapidly than others may be indicative of a reverse causal relation between finance and economic growth. As well as being unable to shed adequate light on the causal relation between the development of the banking system and economic growth, these two types of measures have the further shortcoming that they essentially concentrate on the role of banks in stimulating capital accumulation. Yet, as the recent economic literature has shown, the specific role performed by banks in the economic system is not to intermediate savings, but rather to certify the quality of borrowers, monetizing liabilities which otherwise would fail to find purchasers in the markets (See Minsky 1986, Fama, 1985; Stiglitz and Weiss, 1988). This thinking suggests the need for a more qualitative measure for the state of the banking sector development. The existing literature has however focused on the impact of the increased volume of financial services on economic growth. The importance of the quality of the financial services has not received much attention in literature. Lucchetti et al (2001), Koetter et al (2006) and Kessy (2008) are among the few studies that have used a measure of the quality of the banking sector to explore further the link between finance and growth. Of these three studies the latter was done for Eastern Africa countries.
It has been noted in literature that economic growth variables tend to present endogeneity issues in empirical studies. However, in the study of banking efficiency and economic growth as found in Kessy (2008), the fixed effect model was used to establish the positive independent effect of banking sector efficiency on economic growth. This may present bias in the results due to issues of endogeneity in the financial and the economic growth variables. The current study overcomes this issue by using the dynamic GMM method to investigate the linkages between efficiency and economic growth. The advantage of this GMM methodology is that it takes care of the econometric problems caused by unobserved country-specific effects and endogeneity of the independent variables in lagged-dependent-variable models such as economic growth regressions. The inclusion of both cross-country and time-series data introduces additional information about the over-time change in growth and its determinants, and, thus, helps to get more precise results, Mhadhbi (2014).

Africa banking sector has gone through considerable reforms in the late 1980s and the early 1990s aimed at improving the efficiency of the banking sector. It was envisaged that these reforms will place banks in sound footing and spur growth. However, it is not clear which aspect of the banking sector development matters to growth—the size or the efficiency of intermediation. That is, whether the mere expansion of credit in the economy is the most beneficial on the continent or the efficiency with which the banking sector allocates credits? This study aims to answer this question and further provides evidence on the other determinants of economic growth.
The rest of the chapter is structured as follows; Section 2 takes an in-depth review of literature in this area whilst Section 3 looks at the methodology; Section 4 looks at the analysis and the findings of the research and the last section deals with the conclusions and recommendations.

5.2 Literature Review

In this section the thesis takes a look at the theoretical as well as empirical literature in the finance-growth debate.

5.2.1 Finance and Growth

There is a sizable amount of theoretical literature on the relationship between financial development and economic growth. The mechanisms by which financial development affects real growth, however, often differ among theories, Hasan et al (2008). Pagano (1993) shows that financial intermediation can affect real growth by increasing the savings rate (De Gregorio, 1994; Jappelli and Pagano, 1994), improving the allocational efficiency of investments (Bencivenga and Smith, 1991; Greenwood and Jovanovic, 1990), and by enhancing the functional efficiency of the banking system (Viaene, 1993; Gupta and Lensink, 1996). Related to the banking-efficiency channel, Graff and Karmann (2006) argue that financial intermediaries need to allocate scarce resources efficiently when providing their products and services. Levine (2004) outlines extensively the functions of the financial sector in the economic growth process. These are discussed below.

Production of Information and Allocating Capital

There are large costs associated with evaluating firms, managers, and market conditions before making investment decisions. Individual savers may not have the ability to collect, process, and produce information on possible investments. Since savers will be reluctant to invest in activities about which there is little reliable information, high information costs may keep capital from
flowing to its highest value use. Thus, while many models assume that capital flows toward the most profitable firms, this presupposes that investors have good information about firms, managers, and market conditions. (Bagehot, 1873)

We therefore need financial intermediaries to channel funds from savers to borrowers at lower cost. Financial intermediaries may reduce the costs of acquiring and processing information and thereby improve resource allocation (Boyd and Prescott, 1986). Without intermediaries, each investor would face the large fixed cost associated with evaluating firms, managers, and economic conditions. Consequently, groups of individuals may form financial intermediaries that undertake the costly process of researching investment possibilities for others to reduce unit cost. In Boyd and Prescott (1986), financial intermediaries look like banks in that they accept deposits and make loans. Allen (1990), Bhattacharya and Pfeiderer (1985), and Ramakrishnan and Thakor (1984) also develop models where financial intermediaries arise to produce information on firms and sell this information to savers. Unlike in Boyd and Prescott (1986), however, the intermediary does not necessarily both mobilize savings and invest those funds in firms using debt contracts.

By improving information on firms, managers, and economic conditions, financial intermediaries can accelerate economic growth. Assuming that many entrepreneurs solicit capital and that capital is scarce, financial intermediaries that produce better information on firms will thereby fund more promising firms and induce a more efficient allocation of capital (Greenwood and Jovanovic, 1990). There is a cost to joining financial intermediaries, however. Growth means that more individuals can afford to join financial intermediaries, which improves the ability of
financial intermediaries to produce better information with positive ramifications on growth. Thus, the Greenwood and Jovanovic research emphasizes (i) the two way interactions between finance and growth and (ii) the relationship between income distribution and financial development during the process of economic development. Besides identifying the best production technologies, financial intermediaries may also boost the rate of technological innovation by identifying those entrepreneurs with the best chances of successfully initiating new goods and production processes (King and Levine, 1993b; Galletovic, 1996; Blackburn and Hung, 1998; Morales, 2003; Acemoglu, Aghion, and Zilibotti, 2003).

**Monitoring of Firms and Exerting Corporate Governance**

Corporate governance is central to understanding economic growth in general and the role of financial factors in particular. The degree to which the providers of capital to a firm can effectively monitor and influence how firms use that capital has ramifications on both savings and allocation decisions. To the extent that shareholders and creditors effectively monitor firms and induce managers to maximize firm value, this will improve the efficiency with which firms allocate resources and make savers more willing to finance production and innovation. In turn, the absence of financial arrangements that enhance corporate governance may impede the mobilization of savings from disparate agents and also keep capital from flowing to profitable investments (Stiglitz and Weiss, 1983). Thus, the effectiveness of corporate governance mechanisms directly impacts firm performance with potentially large ramifications on national growth rates. Diffuse shareholders may exert effective corporate governance directly by voting on crucial issues, such as mergers, liquidations, and fundamental changes in business strategies, and indirectly by electing boards of directors to represent the interest of the owners and oversee
the myriad of managerial decisions. With low information costs, shareholders can make informed decisions and vote accordingly. In the absence of large market frictions and distorted incentives, boards of directors will represent the interest of all shareholders, oversee managers effectively, and improve the allocation of resources.

Starting from at least Berle and Means (1932), however, many researchers have argued that small, diffuse equity may encounter a range of barriers to exerting sound control over corporations. An assortment of market frictions, however, may keep diffuse shareholders from effectively exerting corporate governance, which allows managers to pursue projects that benefit themselves rather than the firm and society at large. In particular, large information asymmetries typically exist between managers and small shareholders and managers have enormous discretion over the flow of information. Furthermore, small shareholders frequently lack the expertise and incentives to monitor managers because of the large costs and complexity associated with overseeing managers and exerting corporate control. This may induce a “freerider” problem because each stockowner’s stake is so small: Each investor relies on others to undertake the costly process of monitoring managers, so there is too little monitoring. The resultant gap in information between corporate insiders and diffuse shareholders implies that the voting rights mechanism will not work effectively. Also, the board of directors may not represent the interests of minority shareholders. Management frequently “captures” the board and manipulates directors into acting in the best interests of the managers, not the shareholders.

Finally, in many countries legal codes do not adequately protect the rights of small shareholders and legal systems frequently do not enforce the legal codes that actually are on the books
concerning diffuse shareholder rights. Thus, large information and contracting costs may keep diffuse shareholders from effectively exerting corporate governance, with adverse effects on resource allocation and economic growth. One response to the frictions that prevent dispersed shareholders from effectively governing firms is for firms to have a large, concentrated owner, but this ownership structure has its own problems. Large owners have greater incentives to acquire information and monitor managers and greater power to thwart managerial discretion (Grossman and Hart, 1980, 1988; Shleifer and Vishny, 1986; and Stulz, 1988). The existence of large shareholders, however, creates a different agency problem: Conflicts arise between the controlling shareholder and other shareholders (Jensen and Meckling, 1976). The controlling owner may expropriate resources from the firm, or provide jobs, perquisites, and generous business deals to related parties in a manner that hurts the firm and society, but benefits the controlling owner. Indeed, Morck, Wolfenzon, and Yeung (2005) show that concentrated ownership appears to have enduring political and macroeconomic implications. Around the world, controlling owners are frequently powerful families that use pyramidal structures, cross-holdings, and super voting rights to magnify their control over many corporations and banks (La Porta et al., 1999; Morck et al., 2000; Faccio and Lang, 2002; Caprio et al., 2003). Morck et al (2005) marshal an abundance of evidence in arguing that (i) these controlling families frequently translate their corporate power into political influence and (ii) the elite then use their influence to shape public policies in ways that protect them from competition and subsidize their ventures. Thus, highly concentrated ownership can distort corporate decisions and national policies in ways that curtail innovation, encourage rent-seeking, and stymie economic growth. In terms of economic growth, a number of models show that well-functioning financial intermediaries influence growth by boosting corporate governance. Bencivenga and Smith (1993) show that
financial intermediaries that improve corporate governance by economizing on monitoring costs will reduce credit rationing and thereby boost productivity, capital accumulation, and growth. Sussman (1993) and Harrison, Sussman, and Zeira (1999) develop models where financial intermediaries facilitate the flow of resources from savers to investors in the presence of informational asymmetries with positive growth effects. Focusing on innovative activity, De La Fuente and Marin (1996) develop a model in which intermediaries arise to undertake the particularly costly process of monitoring innovative activities. This improves credit allocation among competing technology producers with positive ramifications on economic growth.

From a different perspective, Boyd and Smith (1992) show that differences in the quality of financial intermediation across countries can have huge implications for international capital flows and hence economic growth rates. They show that capital may flow from capital scarce countries to capital abundant countries if the capital abundant countries have financial intermediaries that are sufficiently more effective at exerting corporate control than the capital scarce regions. Thus, even though the physical product of capital is higher in the capital scarce countries, investors recognize that their actual returns depend crucially on the monitoring performed by intermediaries. Thus, poor financial intermediation will lead to sub-optimal allocation of capital.

**Risk Management**

With information and transactions costs, financial contracts, markets and intermediaries may arise to ease trading, hedging, and pooling of risk with implications for resource allocation and
growth. Levine (2004) divided the ability of finance to reduce risk into three: cross-sectional risk diversification, intertemporal risk sharing, and liquidity risk.

Traditional finance theory focuses on cross-sectional diversification of risk. Financial systems may mitigate the risks associated with individual projects, firms, industries, regions, countries, etc. Banks, mutual funds, and securities markets all provide vehicles for trading, pooling, and diversifying risk. The financial system’s ability to provide risk diversification services can affect long-run economic growth by altering resource allocation and savings rates. The basic intuition is straightforward. While savers generally do not like risk, high-return projects tend to be riskier than low-return projects. Thus, financial markets that make it easier for people to diversify risk tend to induce a portfolio shift toward projects with higher expected returns (Gurley and Shaw, 1955; Patrick, 1966; Greenwood and Jovanovic, 1990; Saint-Paul 1992; Devereux and Smith, 1994; and Obstfeld, 1994).

Acemoglu and Zilibotti (1997) carefully model the links between cross-sectional risk, diversification, and growth. They assume that (i) high-return, risky projects are frequently indivisible and require a large initial investment, (ii) people dislike risk, (iii) there are lower returns, safe projects, and (iv) capital is scare. In the absence of financial arrangements that allow agents to hold diversified portfolios, agents will avoid the high-return, risky projects because they require agents to invest disproportionately in risky endeavors. They show that financial systems that allow agents to hold a diversified portfolio of risky projects foster a reallocation of savings toward high-return ventures with positive repercussions on growth. In terms of technological change, King and Levine (1993b) show that cross-sectional risk diversification can
stimulate innovative activity. Agents are continuously trying to make technological advances to
gain a profitable market niche. Engaging in innovation is risky, however. The ability to hold a
diversified portfolio of innovative projects reduces risk and promotes investment in growth-
enhancing innovative activities (with sufficiently risk averse agents). Thus, financial systems that
ease risk diversification can accelerate technological change and economic growth.

Besides cross-sectional risk diversification, financial systems may improve intertemporal risk
sharing. In examining the connection between cross-sectional risk sharing and growth, theory has
tended to focus on the role of markets, rather than intermediaries. However, in examining risk
sharing, theory has focused on the advantageous role of intermediaries in easing intertemporal
risk smoothing (Allen and Gale, 1997). Risks that cannot be diversified at a particular point in
time, such as macroeconomic shocks, can be diversified across generations. Long-lived
intermediaries can facilitate intergenerational risk sharing by investing with a long-run
perspective and offering returns that are relatively low in boom times and relatively high in slack
times. While this type of risk sharing is theoretically possible with markets, intermediaries may
increase the feasibility of intertemporal risk sharing by lowering contracting costs.

A third type of risk is liquidity risk. Liquidity reflects the cost and speed with which agents can
convert financial instruments into purchasing power at agreed prices. Liquidity risk arises due to
the uncertainties associated with converting assets into a medium of exchange. Informational
asymmetries and transaction costs may inhibit liquidity and intensify liquidity risk. These
frictions create incentives for the emergence of financial markets and institutions that augment
liquidity. The standard link between liquidity and economic development arises because some
high-return projects require a long-run commitment of capital, but savers do not like to
relinquish control of their savings for long-periods. Thus, if the financial system does not augment the liquidity of long-term investments, less investment is likely to occur in the high return projects.

Indeed, Hicks (1969) argues that the products manufactured during the first decades of the Industrial Revolution had been invented much earlier. Rather, the critical innovation that ignited growth in 18th century England was capital market liquidity. With liquid capital markets, savers can hold liquid assets -- like equity, bonds, or demand deposits – that they can quickly and easily sell if they seek access to their savings. Simultaneously, capital markets transform these liquid financial instruments into long-term capital investments. Thus, the industrial revolution required a financial revolution so that large commitments of capital could be made for long periods (Bencivenga, Smith, and Starr, 1995)

In Diamond and Dybvig's (1983) seminal model of liquidity, a fraction of savers receive shocks after choosing between two investments: an illiquid, high-return project and a liquid, low return project. Those receiving shocks want access to their savings before the illiquid project produces. This risk creates incentives for investing in the liquid, low-return projects. The model assumes that it is prohibitively costly to verify whether another individual has received a shock or not. This information cost assumption rules out state-contingent insurance contracts and creates an incentive for financial markets -- markets where individuals issue and trade securities-- to emerge.

Levine (1991) takes the Diamond Dybvig (1983) set-up, models the endogenous formation of equity markets, and links this to a growth model. Specifically, savers receiving shocks can sell
their equity claims to the future profits of the illiquid production technology to others. Market participants do not verify whether other agents received shocks or not. Participants simply trade in impersonal stock exchanges. Thus, with liquid stock markets, equity holders can readily sell their shares, while firms have permanent access to the capital invested by the initial shareholders.

By facilitating trade, stock markets reduce liquidity risk. Frictionless stock markets, however, do not eliminate liquidity risk. That is, stock markets do not replicate the equilibrium that exists when insurance contracts can be written contingent on observing whether an agent receives a shock or not. Nevertheless, as stock market transaction costs fall, more investment occurs in the illiquid, high-return project. If illiquid projects enjoy sufficiently large externalities, then greater stock market liquidity induces faster steady-state growth. Thus far, information costs -- the costs of verifying whether savers have received a shock -- have motivated the existence of stock markets, but trading costs can also hasten the emergence and highlight the importance of liquid stock markets. In Bencivenga, Smith, and Starr (1995), high-return, long-gestation production technologies require that ownership be transferred throughout the life of the production process in secondary securities markets. If exchanging ownership claims is costly, then longer-run production technologies will be less attractive. Thus, liquidity -- as measured by secondary market trading costs -- affects production decisions. Greater liquidity will induce a shift to longer-gestation, higher-return technologies. Besides stock markets, financial intermediaries may also enhance liquidity, reduce liquidity risk and influence economic growth.

As discussed above, Diamond and Dybvig's (1983) model assumes it is prohibitively costly to observe shocks to individuals, so it is impossible to write incentive compatible state-contingent insurance contracts. Under these conditions, banks can offer liquid deposits to savers and
undertake a mixture of liquid, low return investments to satisfy demands on deposits and illiquid, high-return investments. By providing demand deposits and choosing an appropriate mixture of liquid and illiquid investments, banks provide complete insurance to savers against liquidity risk while simultaneously facilitating long-run investments in high return projects. Banks replicate the equilibrium allocation of capital that exists with observable shocks. As noted by Jacklin (1987), however, the banking equilibrium is not incentive compatible if agents can trade in liquid equity markets. If equity markets exist, all agents will use equities; none will use banks. Thus, in this context, banks will only emerge to provide liquidity if there are sufficiently large impediments to trading in securities markets (Diamond, 1991).

Another form of liquidity involves firm access to credit during the production process, which may reduce premature liquidity of projects and thereby foster investment in longer gestation, higher-return projects. Holmstrom and Tirole (1998) note that firm production processes are long-term, uncertain, and subject to shocks. Thus, some firms may receive shocks after receiving outside financing and need additional injections of capital to complete the project. In the presence of informational asymmetries, intermediaries can sell an option to a line of credit during the initial financing of the firm that entitles the firm to access additional credit at an intermediate stage in certain states of nature. This improves the efficiency of the capital allocation process, but the model does not formally link the provision of liquidity with economic growth. Aghion, Angeletos, Banerjee, and Manova (2004), instead, focus on how the ability of firms to access credit during the production process influences innovation and long-run growth when firms face macroeconomic shocks (e.g., recessions). They develop a model where firms can either invest in short-term, low-return investments or in more risky, growth-enhancing
research and development (R&D). They also assume that there are adjustment costs to R&D. In this context, under-developed financial systems that are less able to provide firms with funds to ease these adjustment costs will hinder innovation. Moreover, macroeconomic volatility exerts a particularly negative impact on innovation and growth in under-developed financial systems because firms’ willingness to undertake R&D depends on their ability to borrow in the future to meet adjustment costs, which is influenced negatively by the likelihood of experiencing a recession and positively by the level of financial development. Aghion et al (2004) also provide empirical evidence consistent with the prediction that financial development reduces the adverse growth effects of macroeconomic volatility.

**Mobilization of Savings**

Mobilization -- *pooling* -- is the costly process of agglomerating capital from disparate savers for investment. Mobilizing savings involves (a) overcoming the transaction costs associated with collecting savings from different individuals and (b) overcoming the informational asymmetries associated with making savers feel comfortable in relinquishing control of their savings. Indeed, much of Carosso’s (1970) history of Investment Banking in America is a description of the diverse costs associated with raising capital in the United States during the 19th and 20th centuries.

In light of the transaction and information costs associated with mobilizing savings from many agents, numerous financial arrangements may arise to mitigate these frictions and facilitate pooling. Specifically, mobilization may involve multiple bilateral contracts between productive units raising capital and agents with surplus resources. The joint stock company in which many
individuals invest in a new legal entity, the firm, represents a prime example of multiple bilateral mobilizations. To economize on the costs associated with multiple bilateral contracts, pooling may also occur through intermediaries, where thousands of investors entrust their wealth to intermediaries that invest in hundreds of firms (Sirri and Tufano 1995). For this to occur, "mobilizers" have to convince savers of the soundness of the investments (Boyd and Smith, 1992). Toward this end, intermediaries worry about establishing stellar reputations, so that savers feel comfortable about entrusting their savings to the intermediary (DeLong, 1991; and Lamoreaux, 1995).

Financial systems that are more effective at pooling the savings of individuals can profoundly affect economic development by increasing savings, exploiting economies of scale, and overcoming investment indivisibilities. Besides the direct effect of better savings mobilization on capital accumulation, better savings mobilization can improve resource allocation and boost technological innovation. Without access to multiple investors, many production processes would be constrained to economically inefficient scales (Sirri and Tufano, 1995). Furthermore, many endeavors require an enormous injection of capital that is beyond the means or inclination of any single investor. (Bagehot 1873) argued that a major difference between England and poorer countries was that in England the financial system could mobilize resources for "immense works." Thus, good projects would not fail for lack of capital. Bagehot was very explicit in noting that it was not the national savings rate per se, it was the ability to pool society’s resources and allocate those savings toward the most productive ends. Furthermore, mobilization frequently involves the creation of small denomination instruments. These instruments provide opportunities for households to hold diversified portfolios (Sirri and Tufano, 1995). Acemoglu
and Zilibotti (1997) show that with large, indivisible projects, financial arrangements that mobilize savings from many diverse individuals and invest in a diversified portfolio of risky projects facilitate a reallocation of investment toward higher return activities with positive ramifications on economic growth.

*Facilitating Exchange*

Financial arrangements that lower transaction costs can promote specialization, technological innovation and growth. The links between facilitating transactions, specialization, innovation, and economic growth were core elements of Smith’s (1776) Wealth of Nations. He argued that division of labor -- specialization -- is the principal factor underlying productivity improvements. With greater specialization, workers are more likely to invent better machines or production processes (Smith, 1776). Men are much more likely to discover easier and readier methods of attaining any object, when the whole attention of their minds is directed towards that single object, than when it is dissipated among a great variety of things. Smith (1776) focused on the role of money in lowering transaction costs, permitting greater specialization, and fostering technological innovation. Information costs, however, may also motivate the emergence of money. Since it is costly to evaluate the attributes of goods, barter exchange is very costly. Thus, an easily recognizable medium of exchange may arise to facilitate exchange (King and Plosser, 1986; and Williamson and Wright, 1994). The drop in transaction and information costs is not necessarily a one-time fall when economies move to money, however. Transaction and information costs may continue to fall through financial innovation.
Greenwood and Smith (1996) have modeled the connections between exchange, specialization, and innovation. More specialization requires more transactions. Since each transaction is costly, financial arrangements that lower transaction costs will facilitate greater specialization. In this way, markets that promote exchange encourage productivity gains. There may also be feedback from these productivity gains to financial market development. If there are fixed costs associated with establishing markets, then higher income per capita implies that these fixed costs are less burdensome as a share of per capita income. Thus, economic development can spur the development of financial markets.

In the Greenwood and Smith (1996) model, however, the reduction in transaction costs does not stimulate the invention of new and better production technologies. Instead, lower transaction costs expands the set of "on the shelf” production processes that are economically attractive. Also, the model defines better “market” as a system for supporting more specialized production processes. This does not explain the emergence of financial instruments or institutions that lower transactions costs and thereby produce an environment that naturally promotes specialized production technologies. This is important because we want to understand the two links of the chain: what features of the economic environment create incentives for the emergence of financial arrangements, and how do these emerging financial arrangements influence economic activity.

5.2.2 Empirical Literature

There exists a substantial debate on the importance of finance on growth. Robinson (1952) argues that financial services are provided as a reaction to the demand by corporate firms, that is, finance follows entrepreneurial activity. Lucas (1988) also emphasized that finance is an
overvalued explanatory factor in growth theory. Other researchers such as Goldsmith (1969) and McKinnon (1973) argued that finance indeed plays a major role in growth theory.

The literature on economic growth has identified two broad channels in which banks influence the process of economic growth (see Luchetti el, 2001). The first of these channels is attributed to Hicksian (1969) and is called capital accumulation which states that “by reducing transaction costs and by diversifying risks, banks enable the mobilization of savings to finance the investments necessary to stimulate and sustain economic growth”. The second channel is attributed to Schumpeter (1912) and emphasises the allocation of credit. It states that development is driven by innovations, the “different employment of existing services of labour and land” (Schumpeter, 1912). The role of banks in this instance is to identify the entrepreneurs most able to introduce innovations, and provide them with the purchasing power necessary to direct the means of production to them.

Koetter and Wedow (2006) illustrates these two channels in the vein of Pagano (1993) by using a simple AK growth model as follows;

Let

\[ Y_t = \text{Aggregate output at time } t \]

\[ K_t = \text{Capital (the only production factor)} \]

\[ A = \text{Positive constant (current level of technology)} \]

Then the production function is stated as

\[ Y_t = AK_t \] \hspace{1cm} (5.1)
In equation (5.1) the marginal product of capital equals total factor productivity $A$. All output produced is consumed or saved so that $Y = C + S$. Also, suppose capital stock depreciates at a constant rate $\delta$, then investment equals difference in capital stock between two subsequent periods $K_t$ and $K_{t+1}$, where

$$I_t = K_{t+1} - (1 - \delta)K_t \quad \text{........ (5.2)}$$

Assuming financial market is in equilibrium, so that aggregate savings $S$, equals aggregate investment, $I$, then

$$I_t = \eta S_t \quad \text{........ (5.3)},$$

The factor $\eta$ lies in the range $0 \leq \eta \leq 1$ and captures the ability of the financial intermediary to intermediate funds. Due to the existence of frictions when channeling funds from surplus units to deficit units, only a fraction of the savings is converted to investment. Thus, high values of $\eta$ indicates only little resources are wasted and vice versa.

Also, from eq. (5.1), the growth rate of output $g = \frac{Y_{t+1}}{Y_t} - 1$ depends on the development of $K$. In the steady state, both capital and output grow at the same rate. Thus eq. (5.2) can be re-written as

$$\eta sAK_t = K_{t+1} - (1 - \delta)K_t \quad \text{........ (5.4)},$$

where $s =$ savings rate.

Since $\frac{Y_{t+1}}{Y_t} - 1 = \frac{K_{t+1}}{K_t} - 1$ holds in equilibrium state, dividing both sides of eq. (5.4) by $K_t$ and re-arranging terms as follows

$$\eta sA = \frac{K_{t+1}}{K_t} - (1 - \delta),$$

expanding through the brackets, yield
\[ \eta sA = \frac{K_{t+1}}{K_t} - 1 + \delta, \text{ grouping} \]

\[ nsA = \left( \frac{K_{t+1}}{K_t} - 1 \right) + \delta, \] the term in the brackets equals the growth rate \( g \) of the capital stock.

Therefore

\[ nsA = g + \delta, \text{ and re-arranging yields} \]

\[ g = \eta sA - \delta \quad \ldots \ldots \quad (5.5) \]

Equation (5.5) illustrates how financial development can influence growth: via a larger fraction of income that is saved \( s \); via enhancing total productivity \( A \); and via an improved quality of intermediation, \( \eta \), by reducing the fraction of savings “lost in transition”. The former effect relates to the Hicksian view which emphasizes capital accumulation as a means by which better financial development channel higher quantities from savers to investors. On the other hand, the latter two effects resemble the Schumpeterian train of thought which states that better intermediaries help reduce slack in the financial system.

Empirical analyses in the growth literature rarely specify the AK model described above to illustrate the relation between finance and growth. Most studies analyze how fast per capita income \( Y \) converges to its steady state. Barro and Sala-I-Martín (1995) show that the average growth rate of per capita output depends on the initial level of per capita output, \( Y_0 \). On this basis, Lucchetti et al. (2001) denote what they call the reference model of the finance-growth literature as

\[ \Delta y = \beta_1 y_0 + \beta_2 fd + \beta_3 x + \epsilon \]
where lower case letters indicate the log of a variable, $fd$ denotes a proxy of financial development, $x$ is a vector of additional control variables and $\varepsilon$ is a random error term. Also $\Delta y$ in the above equation depicts the growth rate of per capita GDP.

A large body of empirical research has tested the relationship between financial intermediaries and economic growth. Among them, Levine (1997) finds a first order positive relationship between financial development and economic growth. Other researchers have tested this relationship at the firm level (see Demircug-Kunt and Maksimovic, 1998) industry level (see Rajan and Zingales, 1998), cross-country studies (see Haber, 1991), time series (Rosseau and Wachtel, 1998) and cross country studies using traditional econometric models (see King and Levine, 1993a, 1993b). All these have concluded that there is a positive relationship between financial intermediation and economic growth.

However, some researchers in recent times have questioned the strength of the relationship between finance and growth. Among them, Rosseau and Wachtel (2011) argued that excessive financial deepening or too rapid growth of credit may have led to both inflation and weakened banking systems which in turn gave rise to growth inhibiting financial crises. Second, excessive financial deepening may be a result of widespread financial liberalizations in the late 1980s and early 1990s in countries that lacked the legal or regulatory infrastructure to exploit financial development successfully. Furthermore, there is a thin line between financial deepening that comes from the expansion of financial intermediary activity and financial deepening that is the consequence of a credit boom. In the first instance increased intermediation is likely to be growth
enhancing, while in the second instance credit standards deteriorate, nonperforming loans proliferate and a banking crisis ensues.

Also, the relationship between finance and growth has tended to focus on quantitative measures of financial development. This, most of the time does not explain whether it is the efficiency in the allocation of credit that matters to growth or just by mere quantity in expansion of credit. For example, Berger et al (2004) have noted that researchers have not come to consensus regarding exactly which dimension of the financial system matters most – the size of the financial system or its efficiency. While the majority of the studies point to the strong link between financial sector development and economic growth, it remains unclear whether the financial system improves economic growth primarily through higher levels of investment or primarily through improving the quality of investment. Most variables used in empirical studies have tended to emphasize the role played by the size of the financial system in promoting growth. The issue of how efficient the banking sector is in turning deposit to loans thereby providing quality investment has received little attention in the finance and growth literature. Luchetti et al 2001, pointed out that as far as the empirical evidence is concerned, the analyses carried out to date still seem far from capturing satisfactorily the function of banks in the allocation process. This is because; the indicators used to proxy financial development do not measure the efficiency of banks in the process of resources allocation. The only measure of financial development which seeks to capture allocative aspects is the share of financing granted to the private sector compared with the overall amount of financing supplied to the economy. This approach is based on the two premises that the private sector is more efficient than the public one, and that some sort of crowding-out effect operates among the financing granted to different operators.
Furthermore, Hasan et al (2008) in a cross country study covering the period of 1996-2005 found an independent and economically significant effect of higher mean cost efficiency for economic growth, suggesting that the interaction between better banking and deeper capital markets is indeed most beneficial. They also concluded that the quality effect is stronger in developed economies, while mere quantity expansion is also beneficial in developing economies.

On the African continent, Ndikumana (2001) categorized a handful of studies which have concluded on the existence of a positive relationship between financial development and economic growth. Among them, Odedokun (1996) and Spears (1992) find that aggregate measures of financial intermediation have positive and statistically significant effects on the growth rate of real per capita GDP. Allen and Ndikumana (2000) find similar results in the case of the Southern African Development Community. Also, Gelbard and Leite (1999) find results that suggest a positive and statistically significant link between real per capita GDP growth and their indices of financial development. They find that both the level of initial financial development and the change in the overall financial development index between 1987 and 1997 are positively and significantly related to economic growth. Their results confirm the findings from earlier studies that concluded that the initial level of financial development is an important determinant of future economic growth (King and Levine 1993a). Gelbard and Leite (1999) also find that the changes in the indexes of financial liberalization, the institutional environment, and the array of financial products enter the growth equation positively and significantly.
However, few empirical studies have focused on the qualitative aspect of finance and its impact on economic growth in the African continent. Kessy (2008) studied the banking sector efficiency and economic growth for three Eastern African countries-Kenya, Tanzania and Uganda-and using the fixed effect model found the bank efficiency variable to be positively related to economic growth.

5.3 Modeling Banking Efficiency and Economic Growth

5.3.1 The Empirical Model

The study’s empirical analysis of relating banking sector efficiency and economic growth is based on an equation relating GDP per capita using the bank efficiency scores as one of the independent variables. Following Islam (1995), Levine et al (2000) and Koetter et al (2010) the thesis uses dynamic panel generalized methods of moments (GMM) techniques to address potential endogeneity in the data. This econometric technique has been recently used in the growth literature as an alternative to cross-sectional estimators. The advantage of this GMM methodology is that it takes care of the econometric problems caused by unobserved country-specific effects and endogeneity of the independent variables in lagged-dependent-variable models such as economic growth regressions. The inclusion of both cross-country and time-series data introduces additional information about the over-time change in growth and its determinants, and, thus, helps to get more precise results, Mhadhbi (2014).

The study thus specify the reduced form of a growth model as a dynamic panel model stated as

\[
\ln Y_{it} = \phi \ln Y_{it-1} + \theta \ln F_{it} + \delta \ln Z_{it} + \epsilon_{it}, \ldots \ldots \ldots \ldots \ldots \ldots (5.6)
\]
where

\[ Y = \text{Aggregate output or real GDP}, \]

\[ F = \text{Measure of financial development}, \]

\[ Z = \text{Set of control variables}, \]

\[ \varepsilon = \text{Error term}, \]

The error term, \( \varepsilon_i = \mu_i + \lambda_t + \xi_i \), where \( \mu_i = \text{unobserved country-specific effect}, \lambda_t = \text{time specific effect} \) and \( \xi_i \sim iid(0, \sigma^2) \), independent of each other and among themselves.

Following Lucchetti (2001) and Kessy (2008) it is argued that the volume of credit may not influence economic growth if the credit is not allocated efficiently. Thus, the financial development variable \( F_i \) in eq. (5.6) can be thought of as constituting both the quantitative as well as the qualitative aspect of the banking sector. The quantitative aspect is mostly captured in literature as the volume of credit channeled to the economy by the private sector. The qualitative aspect would be captured by a measure of the banking sector efficiency.

That is, it is assumed

\[ F_i = (C_{it})^* (Eff_{it}) \] so that

\[ \ln F_i = \ln (C_{it})^* (Eff_{it}) \] and

\[ \ln F_i = \ln C_{it} + \ln Eff_{it} \]
Therefore, by substitution, equation (5.6) is modified as;

\[ \ln Y_{it} = \phi \ln Y_{it-1} + \beta \ln C_{it} + \omega \ln Eff_{it} + \delta \ln Z_{it} + \varepsilon_{it} \cdots \cdots \cdots \cdots (5.7) \]

where

Eff_{it} = a measure of efficiency of the banking sector and

\( C_{it} \) = private credit to GDP

Eq. (5.7) reveals two possible ways through which financial development can affect growth: it can increase \( C_{it} \) which is the volume of credit extended by banking system, or it may increase Eff_{it} which is the banking sector efficiency. If financial sector development affects growth of output by increasing the volume of credit in the economy, then \( \beta \) will be statistically different from zero. On the other hand if the impact is through the efficient allocation of financial resources then \( \omega \) will be statistically different from zero. If both the volume of credit and the efficiency allocation of such credit play autonomous and significant role in promoting economic growth, then both \( \beta \) and \( \omega \) will be statistically different from zero.

5.3.2 Estimation Procedure

In order to control for individual heterogeneity (unobserved country-specific effects); the study use a dynamic panel procedure with observations per country over the period 1999-2008. The panel procedure controls for the endogeneity of financial development. It also accounts for the bias induced by including the lagged real per capita GDP in the equation of growth. Firstly, a crucial assumption in growth models is that production functions are supposed to be
homogeneous across analyzed regions. It is most likely that such an assumption is overly heroic
due to unobserved country-specific effects (Koetter and Medow, 2006). While using alternative
samples of more homogeneous regions within one country partly alleviates the problem, Islam
(1995) suggests approaching the problem more directly. He advocates the use of panel estimators
to relax the restrictive assumption of homogeneous production functions across regions. This
approach avoids the bias of estimated coefficients when omitting unobservable country-specific
effects if these are correlated with the error. Furthermore, Levine (2004) notes that cross-
sectional estimation of mean growth rates neglects the information contained in the time
variation and forgoes additional degrees of freedom, which are available when exploiting
longitudinal data. Thus this thesis makes use of panel data and its associated estimation
techniques.

The advantages of using panel data are many and are discussed in Baltagi (1995) and Hsiao
(1986) and Lau and Yotopoulos (1989) among others. These include increased number of
observations, increased ranges of variation of variables in the model thereby allowing for more
precise estimates and reduced multicollinearity among explanatory variables. The use of panel
data also makes it possible to differentiate between economies of scale and technical change, as
well as the ability to study dynamic effects (which cannot be done using cross-sectional data
only). Another decisive advantage of a panel data approach relates to potential simultaneity
problems of financial development indicators and growth. The use of endogenous regressors
leads to estimations that suffer from inconsistency and bias, which requires the specification of
suited instrument variables.
As indicated earlier the strategy for the estimation of the empirical model uses the GMM estimators suggested for dynamics of adjustment developed by Arellano and Bond (1991). Consider the growth model below;

\[ \ln y_{it} = \alpha \ln(y_{i,t-1}) + \beta Z_{it} + \eta_i + \xi_t + \varepsilon_{it} \] .......................... (5.8)

where

\( y_{it} = \) per capita GDP of country \( i \) at year \( t \).

The explanatory variables are the initial per capita GDP, \( y_{i,t-1} \) and \( Z_{it} \), a set of growth determinants and

\( \eta_i = \) unobserved and constant individual specific effects that might affect economic growth

\( \xi_t = \) unobserved time-specific effects and

\( \varepsilon_{it} = \) stochastic error term

The log-linear functional form is usually chosen in order to reduce heteroscedasticity. Equation 5.8 poses some estimation challenges. The first is the presence of unobserved period and country-specific effects. These are usually dealt with by using period specific dummy variables to account for specific time effects. However, the common method of dealing with country specific effects (i.e., within group or difference estimators) are inappropriate, given the dynamic nature of the regression. Also, some explanatory variables are likely to be jointly endogenous with economic growth, hence the need to control for biases resulting from simultaneous or reverse causality. Thus recent growth studies have recommended the use of GMM estimators to solve these potential estimation problems.
The use of GMM estimators are based on differencing regressions or instruments to control for unobserved effects and on using previous observations of the explanatory variables and lagged-dependent variables as instruments (these are called internal instruments). To eliminate the country specific effects, the methodology takes the first differences of equation 5.8 as

\[ \ln y_{i,t} - \ln y_{i,t-\theta} = \lambda (\ln y_{i,t-\theta} - \ln y_{i,t-2\theta}) + \beta (Z_{i,t-\theta} - Z_{i,t-2\theta}) + (\varepsilon_u - \varepsilon_{i,t-\theta}) \]  

(5.9)

The new error term \( \varepsilon_u - \varepsilon_{i,t-\theta} \) is by construction correlated with the new lagged dependent variable, \( y_{i,t-\theta} - y_{i,t-2\theta} \). Thus the use of the within and the OLS estimations are biased to the estimate of the resulting equation.

Also, the use of instruments is required to deal with the likely endogeneity of the explanatory variables and the problem that by construction \( \varepsilon_u - \varepsilon_{i,t-\theta} \) is correlated with the lagged variable \( y_{i,t-\theta} - y_{i,t-2\theta} \). The instruments take advantage of the panel nature of the data set in that they consist of previous observations of the explanatory and lagged-dependent variables. The GMM method relies on past values as instruments and therefore only allows current and future values of the explanatory variables to be affected by the error term. Thus, while relaxing the common assumption of strict exogeneity, the instrumental variable does not allow the \( Z \) variable to be fully endogenous. Under the assumption that the error term \( \varepsilon \) is not serially correlated, (i.e. \( E[\varepsilon_{i,t} \varepsilon_{i,t-s}] = 0, \forall s \geq t \)) that the explanatory variables, \( Z \) are weakly exogenous (the explanatory variables are assumed to be uncorrelated with future realizations of the error term) or the conditions are predetermined by at least one period, \( (E[y_{i,t} \varepsilon_u] = 0, \text{ for } i = 1, \ldots, N \text{ and } t = 3, \ldots, T) \), the GMM dynamic estimator uses the following moments conditions:

\[ E[y_{i,t-s} (\varepsilon_u - \varepsilon_{i,t-\theta})] = \tilde{a}, \text{ for } s \geq 2, t = 3, \ldots, T \]
The GMM estimator based on the moments above is known as the difference estimator. Despite
its advantages with respect to simpler panel data estimators, Alonso-Borrego and Arellano
(1999) and Blundell and Bond (1998) show that when explanatory variables are persistence over
time, lagged levels of these variables are weak instruments for the regression equation in
differences. Instrument weakness influences the asymptotic and small-sample performance of the
difference estimator towards inefficient and biased coefficient estimates respectively. The GMM
dynamic panel model therefore offers particularly a consistent estimate for N sufficiently large
and T relatively small.

Two diagnostic tests are usually applied to the GMM dynamic estimator. Arellano proposed a
suitable test for the fundamental assumption of absence of second order correlation in the
difference. It consists of investigating the second order serial correlation of the residuals in the
first differences. The second test is the Sargan test of over-identifying restrictions. An over-
identification of the (high number of instruments) of the model is expected for \( T \geq 8 \). The test
for Sargan allows verifying the constraints of over-identification or the validity of the
instruments. The GMM is consistent only when the lagged values of the explanatory variables
are valid instruments.

**5.3.3 Dependent and Explanatory Variables**

The dependent variable used in the study is the per capita GDP. Three measures of financial
development were used as part of the explanatory variables. The first is the proxy of the
qualitative aspect of the financial sector, which we defined as the banking sector efficiency.
Koetter and Wedow (2006) enumerate three advantages of using the banking sector efficiency as a proxy of financial development over the traditional measure of volume of credit to GDP.

First, it is a much more direct measure of resources wasted during the intermediation process due to suboptimal allocation and use of input factors in the vein of Leibenstein (1966). It therefore resembles the \( \eta \) component of financial development mentioned in Pagano (1993) much closer compared to the intermediated credit volume employed traditionally.

Second, it is a long-run cost frontier, which covers operational costs inclusive of those costs arising from writing off non-performing loans. Deviations from optimal costs therefore capture the long-run ability of bankers to fulfill their intermediation task efficiently. They argued that this holistic assessment of bank performance captures the ability to gather information both ex ante and ex post more appropriately compared to a proxy of the volume intermediated. This is because systematic and sustained failure to optimize the production process in light of these core functions of successful bankers will result in higher than industry cost.

Finally, the relative ability to convert inputs into outputs is less prone to critique regarding reverse causality. While the use of instruments in a dynamic panel model alleviates the problem, bank efficiency scores enjoy the conceptual advantage that it is a relative measure and therefore independent of the credit volume of an individual bank. This is because the efficiency of a bank does not depend on how much output it produces but rather how well it does so. It therefore seems reasonable to assume that the sustained ability of individual banks to exploit its resources given the available technology as efficient as possible does not depend on whether the economy
is contracting or expanding. Intuitively, the performance of bankers to minimize costs when supplying financial services should foster growth independent of the question whether the intermediated volume is small or large.

The estimation procedure for the banking sector efficiency variable is discussed extensively in chapter three of this thesis. We expect this variable to be positively related to economic growth. The second financial development variable is the private credit to GDP. It is a measure of the extent to which the private sector relies on banks to finance consumption, working capital, and investment. Despite its advantages, the ratio of credit to the private sector to GDP also has imperfections. Its relationship to financial development may be affected by financial innovations, in particular by the emergence of nonbank credit, and by commercial bank lending to other financial intermediaries.

The third measure we used for financial development is the ratio of deposits (commercial banks plus savings banks) to GDP. As a measure of financial development it captures only the liability side of banks, ignoring differences in the composition of the banks’ assets. It looks at how successful the financial institutions are able to mobilize funds for long term projects by investors. Apart from only capturing the liability side of financial institutions, this measure cannot indicate if banks operate as a cartel, forming a closed shop to new industrial entrants. Despite this shortcoming, the measure has the virtue that it is available for a long time-series and for a large cross-section of countries (Rajan and Zingales, 2003). The two together measures the extent of financial intermediation in the banking sector and the study expects a positive relationship with economic growth.
The variable Z in the model captures the other control variables. The variables are carefully selected to reflect the broad factors identified in literature which affect economic growth. We next explain in detail these variables.

The first control variable is the share of domestic savings in GDP. Solow’s neoclassical growth model has shown how the saving rate could affect the growth rate of output for a temporary period of time (Solow, 1957). In Solow’s model even though an increase in saving rate has no effect on the steady state (long-run) growth rate of output per worker, it still positively affects the living standards permanently by increasing the steady state amount of stock of capital per worker which, in turn, allows an increase in output per worker in the long run. The only way to achieve a permanent increase in growth rate of output in this model is an increase in the exogenously given rate of progress of technology. Higher saving rate increases the growth rate of output per worker only at the transition stage as the economy moves from the old steady state to a new one, Begovic and Ciftcioglu (2010). Singh (2009) also studied the effect of domestic savings on economic growth using endogenous growth model and confirms a positive relationship between savings and economic growth.

Empirically, Begovic and Ciftcioglu (2010) studied the effect of domestic savings on economic growth for some selected countries in Central and Eastern Europe and Asia and concluded that domestic savings rate has exerted a statistically significant effect on growth rate of GDP. Other studies in Nigeria and South Africa have found a reverse causality effect between savings and economic growth. In this study, we posit a positive association between savings and economic growth.
The second control variable used is the population growth rate. Economic theory postulates that an increase in the population growth rate has a negative impact on the growth rate of the per capita income. For example, in the simple Harrod-Domar model which assumes a production function with fixed proportions of factors and constant marginal returns to each factor, a one percentage point increase in population growth reduces per capita economic growth by one percentage point.

Also, the standard neo-classical growth model developed by Solow distinguishes between so-called steady state and transitional effects. In the steady state, the higher population growth will reduce income per capita, but will have no impact on per capita income growth. As a result, in the steady state, the economy grows with the rate of population growth (plus technological progress), and per capita growth in the steady state is unrelated to population growth. But in the transition to the steady state, higher population growth has a negative impact on per capita economic growth. In a particular parameterisation of the model (using a Cobb-Douglas economy-wide production function) presented by Mankiw, Roemer, and Weil (1992), they find that an increase in the population growth rate of 10% (e.g. 3% to 3.3%) would reduce per capita income in the steady state by 5%. On the African continent Klasen and Lawson (2007) studied the effect of high population growth on the economic growth of Uganda and concluded that high population growth puts a considerable break on per capita growth prospects in Uganda. Hence, in this study we expect a negative association between population growth and economic growth.

Among the macroeconomic variables, inflation was selected. Theoretical models (Huybens and Smith, 1998, 1999) suggest that inflation may aggravate asymmetries of information in credit
markets, reducing the real rate of return and the volume of credit. Consistent with these theories, Boyd, Levine, and Smith (2001) find inflation to be negatively associated with measures of financial depth. Kablan (2010) also found inflation to destabilize financial development in a sample of SSA countries. Empirical evidence on the relationship between inflation and economic growth is mixed, but researchers such as Fischer (1993), Barro (1996) and Bruno and Easterly (1998) have found inflation to affect growth negatively. Barro (1996) also preferred price stability because he believed it to be good for economic growth. Thus we posit a negative relationship between inflation and economic growth.

Concerning market structure of the banking sector, one variable, namely the concentration of the banking system (measured by the ratio of assets of three largest banks as a share of assets of all commercial banks) could lead to high interest margins and high costs, and hence a lack of competitiveness (Kablan, 2010). We therefore expect this to have negative impact on growth.

The final group of variables is the governance variables. It’s been argued that for a sustained economic growth to occur, the governance and the political environment should be conducive. Political turmoil may bring macroeconomic instability and deterioration in business conditions. Civil strife and outright war can destroy capital and infrastructure. In addition, corruption may increase the cost of doing business and create uncertainty about property rights. We expect measures of control of corruption to have a positive impact on economic growth.

Data for all the variables were taken from the World Bank’s World Development Indicators (WDI) and World Governance Indicators (WGI) and are described in Appendix 3.
5.4 Empirical Results

In this section the main findings of the study are presented, beginning with the descriptive statistics in table 5.1.

5.4.1 Descriptive Results

Table 5.1 presents the descriptive results of the study.

Table 5.1: Descriptive Statistics of Some Selected Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Obs</th>
<th>Mean</th>
<th>Std Dev</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per Capita Income</td>
<td>3064</td>
<td>954.8</td>
<td>1170.32</td>
<td>107.03</td>
<td>4928.68</td>
</tr>
<tr>
<td>Private Credit</td>
<td>2945</td>
<td>0.2372</td>
<td>0.2921</td>
<td>0.0114</td>
<td>1.6242</td>
</tr>
<tr>
<td>Bank Deposit</td>
<td>2945</td>
<td>0.2594</td>
<td>0.1934</td>
<td>0.0296</td>
<td>0.9149</td>
</tr>
<tr>
<td>Savings</td>
<td>3070</td>
<td>0.1223</td>
<td>0.1568</td>
<td>-0.4081</td>
<td>0.715</td>
</tr>
<tr>
<td>Population</td>
<td>3070</td>
<td>0.0232</td>
<td>0.0077</td>
<td>0.0055</td>
<td>0.0945</td>
</tr>
<tr>
<td>Inflation (%)</td>
<td>3070</td>
<td>10.81</td>
<td>24.91</td>
<td>-9.62</td>
<td>325</td>
</tr>
<tr>
<td>Corruption</td>
<td>3070</td>
<td>-0.6304</td>
<td>0.5867</td>
<td>-1.5464</td>
<td>1.0708</td>
</tr>
<tr>
<td>Concentration</td>
<td>2845</td>
<td>0.7155</td>
<td>0.1947</td>
<td>0.387</td>
<td>1</td>
</tr>
</tbody>
</table>

_Source: Author's own Calculations_

(Per Capita Income=GDP/population is used as dependent variable, PrivGDP=private credit Costeff=Bank cost efficiency scores, Bankdeposit=Bank Deposit/GDP, Savings=Gross Savings/GDP, popn=annual growth rate of population, Concentration=Total asset of 3 top banks/Total asset of banking sector, infl=Changes in annual CPI, corr= control of corruption index, ranging from -2.5 to 2.5 with higher values indicating favourable outcome)

From the table per capita income for the selected countries over the 1999-2008 period averaged $954.8 reflecting the low income status of most of the countries included in the sample. This compares to $4,324.63 and $4,332.21 for East Asia and Pacific and Latin and Caribbean countries. The two indicators of financial sector intermediation, Private Credit to GDP and Banking Deposit to GDP scores low compared to elsewhere. For example, over the sample period Private Credit to GDP measures 23.72% compared to 41.40% in Eastern Asian countries and 34.84% in Latin American Countries. Bank Deposits to GDP registered 25.94% for the selected countries over the period. In Eastern Asian countries the ratio is 58.35% and 45.94% in Latin American countries. The scores reflect the generally low levels of financial development in
Sub Saharan Africa. Savings play crucial role for investment which in turn act as a catalyst for growth. Over the sample period, gross domestic savings for the selected countries averaged 12.23% compared to 28.97% for Eastern Asian countries and 21.14% for Latin American countries. Annual population growth over the sample period was 2.32% which compares to 1.27% for Latin American countries and 0.80% for Eastern Asian countries. Thus, generally Sub-Saharan African Countries lag behind in terms of key indicators for an accelerated growth.

5.4.2 Results of the Effects of Bank Efficiency on Economic Growth

In this section the regression results from the study are presented in table 5.2. The correlation matrix of the variables is shown at Appendix 4(b) of this thesis. The table shows that the independent variables included in the estimated models were generally independent of each other and therefore do not pose the risk of mult-collinearity. Three versions of equation 5.7 were run. The first contains the banking sector efficiency estimated by the process described in the chapter 3 of this thesis as an independent variable. The second contains the traditional measure of financial development, namely ratio of private credit to GDP and the third used bank deposit to GDP as independent variables.
<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costeff</td>
<td>0.0212**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.010)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PrivGDP</td>
<td>-0.0143</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.857)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank Deposit</td>
<td>-0.0277</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.604)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Savings</td>
<td>0.1670***</td>
<td>0.1638***</td>
<td>0.1678***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.006)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>Population</td>
<td>-2.1559***</td>
<td>-1.5080</td>
<td>-1.5523</td>
</tr>
<tr>
<td></td>
<td>(0.032)</td>
<td>(0.445)</td>
<td>(0.316)</td>
</tr>
<tr>
<td>Inflation</td>
<td>0.0233</td>
<td>0.0672</td>
<td>0.0443</td>
</tr>
<tr>
<td></td>
<td>(0.674)</td>
<td>(0.469)</td>
<td>(0.594)</td>
</tr>
<tr>
<td>concentration</td>
<td>-0.0673***</td>
<td>-0.0721***</td>
<td>-0.0669***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.003)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>corr</td>
<td>0.0473</td>
<td>0.0267</td>
<td>0.02868</td>
</tr>
<tr>
<td></td>
<td>(0.015)**</td>
<td>(0.599)</td>
<td>(0.421)</td>
</tr>
<tr>
<td>constant</td>
<td>0.0336***</td>
<td>0.0230</td>
<td>0.0244***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.259)</td>
<td>(0.071)</td>
</tr>
<tr>
<td>Wald</td>
<td>233.55***</td>
<td>108.44***</td>
<td>141.05***</td>
</tr>
<tr>
<td>Chi 2(13)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Sargan</td>
<td>2.22</td>
<td>1.04</td>
<td>1.04</td>
</tr>
<tr>
<td></td>
<td>(0.5271)</td>
<td>(0.5933)</td>
<td>(0.7925)</td>
</tr>
<tr>
<td>AR (1)</td>
<td>3.88</td>
<td>0.90</td>
<td>1.38</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.3667)</td>
<td>(0.1679)</td>
</tr>
<tr>
<td>AR (2)</td>
<td>0.52</td>
<td>-0.22</td>
<td>-0.17</td>
</tr>
<tr>
<td></td>
<td>(0.6018)</td>
<td>(0.8285)</td>
<td>(0.8687)</td>
</tr>
</tbody>
</table>

*, **, *** shows significance at 10%, 5% and 1%

(Per Capita Income=GDP/population is used as dependent variable, PrivGDP=private credit Costeff=Bank cost efficiency scores, Bankdeposit=Bank Deposit/GDP, Savings=Gross Savings/GDP, popn=annual growth rate of population, Concentration=Total asset of 3 top banks/Total asset of banking sector, infl=Changes in annual CPI, corr=control of corruption index, ranging from -2.5 to 2.5 with higher values indicating favourable outcome)
Two diagnostic tests are usually computed using the Arellano and Bond GMM procedure to test for the validity of the instruments and for the presence of first and second order serial correlation in the disturbances. The Sargan test is usually used to test whether there is an overidentifying restriction in the model and the Arellano-Bond test for the presence of serial correlation. From the results, the instruments are valid as shown by the Sargan test. Regarding the serial correlation tests, both need to be rejected to conclude that serial correlation is present. In table 5.2, no serial correlation is found in any of the models. Thus there is no inconsistency implied in the model since it will be present if AR (2) in particular were to be rejected (see Arellano and Bond, 1991). The study therefore proceeds with the discussion of the results.

The cost efficiency variable, \textit{costeff} indicates the cost efficiency scores generated earlier. It enters the regression equation positive and significant in line with our expectation. An efficient banking sector identifies efficient production units and allocates the financial resources which tend to spur economic growth. This is done irrespective of whether the resource allocation is small or large as the players of the financial sector allocate the resource to the most productive units. This finding is in line with that of Koetter et al (2010, 2006), Hasan et al (2009), Kessy (2008) and Lucchetti (2001). The empirical results support the hypothesis that the banking system is associated with variations in income through the efficiency channel. It also confirms the importance of the influence exerted by financial variables operating not only through capital accumulation, but quality allocation of the resources. Thus, quality intermediation of the banking sector in the African countries is important in boosting the growth agenda of the continent. The finding also confirms that of Graff and Karmann (2006) that, bank efficiency is one of the channels by which real growth is affected and leans more towards the Schumpeterian hypothesis.
Turning to the traditional measures of financial development, the study did not find a significant relationship between these variables and economic growth. This finding though not in accordance with our expectations of a positive and significant relationship, is in line with the work of Rosseau and Wachtel (2011) and Rioja and Valev (2004). The latter authors had argued that in countries where financial development is very low the impact of financial development on economic growth is uncertain. In their study of impact of financial development on economic growth, they found that financial development exerts positive influence on economic growth only in the ‘middle’ countries. The positive effect becomes smaller when one enters into highly developed financial markets and uncertain in low income countries. Also, Rosseau and Wachtel (2011) have found that the positive effect of financial development on economic growth is not strong as the original data in 1960-1989 due to the incidence of financial crises which is related to the dampening effect of financial deepening on growth. Therefore, quality financial intermediation appears to be the main channel through which the banking sector spurs growth in Africa. Hence, policies embarked upon by central banks and government aimed at improving the efficiency of the intermediation process should be strongly encouraged.

The next significant variable in all the three models is domestic savings. In all the three estimations savings affect economic growth positively. Increase in savings makes it possible for banks to have a larger amount of funds to distribute to deficit units in the economy. Also, government’s incentives for long term savings in the economy provide a source of funds for the government to embark on infrastructural development and hence economic growth. Thus policies such as tax exemptions on long term savings and deposit insurance in the banking system should be encouraged to boost domestic savings.
Population growth rate enters all the three equations negatively and significant in the first model line with expectations. The finding means that rapid population growth acts as a constraint on economic growth of the economy. Population growth exerts a burden on the economy in terms of health, education and other social interventions at the expense of other productive infrastructures to spur economic growth. Hence, quality population growth should be preferred to mere increases in the population while population control measures should be encouraged.

The concentration variable is found to be negatively related to economic growth. Kablan (2010) noted that highly concentrated banking markets could lead to high interest margins and inefficient allocation of scarce resources. Therefore, healthy competition in the banking sector should be encouraged. A competitive banking sector will channel funds efficiently and also at a reasonable cost due to competition.

The governance variable had the expected sign in all the models and significant in the first model. As has been pointed out earlier, corruption brings distortions in the allocation of resources efficiently. Productive resources are directed to the wrong channels thereby denying the economy the full use of its resources.
5.5 Chapter Summary

In this chapter, the thesis sought to analyze the relation between banking sector efficiency and economic growth. Using data for 33 African countries, we distinguish between two channels of financial development; the traditional volume effect and a quality effect proxied as banking sector efficiency scores. The quality effect was estimated using the Fourier flexible approach to banking sector efficiency studies. Our main results are as follows.

Firstly, our evidence supports the notion that the quality of the financial intermediation measured as banking sector cost efficiency scores significantly affects economic growth. The study concluded that bank cost efficiency is positively related to economic growth indicating that quality intermediation is vital to growth.

Secondly, the study did not find a statistically significant effect of the traditional volume measures of banking sector development and economic growth. Also, the share of domestic savings to GDP was found to be positive and statistically significant reflecting the crucial role private savings play in economic growth. Countries with higher levels domestic savings provide a cheap source of funds to private as well as public participants for productive ventures thereby spurring growth.

Furthermore, concentration of the banking sector was found to be negatively related to economic growth. A concentrated banking sector stands the risk of engaging in uncompetitive banking behavior such as higher interest margins thereby increasing the cost of borrowing and stifles the private sector of the needed resources for growth.
Lastly, annual rate of population growth was found to be significant and negatively related to economic growth. Higher annual growth rate serve as a burden on the economy by channeling funds to providing social amenities to the neglect of developing the infrastructural needs of an economy.

Based on these findings it is recommended that policy makers pursue policies that will enhance the intermediation role of the banking sector so as to boost growth. The market in which banks operate should also be of concern to Central Bankers. Policies that will ensure that banks do not operate in an excessive concentrated market should be introduced to the market and monitored from time to time. Incentives that boost domestic savings such as tax incentives and deposit insurance should also be encouraged.
CHAPTER SIX
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction
This segment of the thesis provides the summary of the findings particularly from the empirical papers, conclusions and policy recommendations. The section also outlines areas for further research. Section 6.2 provides the summary of the findings; section 6.3 and 6.4 focus on conclusions and contributions of the current study respectively, section 6.5 provides policy recommendations while section 6.6 provides avenues for further studies.

6.2 Summary of Findings
This thesis is a collection of empirical work on the link between banking sector efficiency and financial development. Chapter two provided an overview of the financial development on the continent. The review shows that standard indicators of banking system development point to the fact that Africa’s banking systems are small in absolute and relative size. Many African banking systems would be mid-sized banks in high-income countries. The average African bank has total assets of US$220 million, while the total balance sheet size of a non-African bank is, on average, almost US$1 billion.

The two most commonly used measure of banking depth; ratio of Private Credit to GDP and ratio of Liquid Liabilities to GDP show that Liabilities to GDP averages 29 per cent in sub-Saharan Africa compared to 61 per cent in East Asia and Pacific and 97 per cent in high-income countries over the period 1990-2011. Similarly, Private Credit to GDP averages 17 per cent in...
sub-Saharan Africa, compared to 44 per cent in East Asia and Pacific and 102 per cent in high-income countries over the same period. The loan-deposit ratio ultimately captures one of the core tasks of financial intermediaries, that is, putting society’s savings to its best use: private sector development. In sub-Saharan Africa the banking sector intermediate on average 69% of deposits, while banks in East Asia and Pacific intermediates 108 percent and 126 percent for banks in high income countries. Countries in Africa showing lower levels of deposits intermediate an even lower share of these scarce deposit resources into private sector loans. There is also a wide variation in the banking depth across the continent, for example while in the Republic of Congo the ratio of liquid liabilities to GDP is 33 percent and the loan-deposit ratio is 17 percent, the corresponding ratios in Tunisia are 62 and 107 percent, respectively.

Africa’s banking systems are characterized not only by low levels of intermediation but also by high interest rates, intermediation spreads, and bank profitability. High lending interest rates, whether caused by inefficiency or lack of competition, do more than add to borrower’s costs. One source of high lending rates is high wholesale interest rates, which reflect currency and other macroeconomic uncertainties, as well as the demand by government for domestic loanable funds. The degree of efficiency and competition in the banking system is another factor explaining variation in lending rates. On average, the net interest margin in African banks between 1999-2011 was 655 basis points, compared with 448 basis points for the rest of the world.

Consistent with their small size, Africa’s banking systems are mostly concentrated, and few banks share the small universe of clients. Herfindahl index, which is the sum of the squares of
market shares; higher numbers thus indicate a more concentrated banking system. Of the countries with a Herfindahl index above 2,000, 50 percent are in Africa, while only a fifth of the countries with a Herfindahl index below 2,000 are in Africa. The high concentration of African banking systems is also captured by cruder measures such as CR3 concentration measures, that is, the market share of the largest three banks, which, on average, stands at 68 percent. African banking systems lack not only depth, but also breadth. While Benin has less than one branch per 100,000 people, Bolivia has almost seven. While Egypt has four branches per 100,000 adults, Malaysia has 11. African banking is mostly short term, as evidenced by the maturity structure on the asset and liability sides of bank balance sheets. More than 80 percent of deposits are sight deposits or are deposits with a maturity of less than one year; less than 2 percent of deposits have a maturity of more than 10 years. Africa’s banking systems are small, concentrated, and mostly foreign owned. This last has not always been a characteristic. Rather, the ownership structure has undergone significant changes over the past 50 years since independence.

With this background of the banking sector in mind, the thesis proceeded to the first empirical chapter. The first empirical chapter estimated the degree of the banking sector efficiency. Banking sector efficiency studies have adopted various methods in estimating efficiency across banks which include the parametric and non-parametric methods. However, in recent times it has been found that the parametric SFA method which states the bank profits or cost as a Fourier flexible functional form envelopes the data better. To date however, studies’ using this method is limited to the advanced countries. Thus it is this gap that the thesis seeks to bridge. The thesis thus estimated the banking sector efficiency using the SFA approach and stating the bank cost
function in the Fourier functional form. Cost efficiency is the main efficiency variable estimated in this empirical chapter.

Using the maximum likelihood approach, the study found an existence of an inefficiency term to be significant. Hence, the study proceeded to calculate the cost efficiency scores by individual banks in each country and in each year. After this, the overall efficiency score for the period was calculated by averaging all the efficiency scores giving us the average efficiency score over the entire period of 76%. The efficiency estimate means that banks can typically save about 24% of total cost if they were operating efficiently. This compares with the findings of Chen (2009) who found that on average SSA middle income countries can typically save between 20-30% of their cost if they were to operate efficiently. Besides this, the study noted that cross-country variations in the efficiency scores for the sample space were not very wide. The lowest efficiency score for was 0.613 and the highest score was 0.876.

The second empirical chapter investigates the link between banking sector efficiency and financial development. The allocation role of financial institutions was first recognized by Schumpeter (1912), who conjectured that bankers help to identify entrepreneurs with good growth prospects, and therefore help to reallocate resources to their most productive uses (Yu and Gan, 2010). Having established the important role of financial development in economic growth, the frontier of the literature in this field is shifting towards providing answers to the question of why some countries are more financially developed than others.
Empirical evidence on the effect of banking sector efficiency and financial development is scanty. Kablan (2010) was among the first to investigate the relationship between financial development and bank efficiency. Using the generalized methods of moments systems the study assessed the factors affecting the financial development for some 27 SSA countries. The result shows a negative relationship between bank cost efficiency and financial development even though this was not statistically significant. However, it is generally agreed that financial markets variables are endogenous. To deal with the potential issue of endogeneity, the thesis made use of the Baltagi EC Two Stage Least Squares (2SLS) estimator with the Baltagi-Chang estimation of the variance components. This approach is adopted because the study hypothesized a bi-causal relationship between financial development and banking sector efficiency. The instrumental variable (IV) approach also helps to deal with potential measurement errors and omitted variable bias. The IV approach further helps to consistently estimate the coefficients of the potentially endogenous variables whether caused by measurement error, omitted variables or simultaneous causality bias.

The study concluded that causality runs positively in both directions between bank cost efficiency and financial development. This means that as banks become more cost efficient, financial sector develops further and credit allocation get more distributed in the real economy. Similarly, it is important that policy makers know that financial sector policies that deepen the financial system also results in cost efficiency in the banking sector by challenging the banking sector to be innovative and efficient in their bit to increase shareholder value.

Turning to the other determinants of financial development, the legal variable rule of law was found to be positive and significant in all the regressions. This means countries with strong rule
of law should have an improved level of financial development as confirmed by the regression results. These findings are in line with that of Laporta et al (1997) and confirm the theory of law and finance.

The settler mortality variable is negative and significant in all the regressions in line with expectations. Thus, the level of financial development in many of the sampled countries seems to have been affected by factors in the past. In countries where the settler mortality was high, the colonial masters could not settle and therefore only extractive industries were established as against institutions that will promote financial development. We thus find support for the endowment theory of financial development in the study.

With regards to capital account openness, the study finds a positive and significant relationship with financial development in all the regressions. This finding is in line with Baltagi et al (2008) and Rajan and Zingales (2003). The finding shows the opening up on a country’s capital markets could lead to improved levels of financial development.

Concerning the macroeconomic variable, inflation has the expected sign in all the models. It enters all the regression models negative and significant. This confirms the findings of Kablan (2010) and Detragiache et al (2005) and suggests that macroeconomic stability is essential for financial development. The finding of the study is also in line with the findings of Huybens and Smith (1998, 1999) who finds that inflation may aggravate asymmetries of information in credit markets, reducing the real rate of return and the volume of credit. Also, inflation reduces the real returns depositors receive on their deposit and thus discourage savings which eventually tighten credit to the private sector because of lower deposit base. Besides this, inflation also slows the intermediation function of financial banks. High inflation means higher interest rates on loans
with its attendance increases in non-performing loans which eventually reduces the desire of banks to expand credit to the private sector. The finding also echoes that of Boyd et al (2001) who find a negative association between inflation and banking sector development.

With regards to geographical variables, the percentage of the population in the rural areas is negative in both regressions. This suggest that in areas where there is a large percent of population in the rural areas, the cost of reaching out to these population is high and therefore does not favour a higher level of financial development. It is also a fact that because many of the countries are not developed, basic infrastructural amenities may not be available thereby preventing financial institutions from establishing there. Thus geographical barriers could be a hindrance to the expansion of financial development. The finding supports the observation made by World Bank (2006), to the effect that sparse population resulting in isolation and great distances (at least in terms of travel time) lead to lack of scale in the financial services sector. Since most financial services involve fixed costs and increasing returns to scale (at least up to a certain point) the problem of scale translates into a problem of high unit costs and even unaffordability of certain services.

Concentration as measured by the ratio of three top banks in the country divided by the total banking sector enters all the models as positive and significant. This finding deviates from that of Kablan (2010) and suggest a concentrated banking sector is better for the financial sector as a whole.

Among the variables which affect the banking sector efficiency, government spending stands out. Government spending enters all the regression equations as negative and significant. This
means increase in government expenditure in the financial sector destabilizes the banking sector as it has the potential of crowding out credit to the private sector and increase interest rates.

Furthermore, the found evidence suggests that opening up of the country to trade affects positively the efficiency in the banking sector. This is because; the banking sector gets the opportunity to increase its portfolio lines by funding other international businesses. By so doing, they are able to leverage on income from these activities and reduce cost of banking in the local market. However, the same cannot be said of the capital account openness. It appears the proxy for the financial liberalization affects banking sector negatively. This is in line with studies that have found negative association of the share of foreign ownership in the banking sector to bank efficiency.

The third empirical chapter investigates the links between banking sector efficiency and economic growth. Over the past 3 decades there has been an enormous research to establish this finance-growth nexus. As pointed out by Lucchetti et al (2001), the main weakness in this strand of literature is the variables used to measure the banking system’s state of development. He contended that these variables are of two types. The first refers to the presence and diffusion of the banking system where the most commonly used indicators are the ratio between liquid liabilities of the banking system and GDP. The second group of variables measures the amount of financing intermediated by banks. Among these variables are the ratio between domestic credit and GDP (Rajan and Zingales, 1998), the share of credit granted to the private sector, or the credit granted to the private sector in ratio to GDP.
These measures give rise to interpretative problems, and they are only partially able to capture the role performed by banks in economic development. Firstly, there is the problem of causality. The growth of the banking system and the amount of credit disbursed are closely influenced by the level of economic development. The wide presence of banks and the importance of bank lending in areas which grow more rapidly than others may be indicative of a reverse causal relation between finance and economic growth. As well as being unable to shed adequate light on the causal relation between the development of the banking system and economic growth, these two types of measures have the further shortcoming that they essentially concentrate on the role of banks in stimulating capital accumulation. Yet, as the recent economic literature has shown, the specific role performed by banks in the economic system is not to intermediate savings, but rather to certify the quality of borrowers, monetizing liabilities which otherwise would fail to find purchasers in the markets (See Minsky 1986, Fama, 1985; Stiglitz and Weiss, 1988). This thinking suggests the need for a more qualitative measure for the state of the banking sector development. The existing literature has however focused on the impact of the increased volume of financial services on economic growth.

The importance of the quality of the financial services has not received much attention in literature. Lucchetti et al (2001), Koetter et al (2006) and Kessy (2008) are among the few studies that have used a measure of the quality of the banking sector to explore further the link between finance and growth. Of these three studies the latter was done for Eastern Africa countries. This study differs from these three studies in that none of them used the fourier flexible approach in estimating the banking sector efficiency. Also, the current study focuses solely on the African countries with much larger sample size than the one done by Kessy (2008).
Using the Arellano and Bond GMM estimator, the study found the cost efficiency variable, to be positive and significant in line with expectations. An efficient banking sector identifies efficient production units and allocates the financial resources which in turn spur economic growth. This is done irrespective of whether the resource allocation is small or large as the players of the financial sector allocate the resource to the most productive units. This finding is in line with that of Koetter et al (2010, 2006), Hasan et al (2009), Kessy (2008) and Lucchetti (2001). The empirical results support the hypothesis that the banking system is associated with variations in income through various channels. It also confirms the importance of the influence exerted by financial variables operating not only through capital accumulation, but quality allocation of the resources. Thus quality intermediation of the banking sector in the African countries is important in boosting the growth agenda of the continent.

Turning to the traditional measures of financial development, even though, the coefficients of the two variables private credit to GDP and bank deposit to GDP are positive, they are not statistically significant. This finding though not in accordance with our expectation is in line with the work of Rosseau and Wactel (2011) and Rioja and Valev (2004). The latter authors had argued that in countries where financial development is very low the impact of financial development on economic growth is uncertain. Also, Rosseau and Wactel (2011) have found that the positive effect of financial development on economic growth is not strong as the original data in 1960-1989 due to the incidence of financial crises which is related to the dampening effect of financial deepening on growth. Therefore, quality financial intermediation appears to be the main channel through which the banking sector spurs growth during the sample period. Hence,
policies embarked upon by central banks and government aimed at improving the efficiency of
the intermediation process should be strongly encouraged. Turning to the traditional measures of
financial development, the study did not find a significant relationship between these variables
and economic growth. This finding though not in accordance with our expectations of a positive
and significant relationship, is in line with the work of Rosseau and Wactel (2011) and Rioja and
Valev (2004). The latter authors had argued that in countries where financial development is
very low the impact of financial development on economic growth is uncertain. In their study of
impact of financial development on economic growth, they found that financial development
exerts positive influence on economic growth only in the ‘middle’ countries. The positive effect
becomes smaller when one enters into highly developed financial markets and uncertain in low
income countries. Also, Rosseau and Wactel (2011) have found that the positive effect of
financial development on economic growth is not strong as the original data in 1960-1989 due to
the incidence of financial crises which is related to the dampening effect of financial deepening
on growth. Therefore, quality financial intermediation appears to be the main channel through
which the banking sector spurs growth in Africa. Hence, policies embarked upon by central
banks and government aimed at improving the efficiency of the intermediation process should be
strongly encouraged.

The next significant variable in all the three models is domestic savings. In all the three
estimations savings affect economic growth positively. Increase in savings makes it possible for
banks to have a larger amount of funds to distribute to deficit units in the economy. Also,
government’s incentives for long term savings in the economy provide a source of funds for the
government to embark on infrastructural development and hence economic growth. Thus policies
such as tax exemptions on long term savings and deposit insurance in the banking system should be encouraged to boost domestic savings.

Population growth rate enters all the three equations negatively and significant in the first model line with expectations. The finding means that rapid population growth acts as a constraint on economic growth of the economy. Population growth exerts a burden on the economy in terms of health, education and other social interventions at the expense of other productive infrastructures to spur economic growth. Hence, quality population growth should be preferred to mere increases in the population while population control measures should be encouraged.

The concentration variable is found to be negatively related to economic growth. Kablan (2010) noted that highly concentrated banking markets could lead to high interest margins and inefficient allocation of scarce resources. Therefore, healthy competition in the banking sector should be encouraged. A competitive banking sector will channel funds efficiently and also at a reasonable cost due to competition.

The governance variable had the expected sign in all the models and significant in the first model. As has been pointed out earlier, corruption brings distortions in the allocation of resources efficiently. Productive resources are directed to the wrong channels thereby denying the economy the full use of its resources.
6.3 Conclusions

This study is a collection of empirical studies on the banking sector efficiency and financial development. The specific objectives which form the basis of the empirical chapters are to estimate the degree of banking sector efficiency in Africa, examine the relationship between bank efficiency and financial development, analyze the determinants of banking sector efficiency and financial development on the continent and to reexamine the finance growth nexus from the perspective of banking sector efficiency. The thesis concluded that African banking sector is 76% cost efficient. This means that about a quarter of the cost of the banks in the sample are due to inefficiency.

The study also found a bi-causal relationship between banking sector efficiency and financial development. This means that as banks become more cost efficient, financial sector develops further and credit allocation get more distributed in the real economy. Similarly, it is important that policy makers know that financial sector policies that deepen the financial system also results in cost efficiency in the banking sector by challenging the banking sector to be innovative and efficient in their bit to increase shareholder value.

Among the other control variables, inflation was found to destabilize the financial development. On the other hand, excessive government intervention in the financial sector appears to destabilize banking sector efficiency.

Furthermore, a good legal environment for the financial sector improves financial development. Markets where rule of law prevail leads to higher levels of financial development and explains the cross-country differences in the financial sector. Other historical variables that have impacted
the cross-country variations in financial development are settler mortality and percentage of rural population. These have negatively affected the development of the financial sector.

Moreover, our evidence supports the notion that the quality of the financial intermediation measured as banking sector cost efficiency scores significantly affects economic growth. The thesis concluded that bank cost efficiency is positively related to economic growth indicating that quality intermediation is vital to growth.

Contrary to established literature, the study did not find a statistically significant effect of the traditional volume measures of banking sector development and economic growth. Variables such as the share of domestic savings to GDP, concentration of the banking sector and annual population growth rate were found to affect economic growth. Domestic savings was found to be positive and statistically significant reflecting the crucial role private savings play in economic growth. Concentration of the banking sector was found to be negatively related to economic growth. A concentrated banking sector stands the risk of engaging in uncompetitive banking behavior such as higher interest margins thereby increasing the cost of borrowing and stifles the private sector of the needed resources for growth. Lastly, annual rate of population growth was found to be significant and negatively related to economic growth. Higher annual growth rate serve as a burden on the economy by channeling funds to providing social amenities to the neglect of developing the infrastructural needs of an economy.
6.4 Contributions of the Study

This thesis has made important contributions to the banking sector efficiency literature on estimation procedures. By applying the Fourier flexible approach exclusively to 307 banks in 33 African countries, the study makes an immense contribution to banking sector efficiency debate. The Fourier flexible approach has been found to be superior to the other stochastic frontier approach to estimating the degree of the banking sector efficiency, its usage has however been limited to the advanced countries. The thesis is among the first to apply the method in estimating banking sector efficiency on the African continent. It thus contributes to the methodological approach in estimating efficiency in Africa.

Secondly, the thesis also provides an empirical evidence of the linkage between banking sector efficiency and financial development. It reveals that developing the financial sector can begin with enhancing the efficiency of the banking sector. Likewise, banking sector efficiency can be achieved through an expanding financial sector. This is an important finding as it helps policy makers to focus on one or the other depending on the particular monetary policy direction of the Central bank. For example, in a situation where credit expansion is leading to inflationary pressures in the economy the Central Bank can emphasize on the efficient allocation of credit by restricting credit to certain sectors considered unproductive and vice versa. This contribution is one of the first on financial development and banking efficiency literature in Africa.

The thesis further identifies banking sector efficiency as one of the determinants of financial development and financial development also as one of the determinants of banking sector efficiency.
Also, the evidence provided by the study show that the size of the banking sector does not matter so much to economic growth of the economy. It is the efficient allocation of the financial resources in the economy that matters to economic growth. Thus, this study contributes to the finance-growth debate by establishing that finance affects the growth of the economy through the banking sector efficiency channel. It thus confirms the Schumpeterian hypotheses that efficient allocation of financial resources leads to economic growth.

Furthermore, the study makes another contribution by identifying that the market in which the banking sector operates is crucial to economic growth. The study established that banking sector concentration negatively affects economic growth. Banks that become large relative to their industry tend to engage in uncompetitive behavior which in turn slows down growth.

### 6.5 Policy Recommendations

The findings from the study have several implications for policy makers. Firstly, in the light of the findings above, it is recommended that policy makers approach financial development from the banking sector efficiency channel. This will position banks to offer innovative services and thereby deepened the financial sector as the level of financial development increase. Approaching financial development from this angle also has the added advantage of influencing economic growth positively.

Also, governments should do well to enact or strengthen existing laws that give confidence to investors in the financial markets. This will go a long way to improve the level of financial development as market participants becomes confident. If financial sector participants know that
everyone will play by the rules should one default on its obligations, it will improve confidence and also reduce cost in the financial sector.

It is also recommended that policy makers should pursue policies that will enhance the intermediation role of the banking sector so as to boost growth. The market in which banks operate should also be of concern to Central Bankers. Issue of new licenses for new entrants to the banking sector should be encouraged. This will prevent existing banks from becoming too large and encourage competition.

The structure of the population (that is the percentage of total population in the rural areas) was found to be negatively associated with financial development. Hence policies aimed at expanding the national economy to the rural areas so that financial services can be extended there must be upheld. Also, population growth rate should be controlled as excessive growth rate at the expense of economic growth becomes a burden on the economy.

Countries with higher levels of domestic savings provide a cheap source of funds to private as well as public participants for productive ventures thereby spurring growth. It is recommended that policy makers should provide incentives for private savers in the economy by way of deposit insurance and tax incentives on interest earned so that people are encouraged to save more.

Lastly, macroeconomic stability is essential to expand financial development and to enhance banking sector efficiency. It is therefore recommended that governments should do well to maintain stability in the economy by adopting policies that reduce inflation as it destabilizes the financial sector.
6.6 Avenues for Future Research

The thesis analyzed financial development and economic growth by examining banking sector efficiency and indicators of banking development. It is therefore recommended that a further research investigating the link between banking sector efficiency and stock market development should be undertaken. This will help determine whether banking sector complements or substitutes stock market development.

Also, we need to establish whether there is a difference in estimating banking sector efficiency scores using the various empirical methods mentioned in literature. Further, whether there is a significant statistical difference in the efficiency scores of banks in the various regions of Africa and what factors explained such differences.

Finally, it is recommended for future research in Africa to investigate whether there has been any efficiency improvement in the banking sector after the various financial reforms embarked upon in the early late 1980s and the early 1990s.
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Appendix 1: Number of banks per country included in the study

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<th>COUNTRY</th>
<th>NUMBER OF BANKS</th>
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</tr>
<tr>
<td>BOTSWANA</td>
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</tr>
<tr>
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</tr>
<tr>
<td>BURUNDI</td>
<td>4</td>
</tr>
<tr>
<td>CAMEROON</td>
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</tr>
<tr>
<td>CAPE VERDE</td>
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</tr>
<tr>
<td>CHAD</td>
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<tr>
<td>CONGO</td>
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<td><strong>TOTAL</strong></td>
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### Appendix 2: Efficiency Estimations Assuming Different Distributions of the Cost Function

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### Appendix 3: Description and Sources of Variables Used

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<thead>
<tr>
<th>Variables</th>
<th>Description</th>
<th>Source</th>
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<tr>
<td>Private Credit</td>
<td>Private credit is defined as financial resources provided to the private sector such as loans, purchases of non-equity securities trade credits and other accounts receivable that establish a claim for payment. The values are scaled down by the GDP of the country. Source: Beck et al (2009)</td>
<td></td>
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<tr>
<td>M2</td>
<td>Represent money and quasi money. It comprises the sum of currency outside banks, demand deposits other than those of the central government, time, savings and foreign currency deposits of resident sectors other than the central government. The values are scaled down by the GDP of the country. Source: Africa Development Indices, World Bank</td>
<td></td>
</tr>
<tr>
<td>Efficiency Scores</td>
<td>Efficiency Scores obtained via the bank cost function of equation estimated using Stata 11 Source: Author’s calculation</td>
<td></td>
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<tr>
<td>Creditor Rights Index</td>
<td>An index aggregating creditor rights, following La Porta and others (1998). A score of one is assigned when each of the following rights of secured lenders are defined in laws and regulations: First, there are restrictions, such as creditor consent or minimum dividends, for a debtor to file for reorganization. Second, secured creditors are able to seize their collateral after the reorganization petition is approved, i.e. there is &quot;automatic stay&quot; or &quot;asset freeze.&quot; Third, secured creditors are paid first out of the proceeds of liquidating bankrupt firm, as opposed to other creditors such as government or workers. Finally, if management does not retain administration of its property pending the resolution of the reorganization. The index ranges from 0 (weak creditor rights) to 4 (strong creditor rights) and is constructed as at January for every year from 1978 to 2003, the 2003 indices are assumed through to 2008. Source: Djankovic et al (2007).</td>
<td></td>
</tr>
<tr>
<td>Contract Enforcement</td>
<td>The number of days to resolve a payment dispute through the courts. Source: Africa Development Index, World Bank</td>
<td></td>
</tr>
<tr>
<td>Rule of law</td>
<td>The variable measures perceptions of the extent to which agents have confidence in and abide by the rules society and in particular the quality of contract enforcement, property rights, the police and the courts as well as the likelihood of crime and violence. The index ranges from -2.5 to +2.5, with higher values indicating favourable outcome. Source: Kaufmann et al (2012).</td>
<td></td>
</tr>
<tr>
<td>Trade Openness</td>
<td>The sum of merchandise export and imports scaled by GDP of the country. Source: Africa Development Index, World Bank</td>
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<tr>
<td>Capital Account Openness</td>
<td>A de jure measure of financial openness. The index ranges from -1.83 to +2.5 with higher values indicating greater openness. Source: Chinn and Ito (2008).</td>
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<tr>
<td>Settler Mortality Rates</td>
<td>The mortality rates of European settlers per 1000 mean strength in the 19th Century. Source: Acemoglu et al</td>
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<tr>
<td>Inflation</td>
<td>Changes in the Annual Consumer Price Index (CPI). Source: Africa Development Index, World Bank</td>
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<tr>
<td>Government Spending</td>
<td>Total Government expenditure divided by GDP. Source: Africa Development Index, World Bank</td>
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<tr>
<td>Bank Concentration</td>
<td>Asset of the 3 largest banks in the country divided by the total asset of the banking industry Source: Beck et al (2009)</td>
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<tr>
<td>Rural Density</td>
<td>Percentage of population living in rural areas. Source: Africa Development Index, World Bank</td>
<td></td>
</tr>
<tr>
<td>Variables</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
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</table>
| Economic Freedom             | Index of economic freedom ranging from 0 to 100 with higher values indicating favourable outcome.  
  *Source: The Heritage Foundation* |
| Control Of Corruption        | Reflects perceptions of the extent to which power is exercised for private gain, including both petty and grand forms of corruption as well as “capture” of the state by elites and private interest. The index ranges from -2.5 to +2.5 with higher values indicating favourable outcome.  
  *Source: Kaufmann et al (2012)* |
| Regulatory Quality           | Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. The index ranges from -2.5 to +2.5 with higher values indicating favourable outcome.  
  *Source: Kaufmann et al (2012)* |
| Government Effectiveness     | Reflects perceptions of the quality of the public services, the quality of the civil service and the degree of independence from political pressure, the quality of policy formulation and implementation and the credibility of the government’s commitment to such policies. The index ranges from -2.5 to +2.5 with higher values indicating favourable outcome.  
  *Source: Kaufmann et al (2012)* |
| Per Capita GDP               | GDP divided by population.  
  *Source: Africa Development Index, World Bank* |
| Gross Domestic Savings       | Share of domestic savings in GDP.  
  *Source: WDI, Word Bank* |
## Appendix 4a: Correlation Matrix: Bank Efficiency and Some Selected Variables

The correlation matrix below shows the pairwise correlation coefficients between various selected variables in the study. Each entry in the matrix represents the correlation coefficient between the corresponding variables. For instance, the correlation between Costeff and Private Credit is 0.0976, indicating a relatively weak positive relationship.

### Correlation Matrix of Selected Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Costeff</th>
<th>Private Credit</th>
<th>Creditor right</th>
<th>Rule of Law</th>
<th>Inflation</th>
<th>Capital Account Openness</th>
<th>Trade</th>
<th>Gov't Spending</th>
<th>Rural Population</th>
<th>Concentration</th>
<th>Settler Mortality</th>
<th>M2/GDP</th>
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## Appendix 4b: Correlation Matrix: Economic Growth and Some Selected Variables

### Correlation Matrix of Selected Variables

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