UNIVERSITY OF GHANA

FINANCIAL DEEPENING, DOMESTIC RESOURCE MOBILISATION AND PER CAPITA INCOME GROWTH IN AFRICA

BY

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JULY, 2016
DECLARATION

This is to certify that this thesis is the result of research undertaken by **BAAFI YAW AYIMADU** towards the award of a Master of Philosophy (MPhil.) degree in the Department of Economics, University of Ghana. I hereby declare that with exception of references made to works of other researchers, this thesis is entirely my own work under the guidance of my supervisors.

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(SUPERVISOR)
ABSTRACT

Financial sector has gained prominence as a possible determinant of saving and growth in the globalized financial markets. The financial sector in Africa, since the 1990s, continues to experience some reforms and development. However, despite all these reforms in the financial sector, the region has low levels of domestic savings resulting in the dependence on foreign resources for their infrastructure needs, which mostly are associated with volatilities and uncertainties. Based on this background, the study empirically examines whether the deepening of the financial system in Africa has stimulated domestic resource mobilisation and income growth employing the System GMM estimation technique for the period 1998 to 2013. Based on the life cycle hypothesis and the AK endogenous growth model, a model linking savings and its determinants as well as growth and its determinants were specified.

The empirical results revealed that the financial system in Africa has not been developed enough to stimulate domestic resource mobilisation and enhance growth. The different measures which were employed to measure financial deepening were found to be positive but insignificant, implying that financial deepening has not stimulated domestic resource mobilisation and income growth in Africa. An interesting observation from the empirical results is the negative effect of interest rate and savings implying that savings in the region depends more on income than on real interest rate. This is in contrast to the McKinnon and Shaw theory that savings positively depends on real interest rate. The study recommends the need for countries in the region to intensify the ongoing financial sector reforms to focus on its primary role of mobilizing and allocating resources.
DEDICATION

This thesis is dedicated to the God Almighty, my family and all my friends.
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I am grateful to the Almighty God for His guidance and protection throughout the entire period of the program.

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These notwithstanding, all errors and omissions are the sole responsibility of the author.

Yaw Ayimadu Baafi

(January, 2017)
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<td>ADF</td>
<td>Augmented Dickey-Fuller</td>
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<td>African Development Indicators</td>
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<td>AR</td>
<td>Autoregressive</td>
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<td>DCPS</td>
<td>Domestic Credit to Private Sector</td>
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<td>FD</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>GMM</td>
<td>Generalised Method of Moment</td>
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<td>IMF</td>
<td>International Monetary Fund</td>
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<td>OECD</td>
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<td>Ordinary Least Square</td>
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CHAPTER ONE
INTRODUCTION

1.1 Background

Financial deepening is the improvement in the efficiency in the banking institutions and financial systems in developing countries. Generally, financial deepening measures the ease with which the financial system provides funding for entrepreneurial activities, as well as the extent to which financial services are made available (Guama, 2014). Mohan (2006), defined financial deepening using four different indicators; (a) improvement in the efficiency of the financial sector, (b) increasing range and access of financial system, (c) improvement in the regulation of the financial sector as well as (d) increased access of the population to the financial services.

The financial sector performs numerous functions that lead to the growth of an economy and Levine (2005) identifies five of such functions. According to him, financial sector performs functions such as; (a) the pooling and mobilization of savings, (b) easing the exchange of goods and services, (c) helping to trade, hedge and pool risk, (d) producing information and allocating capital monitoring firms and (e) exerting corporate governance. These can be achieved either by direct based financing or by indirect bank based finance. (Levine, 2005; Nowbutsing, Ramsohok & Ramsohok, 2010)

These functions of the financial system help it to attract more deposits and result in a more efficient and better resource allocation, leading to growth of the economy.

Most developing economies often do not have efficient financial systems which can mobilize domestic resources while also acting as an efficient intermediary that can transform these resources into credit.
Following Keynes (1936) theoretical framework who advocated government interference in financial markets, governments in the region tried to generate growth through repressive financial policies; through interest rates and credit controls. However, in 1973, McKinnon (1973) and Shaw (1973) both argued against repressive financial policies claiming that they acts as disincentives to the mobilisation of savings.

McKinnon (1973) and Shaw (1973) postulated that the result of a developed financial system will lead to increased savings by raising the efficiency and effectiveness of financial intermediation (Schmidt-Hebbel and Serven, 2002).

This has led most developing economies to resorting to development strategies that focus more on the liberalization of their financial systems of which African countries are no exception. Most of these countries around the 1980s have undertaken policies that aim at lowering the extent to which government intervenes in the financial system, through the privatization of its banks. These policies according to Cobbina (1999) were expected to, through the mobilisation of savings promote growth in a developed financial intermediation, improve resource allocation efficiency as well as increase domestic and foreign investments (Cobbina, 1999).

Domestic resource mobilization can be referred to as the savings and investments generated by households, domestic firms and governments. In contrast to mobilization of foreign resources especially through aid, debt relief and foreign direct investments, domestic resource mobilization provides the benefit of greater domestic ownership of policy attachment with domestic needs. Mobilizing resources domestically is not prone to the dangers associated with external mobilisation like Official Development Assistance (ODAs) and foreign direct investments, which come with certain fringe objectives by those developing partners.
By this emphasis on domestic resource mobilization, it is not implied that external resources for development ought to be rejected. Rather, external resources come with certain disadvantages that are not shared by domestic resources. For example, aid receipts and other ODAs all exhibit volatility and uncertainty. Aid normally is associated with certain conditionality such as currency appreciation and reduced export earnings. Foreign direct investments mostly are meant to serve the interest of investors instead of focusing on the needs and development of the country (Culpeper and Bhushan, 2008). The challenge confronting the stimulation of domestic resource mobilization, particularly in low income countries, is the fact that domestic resources are scarce in poor countries. Accordingly, increasing domestic resource mobilization has been termed by some economists as a hard option when compared to mobilizing foreign resources (Aryeetey, 2009). Moreover, many low income countries continue to experience an erosion of its domestic resources due to some repressive policies like tariff reduction, reduced revenues from corporate taxation, and capital flight (Baunsgaard and Keen, 2005).

Some suggestions are that domestic resource mobilization can help developing countries to enhance their growth and economic performance and contribute towards reduce dependence on external resources.

Africa has and continues to have the least record of domestic resource mobilization of any region. According to statistics, foreign resources or savings which normally come in the form of official development assistance rather than private capital flow have assisted in funding the already low investment levels in the African region.

With this record, improvement in the region’s domestic resource mobilisation is imminent since an increased resource inflow poses some serious risk which can even lead to low savings rates.
In situations like this, countries lose the capacity to mobilize the needed resources necessary for generating growth in the absence of such official development assistance.

The idea of mobilizing resources domestically is not a new concern in the sub region. Improvement in the region’s low rate of domestic resource mobilisation has been one of the policy concerns of most developing economies in recent times. The results of these policies were the implementation of financial liberalization programs in the region which was aimed at removing those restrictions in the financial market and other forms of resource mobilisation which causes distortions. The expectation of the financial liberalization policies was financial deepening; thus, an increase in the size of the financial sector relative to output as well as increases in private and overall savings and investment rates. Clearly, despite these financial reforms and some growth in more recent years, resource mobilization in the region remains generally weak. Many of these policies introduced, such as high reserve requirements, concessionary discount facilities and extensive use of targeted credit program resulted in discouraging deposit mobilization, thus, the numerous small savers that exist, even in the poorest sectors of the region, were overlooked as a source of internal funds after these reforms (Mavrotas and Kelly, 1999). Most of these countries often lack an efficient financial system which is able to convert individual’s savings into credits or investments as well as provide incentives for savers.

Domestic resource mobilization through the deepening of the financial system in the region has been overlooked as a source of financing until very recently, though there are substantial prospects there which, if taken in account, can propel savings and growth significantly. The mobilization of domestic resources is one of the major policy issues for developing countries of which African countries are inclusive.
1.2 Problem Statement

Financial deepening and its effect on economic growth have continued to be the focus of most empirical and theoretical research in recent times. Its impact on growth has been extensively analyzed for various countries and time for different econometric methodologies. In spite of numerous empirical researches into the relationship of financial deepening on growth, the impact of financial deepening on domestic resource mobilization has not been properly explored particularly in Africa. The empirical literature in this area of study is limited when compared with that of financial deepening and economic growth with some few studies including Ziorklui (2001), Quartey (2005), Kelly and Mavrotas (2008), Odhiambo (2008), Ang (2010), Bayer (2014) and Gungor (2014). However, issues relating to financial deepening and domestic resource mobilization are critical to the overall development process in the region.

According to the Harrod Domar model for instance, there exists a positive relationship between savings and growth. Savings is critical in the development process, and the financial sector must be efficient enough to generate the required savings for investment that will propel growth and development.

Savings as a percentage of GDP in Africa has been relatively low, currently with an average of 20.38 percent which was last measured in 2013 according to the World Bank, though their financial sector have gone through some reforms. Therefore a study that examines how the deepening of the financial system have been able to stimulate domestic resource mobilization and income growth for a large group of countries in Africa would be a novelty. For instance, in 1996, According to World Bank data (2015), Ghana’s savings as a percentage of GDP which was 13.2 percent, declined to 1.96 percent in 2008 and continued to have a changing trends until the year 2012 when savings to GDP ratio of 27.9 percent was recorded. In those same periods, the saving to GDP ratios in Kenya increased from 21.5 percent in 1996 to 29.5 percent in 2012.
and continues to increase. That for South Africa also declined from 19.5 percent in 1996 to 18.8 percent in 2012 (World Bank, 2015). Thus, mobilisation of resources domestically in the region continues to be very low, despite the developments and innovations within their financial sector. The financial sector development has occurred during the period when per capita income growth continues to increase within the region, though relatively low compared to international standards. In Ghana, per capita income growth has increased from 0.5 percent in 1990 to 6.4 percent in 2012. Kenya’s per capita income growth also increased from 0.7 percent in 1990 to 1.6 percent in 2012. For South Africa, it increased from -2.3 percent in 1990 to 0.6 percent in 2012 (World Bank, 2015).

The financial system in the region, when compared to other developing countries in South Asia, Latin America and East Asia, shows some distinctive features. The financial sector in some of the regions in Africa still focuses mainly on the banking sector, making the financial sector thin and difficult for it to generate domestic savings or resources and attract foreign private capital. Again, the financial sector in the region is mostly uncompetitive, with the allocation of credit mostly subject to government interventions.

It is against this background that the study seeks to investigate if financial deepening has stimulated domestic resource mobilization and income growth in Africa during the period 1998-2013 by panel regression. Three basic questions motivating this study are:

- What are the key policy drivers of greater domestic resource mobilization and per capita income?
- Has financial deepening stimulated weak domestic resource mobilization in Africa?
- Have countries with enhanced financial deepening improved on their income growth?
1.3 General Objective

The main aim of this paper is to find out if financial deepening has stimulated domestic resource mobilization and income growth for a panel of 42 African countries for the period spanning 1998-2013. However, specific answers to the above research questions will help achieve the objectives underlying this study which is to:

- Investigate whether there has been a statistically significant increase in the level of domestic savings due to financial deepening in Africa
- Investigate whether financial deepening has had a positive and significant impact on growth of per capita income in Africa.
- Recommend policies in which financial deepening in Africa can stimulate domestic resource mobilisation and per capita income growth.

1.4 Significance of the Study

The main contribution of this study is to examine whether financial deepening has actually stimulated domestic resource mobilization and income growth in Africa. Previous empirical works on the finance-domestic resource mobilization debate are inconclusive, motivating this research. Besides, most of these studies have concentrated mainly on the use of the bivariate causality test. Empirical evidence have shown that bivariate causality test suffers from the omission-of-variables bias (Odhiambo, 2008; Gries et al, 2009).

The results of this study will also inform policy makers on how the development of the financial system in Africa has enhanced income growth as well as appropriate policies to implement in order to stimulate domestic resource mobilisation through the deepening of the financial sector in the region.
1.5 Organization of the Study

The rest of the chapters of the study are organized as follows: Chapter two reviews related and relevant literature on the topic; Chapter three gives an overview of recent developments in the African region; Chapter four explains the methodology used to analyze the panel data set; Chapter five reports the results of the data analysis and discussion; Chapter six conclude, summarizes the findings of the study and makes recommendations for policymakers.
CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction
The chapter will look at the theoretical and empirical literature on the finance-domestic resource mobilisation as well as finance-per capita income growth debate in Africa. It is presented in four sections. The first section examines the meaning of financial deepening, domestic resource mobilisation and per capita income growth in Africa and the linkages between them in the literature. The second section looks at the theoretical literature; in the context of McKinnon-Shaw, Neo-Structural, Endogenous Growth and Asymmetric Information Models. The third section considers the empirical evidence of the finance-domestic resource mobilisation-per capita income growth nexus. The final section presents the conclusions drawn from the theoretical and empirical literature.

2.2 Definitions and Theoretical Issues

2.2.1 Meaning of financial deepening
Financial deepening, generally measures the ease with which the financial system provides funding for entrepreneurial activities, and the extent to which financial services are made available. Many studies have attempted to capture what constitutes financial deepening. Financial deepening simply is when the financial and banking sector of an economy is developing. Increases in ratios such as M2 to GDP, domestic credit to private sector as a percentage of GDP, currency in circulation to broad money (Cu/M2) and capitalization to GDP are indicators of financial deepening. Goldsmith (1969) attempted to provide a measure for financial deepening through his Financial Interrelations Ratio (FIR) which he explained as the
quotient of the aggregate market value of all financial instruments in a country at a given date to the value of its tangible net national wealth (Goldsmith, 1969). Thus, the higher the FIR, the higher the level of financial deepening and vice versa.

A developed financial system has adequate prudential regulation and supervision of commercial banks. Fry (2005) identified four signals of financial deepening: (i) significant level of price and exchange rate stability, (ii) fiscal discipline in the form of sustainable government borrowing (from the central bank) which does not put inflationary pressures on the reserve money or a sustainable government borrowing (from external sources) which does not increase capital inflows therefore avoiding the appreciation of the exchange rate, (iii) competitive maximizing of profits by commercial banks and (iv) financial intermediation devoid of explicit and implicit taxes.

Rejan and Zingales (1998) also argued that an appropriate measure of financial deepening should capture the ease with which deficit spending units acquire loanable funds to finance some projects. A well-developed financial system, according to them, should be able to forecast and hedge risk in a cost effective manner.

In conclusion, financial deepening can be grouped into three distinct phases: (a) the development of financial institutions, (b) the development of varied and complex financial instruments and services and (c) sound regulatory and supervisory frameworks to prevent the financial institutions and intermediaries from indulging in malpractices which may put the economy at risk (Iyke, 2013). A good measure of financial deepening should therefore capture the ease with which loanable funds get to those who need them most, and the pace at which financial institutions develop to meet changing demands of financial services.
2.2.2 Views on Domestic Resource Mobilisation

Adequate, reliable and predictable generation of resources domestically to finance priority projects and programmes is one of the major challenges facing the countries in the region. For example, according to Briceño-Garmendia et al., (2008), Africa’s infrastructure financing needs is estimated at about $93 billion per year with a gap of about $31 billion per year (Briceño-Garmendia et al., 2008). Closing this gap will require improvement in domestic resource mobilization as well as developing innovative approaches to mobilize development finance (Nnadozie, 2012).

Domestic Resource Mobilization as explained in the previous chapter refers to the savings and investment generated by households, domestic firms and governments. It can also be referred to as the process in which countries are able to raise and spend their own funds to provide for their people. Contrary to foreign resources mobilisation through aid, foreign direct investments and other official development assistance, domestic resource mobilisation offers benefit of enhanced domestic policy ownership and greater linkage with domestic needs. There are two sides to domestic resource mobilisation, the private side which is concerned with private domestic savings, thus the financial sector, example private banks channels towards investments and the public resource mobilisation which is about public savings, the excess of public revenues on current government expenditure. This is what is available for governments to fund public expenditure, including roads, schools and health facilities. Its source is either from borrowing or the taxation of individuals and firms. According to Culpeper (2008), the public and private sectors both have important roles in domestic resource mobilisation: while mobilisation of resources through taxation and public revenue generation is done by the public sector, the private sector on the other hand mobilizes the savings of the households and firms through financial
intermediaries, who allocates resources to investment in productive activities. Thus, improving domestic resource mobilisation in poor countries will mean increasing the fiscal capacity of the country. It also involves deepening financial markets to enable them attract a growing portion of domestic savings and to allocate them to commercially productive uses (Culpeper, 2008). Stimulating domestic resource mobilisation in the region is not just necessary, but desirable. Greater reliance on domestic resources enhances a country’s ownership of public policy, ties accountability to citizens instead of external investors and developing partners and reduce volatility associated with external funding.

Culpeper (2008) proposed reasons for stimulating domestic resource mobilisation. First is that, greater reliance on domestic resource mobilisation is vital to economic growth, poverty reduction and sustained development. High growth economies typically save at least 20 percent to 30 percent of their income to finance public and private investment. Secondly, domestic resource mobilisation is more appropriate to domestic ownership than external funding. Finally, domestic resource mobilisation has an advantage of predictability and less volatile than aid and other external resource mobilisation.

Low levels of domestic resource mobilisation in the region are believed to be mostly caused by the poor structure of the financial systems, low income levels and demographic factors. African countries in general have low levels savings ratios relative to other developing regions. For instance, the average ratio of domestic savings to GDP in Africa over the period 2005-2010 was about 22 percent compared to about 45 percent in East Asia and the Pacific and 30 percent for the middle income countries (World Bank, 2012).

This rate, however, brings out important differences across the African region. In 2005 for instance, Algeria achieved gross domestic savings rates of more than 50 percent of their GDP,
while Eritrea had rates far below minus 20 percent, indicating dissaving (African Development Indicator, 2014).

Most governments in the region depend on external resources because domestic savings fall short of current investment needs. The challenge is therefore for African countries and their partners to end the vicious circle of aid dependence that shifts government’s accountability away from its citizens towards donors. One way to reduce aid and other external dependency over time is through domestic resource mobilisation. Domestic resource mobilisation is the most reliable and sustainable source of development finance relative to external mobilisation. Raising more revenue from internal sources helps countries channel needed resources to reduce poverty, bridge infrastructural gaps and provide other social services.

2.2.3 Meaning of Per Capita Income Growth in Africa

Per capita income is the total resources per total population. Per capita income is often used to measure a country’s standard of living. Growth of per capita income within the region has been relatively low when compared with those of other developing countries. Some of the key reasons for the region’s sustainable low per capita income is the poor nature of economic growth of per capita income of sub-Saharan Africa averaged at 1.30 percent. However, due to political stability, fiscal discipline on the part of governments in the region, it grew steadily from the early 2000s onwards with an average growth rate of 2.51 percent (Kumo, 2011).

The recent performance of per capita growth in Africa has been considered as gloomy given that, real GDP per capita growth had been grim, averaging less than 0.5 percent per annum for over four decades (Bruckner and Ledeman, 2012).
2.2.4 Financial Deepening and Savings mobilisation: The Nexus

Evidence from literature points to a positive relationship between financial deepening and savings mobilisation. The key policy implication of the McKinnon-Shaw (1973) study indicates that financial liberalization would result in an end to financial repression, leading to the deepening of the financial sector to the increased efficiency of the financial sector. The development of the financial sector, thus financial deepening is one of the key elements of financial liberalization and therefore it will be imperative to consider the process of financial liberalization in order to fully understand financial deepening and its impact on savings.

Financial Repression

Financial repression entails the involvement of governments in pricing credits and controlling what financial intermediaries do, using these intermediaries as limiting competition, especially from foreign institutions and tax collection devices. According to McKinnon-Shaw (1973), a low deposit rate prevents resources from being attracted away from productive investments in physical assets. However, during periods of high inflation, matters are worsened especially when real interest rates are negative which is common in Africa inducing disintermediation, which involves the withdrawal of funds from the banking sector. These financial repressive policies tended to reduce individuals incentive to save in the form of monetary assets.

2.2.5 Financial Deepening and GDP Per Capita Growth Linkage

Per capita income growth in developing economies has increasingly been receiving global attention. Although attention has been paid to investigate financial deepening and income growth as well as poverty reduction, the relationship between them is inconclusive. It is argued by
Honohan (2004) and Beck et al. (2004) that financial deepening enhances economic growth and reduces poverty if income inequality is controlled. A deepening financial system allows the poor to have access to financial services such as saving instruments, payment instruments and insurance which they often would have been denied of. Financial deepening helps to mobilise domestic resources which is crucial for efficient allocation of capital to productive investments (Green and Kirkpatrick, 2002).

2.3 Theoretical Literature

The models that explain the relationship between financial deepening, domestic resource mobilisation and per capita income are basically the Classical theory of saving, Absolute Income Hypothesis, Permanent Income Hypothesis, the McKinnon-Shaw model, Neo-structural model, Endogenous Growth model and the Asymmetric Model.

2.3.1 Classical Theory of Saving

Lewis (1954) and Kaldor (1957) first put forward theories on the determinants of savings. According to them, population is divided into two classes: workers who spend all their labour income and capitalists who accumulate property. The Lewis model suggests that growth in income distribution of capitalists increases the ratio of savings. The Kaldor model, on the other hand, suggests that income distribution is likely to adjust between workers and capitalists in a way that will satisfy the identity between savings and investment. Thus, high investment will lead to high growth, leading to increase in capitalist’s share of income and savings. This model is mostly considered inappropriate basis of explaining savings. As argued by Pasinetti (1962),
saving propensities among classes of individuals, rather than classes of income are mostly different. Schmidt-Hebbel et al., (1996) also criticize the theory in that its implications in terms of the inequality-saving link are less automatic, because wage earners do not necessarily represent the poorer segments of the society which may include small rural land owners, and self-employed individuals in the informal sector.

**2.3.2 Absolute Income Hypothesis**

The Absolute-Income model is attributed to Keynes (1930) who argues that savings depends directly on current disposable income. Thus, the propensity to save out of current disposable income is supposed to rise as income increases. The hypothesis further suggests that the savings and consumption function is non-proportional, implying that rich people or countries will consume proportionately less and save more of their income, whilst the poor will consume more and save less.

**2.3.3 Permanent Income Hypothesis**

This model was developed by Friedman (1957) and according to him; income can be divided into permanent income and transitory income. Permanent income entails returns from wealth which is made up of physical and capital assets owned by the household, while transitory income entails unexpected income which may arise from changes in asset values and any other forms of unpredictable income. Friedman argues therefore that individuals make consumption decisions based on their entire life cycle or permanent income, which is mostly stable over time. The model also proposes that individuals who anticipate an increase in their future labour incomes will likely reduce their savings as a precaution against unexpected shocks.
2.3.4 McKinnon-Shaw Model

In an attempt to criticize the works of Neoclassical and Keynesian theories of money and financial development, McKinnon (1973) and Shaw (1973) analysed the benefits of Financial Repression, at least reducing its effect on the financial sector among developing countries. According to their Complementarity Hypothesis, removal of financial restrictions by allowing the market forces to determine real interest rate rise towards their competitive market equilibrium leads to development in the financial process. They both argued that, artificial ceilings on interest rates reduces savings, capital formation as well as discourage the efficient resource allocation.

The distinguishing feature of McKinnon-Shaw model are: the positive effect of real interest rate on deposits and a real rate of interest of output in the savings function; an artificially pegged nominal interest rate which keeps the real rate below the equilibrium; an investment function that is negatively related to the real rate of interest on loanable funds and positively related to the rate of output growth; and loanable funds which are inefficiently non-price rationed (McKinnon, 1973; Shaw, 1973).

According to McKinnon-Shaw model, financial intermediaries channel funds from surplus spending units to deficit spending units based on the transaction costs as well as the possible risks of loan difficulties, size of loan, quality of collateral. Those deficit spending units, which could not access the loanable funds then, will now enter into the credit markets.

Allowing the market to determine the equilibrium interest rate increases both investment and saving. On the other hand, interest rates increases can deter entrepreneurs from investing in investments that are not profitable at higher interest rate. Thus, growth in any financially repressed economy is constrained by the level of savings in that economy (McKinnon, 1973;
Shaw, 1973). McKinnon and Shaw therefore proposed an increase in interest rates or a reduction in the rate of inflation. Abolishment of interest rate ceiling, according to Fry (1997), results in optimal result in terms of interest rate and thereby maximizes investment.

The point of divergence between both authors is that, while McKinnon (1973) based his analysis on an outside money model, Shaw (1973) modeled his analysis on an inside money model.

Outside money according to Shaw is backed by government securities and a change in its value indicates a change in private wealth of government. Also, inside money is money issued on the basis of private bonds purchased in favor of the government though a change in these bonds do not change private wealth since it is an internal debt to the government. According to Fry (1995), if all money is outside money, banks will not extend loans to the private sector.

McKinnon also argued that, investors are constrained to self-finance since monies are accumulated before implementing their investment expenditures. Indivisibility in investments is assumed on the basis of the small size of firms in developing countries. From this, McKinnon postulated a ‘Complementarity’ between money and physical capital reflected in the demand for money function below:

\[
\frac{M}{P} = f(Y, \frac{1}{Y}, d - \pi)
\]  

(1)

With all the partial derivatives being positive where \(M\) is the money stock (Saving, time and sight deposits and currency in circulation), \(\frac{1}{Y}\) is the ratio of gross investment to gross national income and \(d - \pi\) is the real deposit interest rate.
The complementarity hypothesis therefore states that, demand for physical capital and money are complements as there is an increase in demand for money balances for firms to finance investment projects.

On the other hand, Shaw’s (1973) ‘debt-intermediation view’ is based on Goldsmith’s (1969) work on the effect of financial development on output growth, gives a greater emphasis on the role of financial deepening to improve the allocation of credit. In this regard, inside money becomes important where there is a positive relationship between financial intermediation and incentive to save on one hand and quality of investment on the other hand. Shaw’s demand for money function takes the form;

\[
\frac{M}{P} = L((Y), (r|c), (r), (d|n), (r|m), (t)) \quad \text{.................................................. (2)}
\]

Where \((r|c)\) represents the consumer rate of time preference, \((r)\) is the rate of return on physical wealth and government debt, \((d|n)\) is the rate of return on non-monetary financial assets and \((r|m)=u+d-\pi e\) is the own rate of return on money with \(Y\) being money’s yield of service to its holder. The most important variable according to Shaw is the variable \(t\) which signifies a positive effect on demand for money caused by financial developments like technological improvements in the money industry and the increased monetization of the economy.

2.3.5. Neo-Structural Model

Van Wijnberger (1982) and Taylor (1983) were the early writers of the Neo-Structural School of thought. According to them, the theory by McKinnon and Shaw has given little attention to the existence of unstructured money market, thus kerb markets in developing countries, where most of its populace, mostly those in the rural areas are outside the formal banking system (Ghatak, 1975). Only a few rich borrowers have access to the formal financial markets as the poor
borrowers cannot meet the formal requirements. This means, in such economies, majority of the small and medium scale businesses rely solely on the unorganized money markets for loanable funds.

According to the Neo-Structuralists, poor borrowers can obtain loanable funds from the kerb markets with less difficulty making these kerb markets their main source of finance. These markets are also lucrative to lenders since interest rates charged on loans are usually higher than those charged by the formal financial institutions. Thus, in developing countries, kerb markets acts as substitutes for formal financial institutions making large volumes of transaction to be realized in these markets (Van Wijnberger, 1982).

Their main assumptions were on how inflation, wages, savings and importation needs are determined in developing countries. The implication that can be drawn is that the acceleration in the inflation rates alongside growth reduction can be achieved by tight monetary policies that raise the interest rate as well as the devaluation that increases prices of inputs (Fry, 1988).

The Neo-Structuralists again drew inspiration from the Keynesian mechanism on their assumption of efficient kerb markets. Thus, demand and supply in the goods market determine the equilibrium income in the same way as the demand and supply of money and credit determine the equilibrium market clearing interest rates in these kerb markets.

They also argued that non institutional lenders supply loanable funds to small and medium scale borrowers in rural areas of most developing countries though the interest rates charged on these loans are too high. The high rates are linked to a shortage of financial saving mostly due to the fact that rural savings are in the form of hoarding of gold and jewelry and thus the need to
establish more efficient financial intermediaries which can offer attractive financial products and thereby increasing financial saving that can bring down the interest rates (Myint, 1984).

According to Fry (1997), Neo-Structuralists models were developed from Tobin’s Portfolio framework. Thus, unlike the McKinnon and Shaw models which specified two assets; gold and bank deposits as the component of household assets, the Neo-Structuralists models included kerb markets loans as the third form of asset. The implication is that McKinnon and Show models swap was from gold into bank deposits in response to higher deposit rates. However, in the Neo-Structuralists models, whether or not supply of credit increases depended on whether the swap into bank deposit is from gold or kerb market loans.

Van Wijnberger (1982) and Taylor (1983) asserted that since formal financial institutions were less efficient in intermediation because of the existence of mandatory reserve requirements, a swap from kerb market loans to bank deposits would have likely reduced the rate of economic activities under financial liberalization. Bank deposits will rise with the demand for gold and kerb loans reducing as deposit rates increases. In this case, if bank deposits for kerb market loans swap is stronger than bank deposits for gold swap, the supply of loanable funds falls with the kerb market interest rates.

Gupter (2004) asserts that while interest rate deregulation reduces the steady-state stock of capital, reductions in the reserve requirements tend to enhance it. He therefore recommended that financial liberalization policies should be oriented towards a reduction in reserve requirements than interest rate deregulation.

The Neo-Structuralists acknowledged that if households move out of inflation hedges and currency into time deposits, there would be an increase in the supply of loanable funds to the
business sector and a fall in the informal sector interest rates. However, if the movement is from kerb markets financial assets into bank deposits, this would only lead to an increased reserve accumulation by the banking system, with an eventual decline in economic activities.

2.3.6 Endogenous Growth Model

This model focuses on the relationship between long run financial development and economic growth with emphasis on the fact that growth in productivity is the channel of transmission. Endogenous growth model unlike Solow model where technology is exogenous, technology is endogenous. It depends on innovation which could be defined as new goods, new markets and new processes.

The new processes here refer to the financial intermediaries and their instruments while the new markets refer to the role of trade. These are evidenced in the works of Solow and Swan (1956) growth models where they assumed technology to be fixed and capital diminishes with increases in production. In most studies, banks and insurance companies are normally regarded as intermediaries rather than markets. In the absence of formal financial institutions, economic agents must choose between currency and capital in order to increase their expected utility. Each agent has knowledge of the probability of each investment they want to undertake with those with less taste for risk usually investing more in currency than those who are risk lovers. Greenwood and Smith (1997) entrenched the Diamond-Dybvid financial intermediation model using production and capital accumulation. The introduction of banks, according to this model, has caused individuals to hold more deposits with these banks rather than investing them in currency and capital. These banks estimate deposit withdrawals which cannot be individually predicted but rather predicted for the whole economy. These financial institutions, through maturity transformation, stimulate productive investment by persuading these savers to switch
from unproductive tangible assets to productive investment in firms. The opportunity for profits through arbitrage comes from the difference in the rates of return on liquid and illiquid assets. Freeman (1985) developed a simple arbitrage model which he demonstrated that fiat money has a higher rate of return in the short term than capital assets and vice versa and hence capital is a long term asset while fiat money is a short term asset. This distinctive feature motivates the development of financial intermediaries; thus, profits (which is referred to as arbitrage) through rate of return on different assets. This allows financial intermediaries to source for money at lower interest and lend at a higher interest (Champ et al., 2011). Other financial intermediaries will be motivated by the arbitrage and will enter the industry by offering higher rate on return on deposits than existing ones in a perfect competitive market. Existing intermediaries therefore reacts by increasing rate of return on deposits. This process continues until the rate of return on deposits equal rate of return on capital leaving all financial intermediaries with a zero arbitrage. Equilibrium is achieved when financial intermediaries pay the same interest on deposits as the interest they earn on loans or investments. Financial intermediaries therefore mobilize all saving in the economy for investment in higher earning capital leading to an increase in national output.

The main feature here is that, the endogenous growth model advocated for the role of technological and technical progress in the long run growth. In this model, unlike Solow model where technology is exogenous, technology is endogenous. The technological progress here refers to financial innovations (financial deepening), international trade and investments in Research and Development.

In all these models, financial deepening improves the overall productivity whereas, repressive financial policies reduces the growth rate through the discriminatory taxes on financial intermediation. Generally, the services provided by the financial sector to savers, producers and
entrepreneurs reduces due to financial repression which then slows economic growth (King and Levine, 1993).

What this model contributes to the current debate is the fact that it recognizes innovations in the financial development process. Unlike the classical growth models in which technology is exogenously determined, technology is endogenously determined in the endogenous growth framework (Harrison, 1996).

2.3.7 Asymmetric Information Model

Stiglitz (1998) like Keynes advocated government intervention to keep interest rates below their market-equilibrium levels. According to him, financial institutions and intermediaries may be tempted to increase rates above the market rates if they are allowed to function alone, thus discouraging borrowing.

One important function of financial markets is collecting, processing and conveying information for allocating funds and monitoring their use which creates market failures. An example of market failure from costly information is monitoring, which is a public good. For instance, others can benefit from an individual’s research into bankruptcy of a financial institution and then act on them. Because information as a result of the research is now public, there is less expenditure in monitoring them. With this less monitoring by depositors, most financial institutions take greater risks with their deposits.

Costly information also produces externalities. For instance, the failure of some financial institutions may have an adverse effect on other financial institutions because, depositors may assume that there is an increased probability that other financial institutions will fail due to the failure of the few institutions. Their reactions in the form of withdrawing their deposits may
result in predicted failures. Externalities can also be transmitted across markets. For example, the provision of a bank loan makes it easier for a firm to raise equity capital. The bank loan provides a signal that the firm is sound and prospective equity participants can also expect the bank to monitor the firm in which they will be investing. Naturally, financial institutions are rarely concerned about these externality effects. Hence, private interest can diverge from public interest.

Given the imperfections in the financial markets, Stiglitz (1998) argued that repressive financial policies can enhance the efficiency in the allocation of capital by firstly, improving the average quality of the pool of loan applicants through the reduction of interest rates. Secondly, repressive financial policies improve the equity of firms because it reduces the capital cost. Thirdly, repressive financial policies could be used to enhance economic growth, in conjunction with an alternative allocative mechanism such as export performance. Fourthly, sectors with high technological spillovers can be encouraged through directed credit policies.

According to Stiglitz (1998), there is a small range of real interest rates over which financial repression can be appropriate, causing a problem in the implementation of repressive financial policies. Stiglitz (1998) claims that it should not reduce real deposit rates below zero. As an upper bound, real loan rates over 100% are likely to indicate distress borrowing. With bank operating cost ratios in developing countries typically at least twice the level of operating cost ratios in the OECD countries, this represents a maximum real deposit rate of only 5% if banks are to stay liquid (Fry, 1995).

The conclusions that can be drawn from these models are that: McKinnon and Shaw argued for the minimal influence of governments in the financial systems; the asymmetric information model, by Stiglitz refuted this assertion by arguing that the problems of adverse selection and
moral hazard will diminish the role of financial intermediaries if financial markets are allowed to function without government involvement; the neo-structuralists asserted the need for economic agents and policymakers to recognize the existence of informal financial markets; the endogenous growth model then advocated the role of technological and technical progress in long run growth. The technological progress here refers to financial innovations, international trade, and investment in Research and Development.

2.4 Empirical Literature
The study now focuses on the findings of various authors on the finance-domestic resource mobilisation-per capita income growth debate. The empirical works are group in terms of country specific evidence and cross country evidence, for the sake of convenience. They are presented as follows:

2.4.1 Finance-Domestic Savings Debate

Evidence from Cross Country Studies
Cross-country studies refer to those using data from several countries, either cross sectional or a panel (cross-section and time-series analysis combined). Such studies mostly apply panel regressions to investigate how a particular independent (or explanatory) variable affects the dependent variable

Masson et al (1998), using both time series and cross sectional data, examined the determinants of private savings for a large sample of industrial and developing countries and found a positive relationship between financial development and private savings.
Kelly and Mavrotas (2003) used a panel of 17 African countries by employing a panel integration and cointegration tests to assess the impact of financial development on private savings. Though they found a positive relation between private savings and financial deepening among most of the countries in the region, their results were however inconclusive. They highlighted that as much as it is crucial to strengthen the weak financial systems in Africa, financial channels that can improve the level of savings through the financial systems should be given much attention.

Bayar (2014) analysed the effect of financial development on domestic savings using a sample of seven (7) Asian countries for the period 1992-2011. Four different indicators for financial development were used for purposes of robustness: liquid liability to GDP, stock market capitalization to GDP, deposit money bank assets to bank assets, private credit by deposit money banks and other financial institutions to GDP. They used the panel estimation technique and found out that financial development has a positive impact on growth and domestic savings.

Evidence from Country-Specific Studies

Ziorklui (2001) looked at the impact of financial sector development, banks efficiency and financial deepening for sustainable savings mobilisation within the context of the financial system in Ghana. His results showed that, financial sector development has had a considerable impact on the capacity of the Ghanaian banking sector to mobilize savings and therefore enhancing economic performance.

Athukorala and Sen (2004), estimated the savings function using the life-cycle model to examine the determinants of private saving in India during the period 1954 - 1998. Their results provided
an evidence of a statistically significant positive effect of financial development on domestic saving.

Quartey (2005) used a Granger causality test to investigate whether or not financial sector development causes saving mobilisation in Ghana. His results showed that financial development does not granger cause domestic savings and also domestic savings does not granger cause financial development. This was mainly as a result of the underdevelopment of the financial sector, leading to its role of savings mobilisation. The implication is that authorities should focus on policies which are aimed at improving the financial sector. He measured financial development by using private sector as a percentage of GDP.

Odhiambo (2008) employed the Johansen cointegration test to examine the long run relationship between financial development and domestic savings in Tanzania for the period 1968-2001. The result showed that the development of the financial sector positively affects the level of domestic savings. The implication here is that policies aimed at promoting financial sector development should be pursued.

Ang (2011) examined the impact of financial system on savings in Malaysia for the period 1960 to 2007 using the error correction model of estimation. The result showed that financial deepening positively affects savings. However, in examining the impact of insurance markets as well as the liberalization of the financial system on saving, the paper conversely found a negative relationship in Malaysia. The implication here is that financial development which may increase borrowing patterns will likely encourage consumption at the expense of savings.

Khan and Hye (2010) also employed the same model and carried out a similar study in Pakistan for the period 1988 to 2008. Their results showed a negative relationship between financial sector development and savings both in the short and long run.
2.4.3 Financial Sector and Economic Growth Debate

Evidence from Cross Country Studies

Goldsmith (1969), being the first to empirically document the positive correlation between financial development and GDP per capita used annual data set of 35 countries over the period 1949-63 to investigate whether finance has a causal effect on economic growth. Using Ordinary Least Square (OLS) techniques and graphical analysis, he documented a positive correlation between financial development and the level of economic activity and argued that financial markets facilitate growth by enabling efficient intertemporal resource allocation. Although the regression results were positive, it was statistically weak and mostly negative for developed countries.

King and Levine (1993) studied the relationship between financial development and growth from a sample of 80 countries over the period 1960-89 controlling for other factors that affects long run growth. They also constructed additional measures of the level of financial development next to the ratio of liquid liabilities over GDP such as credit to non-financial private enterprises over GDP as well as credit issued to non-financial private firms divided by total credit. Their results showed a positive relation between financial development and growth, and the results were consistent for various financial development measures and growth indicators.

Rajan and Zingales (2001) looked at whether financial development stimulates economic growth with the rational that financial development reduces the costs of external finance to firms. Specifically, they wanted to find out whether industrial sectors that are relatively more in need of external finance develop faster in countries with more-developed financial markets. They found
this to be true in a large sample of countries over the 1980's. Thus, a positive relationship between financial development and economic growth

Levine, Loayza and Beck (2000) studied 71 countries using data for periods 1960-1995, such that there is one observation per country, using the legal origin indicators as instrumental variables in the generalized method of moments (GMM) regression with a new financial development measure, private sector credit as a percentage of GDP. They found out that there is a strong relationship between financial development and long run economic growth. The data further suggested that the instruments are appropriate so that the strong link between financial development and growth is not due to simultaneous bias.

Jalilian and Kirkpatrick, (2002) studied the causality between financial deepening, economic growth and poverty reduction. They looked specifically at whether financial development has contributed to poverty reduction in low-income countries using a Panel of 26 countries (18 developing and 8 developed countries), their results confirmed the contention that financial sector development can result in poverty reduction in developing countries. Their results also showed that growth is finance-led, and therefore provided a firm basis on which to undertake more focused, micro-empirical investigation of how specific financial sector policies and programmes can be deployed as effective instruments for achieving poverty reduction in low-income countries.

Agbetsiafa (2003) examined the long run equilibrium relationship, and the causal relationship between financial development and economic growth in a sample of eight SSA countries using a vector error-correction model. He used an annual data on five financial indicators and per capita GDP as a proxy for growth for the selected countries covering the period between 1963 and
The results showed a one way causality running from financial development to economic development.

Rioja and Valev (2004) studied the finance-growth nexus on a panel of 74 countries using GMM dynamic panel techniques. They found that in the low region where the financial systems are not developed, additional improvements in financial markets have an uncertain effect on growth. On the other hand, intermediate regions, where financial systems were developed, the impact was largely positive and in the high region, the effect was positive, but smaller. This study established that the finance-growth link may vary according to the level of financial development.


Dabós and Gantman (2010) used unbalanced panel dataset for 98 countries covering nine to five-year periods from 1961-1965 to 2001-2005 within the dynamic panels in a GMM framework. Their findings showed that financial development does not have a statistically significant effect on economic growth. Most importantly, they found that the economy's size is a statistically significant determinant of growth. Their conclusion casts doubts on the strength of the growth-finance link.

Effiong (2015) examined the effect of financial deepening growth conditional on a country institutional quality for a panel of 21 SSA countries for the period 1986-2010 using the GMM panel technique. Their results indicated that financial development has not impacted on growth performance in the region.
Evidence from Country-Specific Studies

Darrat (1999) employed multivariate Granger causality tests within a bivariate error correction model for three Middle Eastern and North African (MENA) countries over the period 1964-1993. Using the currency and M2Y ratios as alternative measures of financial development, the study found that, financial deepening causes economic growth although the strength and consistency of his evidence varied across countries and across the proxies used to measure financial deepening. He showed, however, that the causal relationships are predominately long-term in nature. A major policy implication is that, government policies aimed at promoting financial deepening in these countries must be persistent and sustainable in order to foster economic development.

Dritsakis and Adamopoulos (2004) using a Granger causality and cointegration approach in the case of Greece studied the causal relationship among financial development, degree of openness of the economy and economic growth. They found that there is one cointegrated vector among GDP, financial development and the degree of openness of the economy but rather a causal relationship between financial development and economic growth on one hand and also between the degree of openness of the economy and economic growth on the other hand were established.

Abu-Bader and Abu-Qarn, (2005) tested the causal relationship between financial development and economic growth in Egypt using the cointegration and vector error correction model during the period 1960-2001. They found out that financial development causes economic growth either through the increasing resources for investment or through the increase in investment efficiency.
Odhiambo (2009) examined the impact of interest rate reforms on financial deepening and economic growth in Kenya using annual series from 1968 to 2005. Employing the Johansen cointegration technique and Granger causality within an error-correction model, he found strong support for the McKinnon-Shaw hypothesis regarding the positive impact of interest rate liberalization on financial deepening. The study also confirmed supply-leading hypothesis of the finance-led-growth argument. He concluded that the interest rate liberalization in Kenya has succeeded in increasing economic growth through its influence on financial depth.

Nowbutsing et al. (2010) studied the impact of financial development on the Mauritian economic growth between 1970 and 2009. They used two measures of financial development namely M2 as a percentage of GDP and claims of private sector in a multivariate VAR analysis. Though the study found positive impact of financial development on growth, its effect was less. The impulse response revealed that a shock in financial development had a positive response on growth. While they concluded that there is a need to invoke policies that increase the effectiveness of the financial sector.
### Table 2.1: Summary of Empirical Findings

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<td>Odhiambo (2009)</td>
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<td>GMM estimation technique</td>
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Source: Author’s Design from Empirical Literature.
2.5 Conclusion

The chapter discussed the meaning of financial deepening, domestic resource mobilisation and per capita income growth as well as linkages between these variables. The dominant theories underlying the finance-domestic resource mobilisation-per capita income growth debates, namely: the Classical theory of savings, the Absolute Income hypothesis, the Permanent Income hypothesis, the McKinnon-Shaw Model, the Endogenous Growth Models, the Neo-Structural Models and the Asymmetric Information Models have all been looked at extensively. Although the McKinnon-Shaw Model remains the most widely used model for many developing countries, the criticisms by alternative models cannot be overlooked. For instance, McKinnon-Shaw assumed perfect market structures and perfect information. It is now clear from the neo-structural theories that markets are not efficient, especially in developing countries. The financial markets in developing countries are dualistic in nature. The asymmetric information models provided evidence that, there exists imperfect information in financial markets. Financial liberalization would not necessarily improve financial sector performance because of the high likelihood of the principal-agent problem.

The available empirical literature on the finance-domestic resource mobilisation-per capita income growth debates was classified in this chapter according to their findings. These findings were then summarized in Table 2.1.

The review further revealed that financial development may result in an increase in borrowing which in the long run may be detrimental to savings though some of the studies also showed inconclusive results. These interesting conclusions provide the impetus for the next chapter.
CHAPTER THREE

FINANCIAL SECTOR, DOMESTIC RESOURCE MOBILISATION AND PER CAPITA
INCOME GROWTH IN AFRICA:

OVERVIEW

3.1 Introduction

This chapter gives a brief description of financial Sectors in the African region and the nature of
economies in the region. The chapter also describes the trend and recent developments of
specific macroeconomic variables that are relevant to the current study.

3.2 Overview of the Financial Sector in Africa

Financial sectors in African countries are among the least developed in the world. This can
mostly be directed to misguided policies that encouraged substantial political interference in the
operation of financial institutions. Progress in reforming the financial markets has been
substantial in Africa though the pace of reforms has varied and some restrictions still in place in
some countries in the region. However, financial intermediation is still low, and by some
measure has even declined. According to Gulde et al., (2006), the average private sector credit to
GDP ratio declined from 17.2 percent to 8.7 percent by end of 2004, excluding 15 countries
whose financial sectors showed signs of sustained development during between 1980 and 2004
(Gulde, Pattillo and Christensen, 2006). This poses risk considering the fact that most policies
grounded towards financial liberalization were considered during this period with greater discipline
in implementing monetary policy.

Most developing countries, including African countries have gone through some financial
reforms in order to strengthen their financial systems and enhance growth which in the long run
will improve the standard of living for its citizens. These policies, however, took the region far from its goals.

According to Gelbard and Leite, (1999), following the end of the colonial era in the 1960s, the financial sector in the region was heavily regulated and controlled. This was so because the formal financial sector at that time was considered inefficient in providing credit to all sectors and areas of the country which resulted in high level of disparity in the growth of the sectors. Tools like interest rates and credit allocation were what governments at that time used to control these financial systems. These policies however led to financial repression and hampered the growth of the financial sector (Gelbard and Leite, 1999).

Following the works of McKinnon (1973) and Shaw (1973), who advocated for the liberalization of the financial system, many African countries adopted their policies. Some of these reforms include the cutting back of directed credit and interest rate liberalization. Many of these countries adopted the financial liberalization program as proposed by the World Bank and International Monetary Fund to help improve their economies. The gain from the adoption of the liberalization policy in the region since its adoption has been mixed with the Sub-Saharan African countries having the lowest level of financial development relative to other developing countries.

According to Soyibo and Raheem, (1995), in spite of the liberalization of the financial sector in the region, banks and other formal financial institutions continue to impose stringent regulation on credit to individuals and firms. As a result, there has been the development of informal institutions and cooperative societies for the poor because of high collateral values which are normally requirements for loans to individuals (Soyibo and Raheem, 1995). These informal institutions mainly give credits to individuals for consumption and small scale businesses. Given
this, the direct effect of the deepening of the financial sector on the income of the poor will depend mostly on the development of these informal financial institutions.

Same can be said of the level of per capita income in the sub-Saharan African countries. The growth of per capita income has been relatively low and stable.

3.2.1 Financial Deepening Trends in Africa

Domestic credit to the private sector as a percentage of GDP has not improved much over the last four decades. For instance, from 1970 to 1980 it inched marginally from 28.12% to 29.06% representing a 0.94% point increase. It however reached a peak of 65.00% in 2007 and continuous to exhibit oscillatory trends with its current figure being 47.36% in 2014.

The total number of the region’s listed domestic companies has also reduced from 1039 in 1994 to 932 at the end of 2011 though market capitalization of listed companies as a percentage to GDP increased from 119% in 1994 to 149% as at the end of 2006 (World Bank, 2015).

Most of the banking systems in the region proved resilient to the 2008-2009 financial crises though there were pressures on loan quality, profitability and bank liquidity. This was mainly as a result of most banking systems in the region reliance on stable domestic retail funding which are relatively stable and also the fact that the banking sector had minimal cross border liabilities. South Africa was the most affected because of the fact that its equity market and deep liquid bond market attracts substantial amounts of foreign portfolio investment, which saw sharp reversals during the crisis (IMF, 2012). The trend in the domestic credit to the private sector as a percentage of GDP is depicted by figure 3.1 below.
3.2.2 Domestic Resource Mobilisation Trends in Africa

Savings in the region is the lowest compared to other developing regions in the world. In 2012 for instance, gross domestic saving (% of GDP) in the region was 20.07% compared with 20.91 percent in Latin America and the Caribbean, 26.38 percent in south Asia and 29.49 percent in East Asia and the Pacific’s (World Bank, 2015).

The savings rate for Africa has evolved in the following pattern over the years. From 1970 to 1980, the GDS for the region increased steadily from 21.08% to its highest 24.13% (World

Source: World Development Indicators Database, World Bank
Bank, 2015). The rate fell to its lowest in 1998 (12.86%), which most economists especially Eldabawi and Mwega in 2000 referred to as ‘Saving Collapse’. Afterwards, the savings in the region has continued to experience some recovery and stability though low with the current rate being 17.90% in 2014 (World Bank, 2015).

**Figure 3.2: Gross Domestic Savings (% of GDP), 1970 to 2014**

Source: World Development Indicators Database, World Bank

These trends represent the general economic performance of the various regions over the past four decades. This trend shows increasing differences among developing regions in the world, especially after 1980. While the saving rate of Africa has fallen, that of Latin America’s have stagnated and East Asia’s rates continues to rise (Hussein and Thirlwall, 1999).

Stability over time is also crucial for smooth and predictable investments, and Africa again fares worse that other developing regions in this area. One important reason for this is the variability
of the sources of income, which is higher in Africa than in other developing regions, mainly due to exogenous shocks. For instance, the standard deviation for GDS as a ratio of GDP from 1965 to 1994 was 8.06% for Africa, 6.02% for Latin America and 6.60% for the East Asian (Schmidt-Hebbel et al., 1994).

Individual’s ability to save, according to Loayza et al., (2000), is mostly determined by the rate of income growth, income levels and the dependency ratio. Thus, there exist a strong positive relationship between per capita income and savings (Hussein and Thirlwall, 1999). Savings rate responds negatively to increases in the dependency ratio while increasing with rise in the rate of growth of per capita income.

3.2.3 Trends in Per Capita Income Growth Rate in Africa

Growth in per capita income of the region has been consistently low when compared with those of other developing regions (Latin America and Pacific’s) and even more significantly low when compared with per capita incomes of developed regions like the OECDs. The poor nature of growth experienced by the region is one of the major reasons for the lower level of per capita income in the region.

Between 1980 and 1990, the growth of per capita income of the region stood at an average of 1.49% and has been increasing in the two subsequent decades as a result of political stability, fiscal discipline on the part of governments in the region to the extent that the average growth rate of per capita income between 1991 and 2000 stood at 2.07% with that between 2001 and 2010 standing at 5.26%.
The recent per capita GDP growth performance in Africa according to Bruckner and Lederman (2012) has been considered remarkable given that, for over four decades since 1960, real GDP per capita growth had been dismal, averaging less than 0.5% per annum. The trend in the growth rates of per capita income for the region is depicted by the figure below:

**Figure 3.3: GDP per capita growth (annual %) in Africa, 1990 to 2014**

![GDP per capita growth (annual %) in Africa, 1990 to 2014](image)

Source: World Development Indicators Database, World Bank

### 3.2.4 Inflationary Trends in Africa

The region began the period (1975-2014) with an average inflation of 18.31 percent. Inflation subsequently peaked to 27.45 percent in 1994. Average inflation after that has remained relatively low, hitting a decade low of 4.14 percent in 2004. It however increased slightly to 10.66 percent in 2008. This slight increase in inflation across the region was as a result of various factors some of which include domestic food prices increased sharply in countries such as...
as Kenya, Guinea, Sierra Leone and Madagascar. Poor harvests due to unfavorable weather conditions were paramount in Benin (Floods) and Kenya (drought). Net staple importers such as Guinea, Sierra Leone and Madagascar were also affected by the impact of higher international prices. Other factors such as political crisis and foreign exchange shortages increased inflation in Cote d’Ivoire and Guinea respectively. Average inflation in the region has since declined significantly to close the period at 4.39 percent per annum. On the average inflation in Africa over the period declined by about 4.15 percentage points (WDI, 2012).

**Figure 3.4: Inflationary Trend in Africa, 1975 to 2014**
3.3 Conclusion

The financial systems in Africa have gone through significant transformation from one of government centered to majority private owned. This has reduced the excessive state control and credit allocation that was experienced in the past. The financial system in the region has experienced some deepening over the years. Broad money (M2/GDP) has been on a significant increase in most of the countries in the region. One significant obstacle to the development of the financial system in the region are the poor nature of the capital markets and the small percentage of domestic credit to the private sector as a percentage of GDP. However, a major source of encouragement is the increasing demands for innovative financial systems and capital markets as well as the attention given to the private sector as an engine for economic growth in the region.

The recent per capita income growth in the region often follows after the financial development path. For most periods that experienced tremendous financial deepening, real GDP as well as per capita income grew faster; the reverse is true to some extent.

The next chapter is built on this one. After understanding the trends in the economic activities over the years in Africa in the current chapter, the extent of the impact of each activity on one another will now be examined. This will help shape the existing knowledge on the policy path to follow in order to achieve a particular macroeconomic goal.
CHAPTER FOUR
METHODOLOGY

4.0 Introduction
Various estimation methods have been used in analyzing the impact of financial deepening on domestic resource mobilisation as well as per capita income growth. The choice of estimation technique according to literature depends mostly on the variables as well as objective of the study being conducted. Some of the estimation techniques applied include Ordinary Least Squares (OLS) method, Johansen approach to cointegration and the Generalized Method of Moment (GMM).

This chapter describes the estimation techniques, statistical program and data used to analyse the impact of financial deepening on domestic resource mobilisation and per capita income growth in Africa.

For the above objective to be achieved, this chapter is subdivided into four (4) main sections. The first section looks at the conceptual framework of the model employed in the analysis. The rational is to align the study in its right methodological perspective, with regards to necessary tools for estimation and analysis. The second section outlines the empirical model and the econometric methodology employed in the study. The third section provides the description of the data to be used for the study, while the last section provides the conclusion for this chapter.
4.1 Conceptual Framework

This section outlines the conceptual framework within which this study is built. A good way to start would be to define domestic resource mobilisation. As already defined in the introductory and literature section, domestic resource mobilisation is generally regarded as resources originating from domestic agents, notably households (through savings), businesses or firms (through retained profits) and government or the public sector (through taxation and revenue generation). Through the deepening of the financial system, households, businesses and governments are able to channel their resources into financial institutions like banks and other insurance institutions. For example, banks are able to attract household savings as well as commercial deposits which they make available as loans to firms and households for investment.

The review of literatures on the determinants of savings reveals that Life Cycle theory proposed by Modigliani (1986) is an appropriate theory to provide a theoretical basis for this study. Most of the studies that have been done on the savings determinants either on the individual country basis or group adopted the Life Cycle Theory. Some of these studies include Kelly and Mavrotas (2005); Quartey and Pray (2008); Ozcan (2006); Ang (2010). This is due to the fact that it is capable of explaining the variables that determine saving.

The life-cycle hypothesis is a model that explains individual’s consumption patterns. It implies that individuals plan their consumption and savings behavior over their life cycle. The theory assumes that individuals will want to level their consumption over their lifetime and as a result, increase in per capita income of an individual will result in an increase of aggregate saving rate, as it increases the lifetime earnings and saving of working class group relative to older or retired groups (Athukorala and Sen, 2004). Thus, countries with higher per capita growth rates are expected to have higher levels of savings relative to those with lower per capita
income growth rates. Following the study of Gersovitz (1988), consider an individual with “T” lifespan, receives income payments of $y_i$ and consumes $c_i$ with the only constraint being the present value of the lifetime consumption ($C$) not exceeding the present value of lifetime income ($Y$) as shown below:

$$C = \sum_{i=0}^{T-1} \left( \frac{c_i}{(1+r)^i} \right) \leq \sum_{i=0}^{T-1} \left( \frac{y_i}{(1+r)^i} \right) = Y \quad (1)$$

The individual is however able to lend or borrow at interest rate $r$ in period $i$ if his objective, thus, maximization of discounted lifetime utility, $V$, does not require that $y_i = c_i$. $V$ is then defined as follows:

$$V = \sum_{i=0}^{T-1} \phi_i \cdot U[C_i] \quad (2)$$

The decision maker’s problem is solved for the two period model by the first order condition:

$$U'[C_0] = (1+r) \phi U'[C_1] \quad (3)$$

$c_0^*$ and $c_1^*$ are the optimal values with current savings being treated as residual explaining why most models examining savings are formulated in terms of consumption.

According to Bayoumi (1993) who studied the impact of financial liberalization on household savings in the life cycle model, assumed that consumers live for a fixed number of periods and wish to level their consumption path. The study also assumed that the endowments available to individuals when they are young are small, so they would like to borrow when young in order to smooth consumption over their lifecycle.

According to Green et al., (2005), prior to the development of the financial system, individuals have limited access to financial intermediation. After the initial period, individuals are able to use financial markets to level consumption over middle to old age.
Financial development increases competition between providers of financial intermediation, thereby eliminating the constraint on going into debt. This means the young can now borrow in order to attain their optimal lifetime consumption path.

Green et al. (2005) model assumed a financial system that allows for saving and dissaving which makes it hard to envisage saving taking place in a non-monetary form. Therefore, financial liberalization is considered the mechanism which will generate institutions that provide efficient financial intermediation which will mobilise savings.

Against this background, the current study will augment the life cycle model to include some key macroeconomic variables that are characteristic to the African sub region like inflation, real interest rate, age dependency, and financial deepening indicators for its first model.

On the other hand, the theoretical framework that links financial deepening and growth is based on the endogenous growth model – the AK model by Rebeo (1990). The recent revival of interest in the link between financial development and growth originates from the insights of endogenous growth models. This provides theoretical underpinning that shows that financial development does not only have a level effect but also growth effect.

To examine the effects of financial deepening on growth according to Pagano (1993), we construct a simple endogenous growth model, the AK model, where aggregate output is a linear function of aggregate capital stock:

\[ Y_t = AK_t \]  

(4)

The production function above can be seen as a reduced form resulting from one of two underlining theories: Romer (1989), where each firm faces technology with constant returns to scale but productivity is an increasing function of the aggregate capital stock \( K_t \). Alternatively,
the model can be derived from the framework of Lucas (1988) where he assumed \( K_t \) as a composite of physical and human capital.

Assuming that the economy produces a single good that can be invested or consumed (\( Y = C + I \)), and if invested, depreciates at a rate of \( \delta \) per period. Gross investment then becomes

\[
I_t = K_{t+1} - (1 - \delta) K_t
\]

Assuming also a closed economy with no government spending, for capital market equilibrium, gross saving \( S_t \) equal gross investment \( I_t \). Assume a proportion \( 1 - \phi \) of savings is lost in the process of financial intermediation (Pagano 1993):

\[
\phi S_t = I_t
\]

From (1), the growth rate at time \( t+1 \) is

\[
g_{t+1} = \frac{Y_{t+1}}{Y_{t}} - 1 \quad \text{and} \quad g_{t+1} = \frac{K_{t+1}}{K_t} - 1
\]

From equation two, the steady state growth rate becomes:

\[
g = A \frac{I}{Y} - \delta \quad \text{Since} \ I = \phi S, \ \text{and} \ \frac{Y}{Y} \text{is} \ s, \ \text{therefore};
\]

\[
g = A\phi s - \delta
\]

Where \( Y \) is output, \( I \) is gross investment, \( A \) is parameter representing productivity of capital, \( \delta \) is the rate of depreciation if the good is invested, \( s \) is gross saving and \( (1-\delta) \) is the part lost in the process of financial intermediation.

From the above, it can be seen that financial deepening can improve the efficiency accumulation (increase in \( \phi \); can contribute to raising the saving rate (increase in \( s \)); can also affect directly the marginal productivity of capital (increase in \( A \))

The link here therefore is that the endogenous growth model advocated for the role of technological and technical progress in the long run growth. In this model, unlike Solow model where technology is exogenous, technology is endogenous. The technological progress here
refers to financial innovations (financial deepening), international trade and investments in Research and Development (Pagano, 1993).

Against the background of the AK endogenous growth model, this study examines the effect of financial deepening on growth for its second model.

### 4.2 The Empirical Model

This study relies on panel data due to the ability to get more data points hence increasing the degree of freedom and also minimizing collinearity among the repressors. In this study, panel data procedures suits the methodology because the study takes into consideration forty two (42) countries over a period of sixteen (16) years (1998-2013).

In general:

\[
Y_{it} = \alpha_i + \gamma_t + \beta X_{it} + \mu_{it} 
\]

(8)

Subscript i represent the cross sectional dimension (country) and t represents the time series dimension (time)

\(Y_{it}\) is a \((k\times1)\) vector of dependent variables which is the Gross Domestic Savings as a percentage of GDP for model one and GDP per capita growth for model two.

\(\alpha_i\) is a \((k\times1)\) vector of constants for all periods and specific to country (i)

\(\gamma_t\) is the time fixed effect

\(\beta\) is a \((k \times k)\) matrix of the coefficient estimates for the explanatory variables

\(X_{it}\) is \((k\times1)\) vector of the explanatory variables in the model

\(\mu_{it}\) \((k\times1)\) vector of error terms in the model
Panel data according to Baltagi (2004) have some advantages over pooled data. For instance, (i) panel data accounts for heterogeneity across individual units which pooled data assumes away. (ii) Panel data also caters for time-invariant variables which are often omitted in pooled data. (iii) Panel data are less likely to experience the problem of autocorrelation and multicollinearity as is often the case with time series data. (iv) Panel data also minimizes the risk of obtaining biased results.

Fixed effect and random effect are the two types of panel models. They differ by their assumption of how heterogeneity is captured and in the estimation of techniques employed.

To explain the effect of financial deepening on domestic resource mobilisation and growth, we follow the studies of Bayar (2014) and Effiong (2015) respectively. Hence, domestic resource mobilisation, measured by gross domestic savings is hypothesized to be explained by financial deepening and other control variables as well as growth is hypothesized to be explained by financial deepening indicators and other control variables. The empirical models are specified below:

**Model One**

\[ S_{it} = \lambda S_{i,t-1} + \beta_0 + \beta_1 FD_{1it} + \beta_2 GROWTH_{it} + \beta_3 INF_{it} + \beta_4 AD_{it} + \beta_5 RIR_{it} + \mu_i + \nu_t + \varepsilon_{it} \]  
\[ S_{it} = \gamma_0 S_{i,t-1} + \gamma_1 FD_{2it} + \gamma_2 GROWTH_{it} + \gamma_3 INF_{it} + \gamma_4 AD_{it} + \gamma_5 RIR_{it} + \mu_i + \nu_t + \varepsilon_{it} \]

**Model Two**

\[ GROWTH_{it} = \delta GROWTH_{i,t-1} + \alpha_0 + \alpha_1 FD_{1it} + \alpha_2 TO_{it} + \alpha_3 GE_{it} + \alpha_4 INF_{it} + \alpha_5 GR_{it} + \lambda_i + \pi_t + \psi_{it} \]
\[ GROWTH_{it} = \eta GROWTH_{i,t-1} + \theta_0 + \theta_1 FD_{2it} + \theta_2 TO_{it} + \theta_3 GE_{it} + \theta_4 INF_{it} + \theta_5 GR_{it} + \lambda_i + \pi_t + \psi_{it} \]

Where S represents Gross Domestic Savings (% of GDP), FD1 and FD2 represents broad money (% of GDP) and Domestic credit to Private Sector (% of GDP) respectively. Both are indicators
for financial deepening. Growth represents GDP per capita income growth. GE, INF, AD, TO and GR represents Government Expenditure (% of GDP), Inflation rate, Age dependency, Trade Openness (% of GDP) and Government Revenue (% of GDP) respectively. These variables have been appropriately defined at the next section. Subscript $i$ and $t$ denote cross-section of countries and time dimension (in years) respectively. $\mu_i$ and $\lambda_i$ represents country specific effect and $\nu_t$ and $\pi_t$ also represents time fixed effect.

### 4.3 Definition of Variables and Expected Signs

#### 4.3.1 Dependent Variables

The dependent variables of the study are Domestic Resource Mobilisation as indicated by Gross Domestic Savings for model one and GDP Per capita income growth rate for model two.

**Gross Domestic Savings (% of GDP)**

Gross domestic saving is defined as GDP minus final consumption expenditure. It is expressed as a percentage of GDP. Gross domestic saving consists of savings of household sector, private corporation sector and public sector. For the measurement of domestic resource mobilisation, this study used gross domestic saving as a percentage of GDP. This variable was also used to measure domestic resource mobilisation in the works of Quartey and Prah (2008).

**GDP Per Capita Growth**

There are some common indicators used as measurements for growth of an economy. For instance, King and Levine (1993) used four proxies to measure growth; “real per capita GDP, the rate of physical capital accumulation, the ratio of domestic investment to GDP, a residual measure of improvements in the efficiency of physical capital allocation”. In this study, real
GDP per capita growth was used. The definition from the World Bank is; “GDP Per Capita is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the product divided by midyear population”. This measure evaluates the activities of an economy, and by using this indicator for all the chosen countries on the same currency, results can be properly compared. Another advantage of this proxy is that the population differences are also included in this indicator, which means the correct estimations can be computed.

4.3.2 Independent Variables

The variables of interest in this study are financial deepening as proxied by Broad money as a percent of GDP and Domestic Credit to Private sector as a percentage of GDP as well as the interactive effect of financial deepening indicators and gross domestic savings on GDP Per capita income growth.

**Financial Deepening**

Financial deepening is usually defined as a process that makes improvement in quality, quantity and efficiency of financial intermediary services. It mostly cannot be captured by one single measurement or indicator (Abu-Bader and Abu-Qarn, 2008). This study employs two commonly used proxies of financial deepening for the purpose of testing the sensitivity of our findings.

The first measurement of financial deepening used in this study is the broad money as a percentage of GDP (M2/GDP). The World Bank defines M2 as “the sum of currency outside banks, demand deposits other than those of the Central government, and the time, savings and foreign currency deposits of resident sectors other than the central government.” It has been
employed in most studies as the standard measure of financial deepening because it has been found to be a good proxy in some studies and in most cases data are readily available (Quartey 2005). However, this ratio has been criticized as not being an entirely good proxy of financial depth because it measures the extent of monetization and economies with underdeveloped financial systems may have a high ratio of M2/GDP which may not measure financial depth, as money is used as a store of value in the absence of other more alternatives (Luintel and Khan, 1999). A high M2/GDP is expected to increase domestic resource mobilisation as proxied by gross domestic savings, all other things being equal.

The second proxy is Domestic Credit to Private Sector as a percentage of GDP. Private credit is the credit extended to the private sector by commercial banks. It is also the value of loans made by banks to private enterprises and households. This ratio emphasizes the important role played by the financial sector in the financing of the private economy. It isolates credits issued to the private sector from credit issued to governments, agencies as well as public enterprises. It also excludes credit issued by the Central Bank (Levine et al., 2000). This proxy is mostly used to assess the allocation of financial assets that M2/GDP cannot offer. An increase in private financial saving results in higher M2/GDP ratio, however, credit to the private sector which eventually is responsible for the quantity and quality of investments, leading to economic growth, may not increase as a result of high revenue or reserve requirements. A high domestic credit to private sector as a percentage of GDP indicates a high level of domestic investments, indicating higher income holdings as well as higher domestic resource mobilisation everything being equal. This indicator has been used in numerous works (Beck et al., 2000; Quartey 2005).

The deepening of the financial sector, through the expansion of banks as well as improvement in the accessibility of financial instruments is an important factor in promoting savings. Savings on
the other hand will be kept in non-monetary terms such as jewelry and real estate if the financial institutions are not well organized and this may defeat the main purpose of saving. Therefore, the potential positive effect between financial development and savings depends on the degree of substitution between financial saving and other forms of savings in the household asset portfolio. As a result of that, the potential impact of financial development on savings seems to be ambiguous (Athukorala and Sen, 2004).

4.3.3 Control Variables

**Government Expenditure (% of GDP)**

General government final consumption expenditure includes all government current expenditures for purchases of goods and services. Government expenditure from the Keynesian proposition is expected to increase the growth of an economy. Government expenditure has a negative impact on gross domestic savings and an ambiguous impact on growth. Increase in government spending can have a negative impact on growth by crowding out private investment. However, if the spending is on infrastructure, it can promote growth. This measurement is usually used as a proxy of fiscal policy and macroeconomic stability (Levine et al., 2000).

**Government Revenue (% of GDP)**

Government Revenue (% of GDP): Government revenue as a percentage of GDP measures current revenue including all revenue from taxes and current nontax revenues such as fines, fees, recoveries, and income from property or sales, and grants. Government revenue as a percentage of GDP has a positive impact on per capita income growth.
Trade Openness (% of GDP)

Measured as a percentage of imports plus exports in GDP, positive coefficient is expected if the openness to international trade is beneficial to economic growth. For the countries under study, openness may not benefit as most of the countries in the region are exporters of raw materials, agriculture and intermediate goods and importers of final goods. This kind will negatively affect growth and was used in the study of Honohan and Beck (2007).

Inflation Rate

Inflation, its integration as the explanatory variable of growth is understandable by the concept of the financial repression. Indeed, a high inflation generally characterized economies, where financial repression is high and generates negative real interest rates, thereby reducing the weight of the national debt. However, high inflation discriminates against long-run investment and has a detrimental effect on growth and saving. The expected sign for this variable on growth and savings is negative. Employed by Jung & Marshall, (1986); Ilyas et al., (2014)

Age Dependency

The ratio of non-working age population, that is, the population either younger than 15 years or older than 65 years of age. The Life Cycle Model postulates that dependency encourages dissaving, therefore a negative relationship between age and savings is expected. Agenor and Aisenman (2004) find positive relationship between age dependency and savings. Loayza et al., (2000) find negative association between dependency and savings. Kelley and Schmidt (1996:366) indicate that there is no definite relationship between dependency and savings.
**Real Interest Rate**

Real interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator. The sign of real interest rate on saving is ambiguous, both theoretically and empirically. Although McKinnon-Shaw models suggest that interest rate has a positive impact on savings, the existence of opposing effects does not lead to a clear conclusion regarding the sign. Higher interest rates increase saving through the substitution effect, but could ultimately reduce the saving rate if the associated income and wealth effects are sufficiently strong. This is consistent with Giovanni (1985) and Odhiambo (2006).

### 4.4 Econometric Model Estimation Technique

To address the objectives of the study, the econometric estimation technique employed is based on the Generalized Methods of Moment (GMM) estimation framework introduced by Holtz-Eakin et al. (1990), Arellano and Bond (1991) and Arellano and Bover (1995). The panel consists of data for 43 African countries over the period 1998-2013.

The first model is estimated to examine the effect of financial deepening and other control variables on domestic resource mobilisation. We estimate a second model to examine the interactive effect between financial deepening and gross domestic savings as well as financial deepening and other determinants on per capita income growth. The empirical models estimation takes the form of Arellano-Bond dynamic equation. This is stated as follows:

\[ y_{i,t} = \alpha y_{i,t-1} + \beta' X_{i,t} + \mu_i + \xi_{i,t} \]
Where $y_{i,t}$ is the dependent variable for country $i$ at time $t$, $X_{i,t}$ is the set of explanatory variables for a country, $\mu_i$ is country fixed effect, and $\varepsilon_{i,t}$ is the idiosyncratic shocks. $y_{i,t-1}$ is the lag of the dependent variable. Explanatory variables include measures of financial deepening, trade openness, inflation, real interest rate, age dependency, government expenditure (% of GDP) and government revenue (% of GDP).

GMM is seen as very appropriate to the study due to the few time periods of the dataset over a larger number of countries, thus, small “T” but larger “N” (Arellano-Bond, 1991). Also, a study that includes variables that are not strictly exogenous demands an estimation technique that can efficiently correct the endogenous features of the independent variables. Also, GMM as a dynamic panel is very efficient for independent variables that are correlated with current and past realization of the error terms. Additionally, it is good for variables that vary across individuals but not over time (fixed effects) and also are heterogeneous with autocorrelation within individuals (Roodman, 2006).

According to Edison et al. (2002), the motivation for the choice of the GMM estimation model is due to its advantages over other estimation methods: (a) it controls for country-fixed effects, through the error term of the estimation method; (b) it also controls for endogeneity of variables; (c) it uses both the time-series and cross sectional estimations of the data set which increases the degree of freedom; (d) the panel data increases the sample size which intends reduces estimation biases and leads to robustness of the model. The most distinguishing feature of the GMM estimators is that, it uses both internal instruments, namely the lags of the endogenous variables and classical or external instrumental variables.

In a normal OLS, estimation of a dynamic panel by introducing a lag of the dependent variable as one of the explanatory variables or repressors lead to a biased estimation. This is because the
lagged dependent variable correlates with the error term. In the GMM estimation technique, the
lagged value of the dependent variable (gross domestic saving) and the lags of the independent
variables are used as instrument to control the biases that abound in the OLS estimation. The use
of instruments is therefore very significant to help check and correct autocorrelation.

The assumption of no serial correlation and orthogonality of the error terms, not strictly
exogenous variables, the following moment conditions hold;

\[ E(y_{i,t-j}, X_t, Z_t, \varepsilon) = 0 \text{ for } j = 2,3,4 \ldots \text{ (T-1);} \ i = 1 \ldots 43 \]

Where; \( y_{i,t-j} \) the lagged dependent variable, \( X_t \) is a set of explanatory variables, \( Z_t \) is the set of
instruments and \( \varepsilon \) is the unobservable features. The above is the basis of the GMM estimation
and will only be valid if the lag of the dependent variable and the instruments are valid. To
address the issue of too many instruments, Roodman (2009) suggested the use of only one or two
lags instead of all available lags for instruments. This is done to limited the number of
instruments generated from the system GMM estimators and has been adopted by researchers
like Levine, Loayza and Becks, (2000); Zhang et al., (2012).

In order to check the validity of the estimation, we conduct the following diagnostic tests.

**4.4.1 Diagnostic Tests**

To ensure that the estimation results are reliable, specification tests suggested by Arallano and
Bond (1991), Arallano and Bover (1995) and Blundell and Bond (1997) are carried out. The first
is the unit root test to examine whether or not the data is stationary. The second examines the
hypothesis that the error term \( \varepsilon_{i,t} \) is not serially correlated. The third test will test for the overall
validity of the instruments using the Sargan test of over-identifying restrictions.
4.4.2 Testing for Unit Roots in Panel Data

A unit-root test is conducted to determine whether or not the panel data-set is stationary before carrying out any panel data estimation. This test, according to Green and Limebeer (2012), when conducted will prevent distortions in estimated regression as well as prevent spurious regressions due to time-series process (Green and Limebeer, 2012). Testing for panel unit roots is quite recent and many researches and thesis applying panel data still disregard this crucial step. The study will test for the stationarity of all the variables employed in the study. All panel unit roots begin with the following:

\[ Y_{it} = \delta_i Y_{it-1} + \lambda X_{it} + \mu_{it} \]

If \(|\delta_i|<1\), \(Y_{it}\) is stationary. On the other hand, if \(|\delta_i|=1\), \(Y_{it}\) then contains a unit root.

To examine the stationarity property of our panel variables, the study will employ the Fisher type as proposed by Choi (2001) based on Augmented Dickey-Fuller (ADF) test. This is because of the asymptotic property of “\(T\)” being infinity and “\(N\)” being finite in the data.

The null hypothesis being tested is that all panels contain a unit root. For a finite number of panels, the alternative is that at least one panel is stationary.

4.4.3 Autocorrelation Test

We test for the presence of autocorrelation in the model as the error terms may be correlated. The test has a null hypothesis of no autocorrelation and is done for the differenced residuals. Usually, the autocorrelation test for the first order autoregressive process [AR (1)] rejects the null hypothesis. However, the autocorrelation test for the second order autoregressive process [AR (2)] in first difference is of utmost importance, since it will detect autocorrelation at levels
(Edison et al, 2002). However, rejecting the null hypothesis in the first order does not mean the model is wrongly specified. Rejecting the second order actually attest to the fact that the model is wrongly specified. Hence, rejecting AR 1 does not mean the model is not fit but rather rejecting AR 2 and thus the invalidity of the moment conditions.

In deciding whether or not to accept the null hypothesis, we compare the calculated probability value (P-value) against the conventional significance level of 0.05. If the calculated P-value is greater than 0.05, we fail to reject the null hypothesis. On the other hand, if the calculated P-value is less than 0.05, we reject the null hypothesis and accept the alternative hypothesis. If we fail to reject the null hypothesis, it implies no autocorrelation in the model.

4.4.4 Sargan Test

This test is undertaken to check the validity of the instruments employed, thus, the validity of the-over identified moment conditions (Verbeek, 2004). The null hypothesis states that the instrumental variables are uncorrelated with some set of residuals, making those instruments valid.

Similarly, in deciding whether or not to accept the null hypothesis, we compare the calculated probability value (p-value) against the conventional significance level of 0.05. If the calculated P-value is greater than 0.05, we fail to reject the null hypothesis. On the other hand, if the calculated p-value is less than 0.05, we reject the null hypothesis and accept the alternative hypothesis. If the null hypothesis is not rejected, the instruments are deemed to have passed the test and are considered to be valid instruments by this criterion. The higher the p-value of the Sargan statistic the better, indicating that the instruments as a group are exogenous.
4.5 The Data Source and Sample Size

The study uses annual country level data gathered over the period of 1998-2013 for African countries from the World Development Indicators (WDI) (World Bank Database, 2014), World Governance Indicators (WGI, 2014) and World Economic Outlook (2014). Features of the data include broad money (% of GDP), domestic credit to private sector (% of GDP), inflation, trade openness (% of GDP), age dependency, government expenditure (% of GDP), government revenue (% of GDP), gross domestic savings (% of GDP), real interest rate and GDP per capita income growth.

To facilitate our data analysis process, we resort to the use of Stata 13.0 statistical package. The Stata programme is well known for its precision in the analysis of panel data models and their associated specification tests.

Conclusion

In summary, this chapter developed and presented the conceptual as well as econometric model suitable for undertaking the study. The models used were developed from the theoretical frameworks of both the Life Cycle models and the endogenous growth model, specifically the AK model. The chapter also described the estimation technique employed in the study- system GMM estimation to examine whether financial deepening has stimulated domestic resource mobilisation and growth in Africa. Annual time series data on gross domestic savings (% of GDP), broad money (% of GDP), domestic credit to private sector (% of GDP), government expenditure (% of GDP), government revenue (% of GDP), trade openness (% of GDP), age dependency, inflation and real interest rate from 1998-2013 was employed for the study.
Stationarity test was conducted using the Fisher type as proposed by Choi (2001) as well as post estimation test, Sargan Test and Autocorrelation Test to examine the validity of the instruments employed as well as whether there was serial correction in the error term respectively. The chapter also described the variables used and sources of data. Basically, data were collected from the World Development Indicator and World Governance Indicator databases of the World Bank and World Economic Outlook database of the IMF.
CHAPTER FIVE
DATA ANALYSIS AND DISCUSSION OF RESULTS

5.0 Introduction

This chapter focuses on the analysis of the data set in order to help achieve the objectives of the study. The descriptive statistics of the data set is presented and it’s followed by pre estimation sensitivity analysis tests.

The first model seeks to examine whether financial deepening has been able to stimulate domestic resource mobilisation in Africa using the system GMM dynamic panel approach.

In the second model, we examine the impact of financial deepening on growth in Africa employing the same estimation technique. The chapter also gives a detailed insight of how the estimations are carried out to achieve the above stated objectives of the study.

Finally, the results of the data are presented and interpreted in order to give meaning to the findings and also facilitate comparative analysis with literature in this area of study.

5.1 Descriptive Statistics

Panel data of 42 countries in Africa over the periods 1998-2013 were used for the study. The choice of the sample size period (1998-2013) was within the time of the financial liberalization and development in Africa. Financial reform was first implemented in Africa (specifically The Gambia and Ghana) in the late 1980s (Pill & Pradhan, 1997). Seven (7) different variables were employed in the study to test the impact of financial deepening on domestic resource mobilisation as well as the impact of financial deepening on growth. The choice of which countries to include in the study was based on data available.
The summary statistics discussed include the standard deviation, mean, minimum and maximum values of the variables. Table 5.1 shows the descriptive statistics of the variables.

Table 5.1: Summary Statistics of Panel Data of Africa, 1998-2013

<table>
<thead>
<tr>
<th>Variables</th>
<th>Observations</th>
<th>Mean</th>
<th>Std.Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Domestic Savings (% of GDP)</td>
<td>632</td>
<td>11.66312</td>
<td>25.32206</td>
<td>-152.5373</td>
<td>86.26893</td>
</tr>
<tr>
<td>Initial Gross Domestic Savings (% of GDP)</td>
<td>597</td>
<td>11.55361</td>
<td>25.50017</td>
<td>-152.5373</td>
<td>86.26893</td>
</tr>
<tr>
<td>Broad money (% of GDP)</td>
<td>596</td>
<td>31.86742</td>
<td>20.49846</td>
<td>0</td>
<td>151.5489</td>
</tr>
<tr>
<td>Domestic Credit to Private Sector (% of GDP)</td>
<td>603</td>
<td>22.62048</td>
<td>29.68467</td>
<td>0.1982856</td>
<td>192.6601</td>
</tr>
<tr>
<td>Government Revenue (% of GDP)</td>
<td>633</td>
<td>23.95465</td>
<td>11.04903</td>
<td>0.563</td>
<td>72.299</td>
</tr>
<tr>
<td>Government Expenditure (% of GDP)</td>
<td>629</td>
<td>24.85349</td>
<td>9.379086</td>
<td>2.129</td>
<td>69.786</td>
</tr>
<tr>
<td>GDP Per Capita Growth</td>
<td>664</td>
<td>2.236573</td>
<td>5.3928</td>
<td>-31.34253</td>
<td>57.99019</td>
</tr>
<tr>
<td>Initial GDP Per Capita Growth</td>
<td>648</td>
<td>2.351474</td>
<td>5.251297</td>
<td>-31.34253</td>
<td>57.99019</td>
</tr>
<tr>
<td>Real Interest Rates</td>
<td>403</td>
<td>13.56301</td>
<td>42.84174</td>
<td>-96.86984</td>
<td>572.9363</td>
</tr>
<tr>
<td>Inflation</td>
<td>669</td>
<td>8.733832</td>
<td>28.54048</td>
<td>-72.729</td>
<td>513.9069</td>
</tr>
<tr>
<td>Trade openness (% of GDP)</td>
<td>656</td>
<td>0.7802554</td>
<td>0.4585892</td>
<td>0.2096405</td>
<td>5.317374</td>
</tr>
<tr>
<td>Age Dependency Ratio</td>
<td>588</td>
<td>82.04031</td>
<td>14.05385</td>
<td>39.9614</td>
<td>105.971</td>
</tr>
</tbody>
</table>

Source: Author’s computation (WDI, 2015; IMF, 2015 and WGI, 2015)

The mean values are reported in the third column. It measures the central tendency for the variables. For example, age dependency ratio has the largest mean value while Trade Openness (% of GDP) has the least. Interestingly, the mean of gross domestic saving (% of GDP) and per capita growth are 11 and 2 respectively suggesting a low savings rate and growth rate in the region. One would have expected that with financial liberalization in the region, the gross domestic savings (% of GDP) would have been more.
As regarding the two proxies of financial deepening, it is interesting to note that the maximum values (sixth column) of the two measurements, broad money (% of GDP) and domestic credit to private sector (% of GDP), are more than 110% of GDP. Studies on financial development and growth (Easterly et al., 2000; Cerra and Sexena 2008) argue that the marginal impact derived from financial development when it exceeds the 110% threshold is negative. This applies more to domestic credit to private sector. This is likely to have an effect on the extent to which financial deepening affects savings mobilisation.

The fourth column is the standard deviation which measures dispersion. Higher values of standard deviation indicate greater dispersion or fluctuations in the variable. For instance, real interest rate has the largest dispersion measured by its standard deviation value of 42.84174.

5.2 Correlation Matrix

Table 5.2 presents the correlation matrix for the variables. From the table, the correlation between gross domestic saving (% of GDP) and broad money (% of GDP), government revenue (% of GDP) and GDP per capita income growth are positive. On the other hand, the correlation between gross domestic saving (% of GDP) and domestic credit to private sector (% of GDP), government expenditure (% of GDP), real interest rate, inflation, age dependency and trade openness are negative. It is interesting to note that, the correlation of savings and the explanatory variables are below 50% exhibiting very low relationships. However, these preliminary results are not sufficient to arrive at a conclusion. Further tests will be reviewed in the remaining sections.
Table 5.2: Correlation Matrix (Relationship between savings and other variables)

<table>
<thead>
<tr>
<th>Gross Domestic Savings (% of GDP)</th>
<th>GDP Per Capita Growth</th>
<th>Broad Money (% of GDP)</th>
<th>Domestic Credit to Private Sector (% of GDP)</th>
<th>Trade Openness (% of GDP)</th>
<th>Government Revenue (% of GDP)</th>
<th>Government Expenditure (% of GDP)</th>
<th>Inflation</th>
<th>Real Interest Rate</th>
<th>Age Dependency Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Domestic Savings (% of GDP)</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP Per Capita Growth</td>
<td>0.055400</td>
<td>1.000000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broad Money (% of GDP)</td>
<td>0.044600</td>
<td>-0.084900</td>
<td>1.000000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domestic Credit to Private Sector (% of GDP)</td>
<td>-0.002800</td>
<td>-0.039200</td>
<td>0.692000</td>
<td>1.000000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trade Openness (% of GDP)</td>
<td>-0.134400</td>
<td>0.343300</td>
<td>-0.058500</td>
<td>-0.062600</td>
<td>1.000000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government Revenue (% of GDP)</td>
<td>0.137000</td>
<td>0.042900</td>
<td>0.113000</td>
<td>-0.009200</td>
<td>0.385100</td>
<td>1.000000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government Expenditure (% of GDP)</td>
<td>-0.070100</td>
<td>-0.084000</td>
<td>0.286500</td>
<td>0.095900</td>
<td>0.312600</td>
<td>0.803100</td>
<td>-1.000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inflation</td>
<td>-0.123500</td>
<td>0.062600</td>
<td>-0.099000</td>
<td>-0.037500</td>
<td>-0.026100</td>
<td>-0.080200</td>
<td>-0.012700</td>
<td></td>
<td>1.000000</td>
</tr>
<tr>
<td>Real Interest Rate</td>
<td>-0.088800</td>
<td>-0.007000</td>
<td>-0.045600</td>
<td>-0.057700</td>
<td>0.021000</td>
<td>-0.250300</td>
<td>-0.154100</td>
<td>-0.307700</td>
<td>1.000000</td>
</tr>
<tr>
<td>Age Dependency Ratio</td>
<td>-0.235500</td>
<td>0.028100</td>
<td>-0.731900</td>
<td>-0.525200</td>
<td>-0.135800</td>
<td>-0.457400</td>
<td>-0.412000</td>
<td>0.219700</td>
<td>0.187000</td>
</tr>
</tbody>
</table>

Source: Author’s computation (WDI, 2015; IMF, 2015 and WGI, 2015)

Table 5.2 presents the correlation matrix for the variables. From the table, the correlation between gross domestic savings and initial savings, broad money, government revenue, GDP per capita income growth and exchange rate is positive. On the other hand, the correlation between gross domestic savings to GDP ratio and domestic credit to private sector to GDP ratio,
government expenditure, real interest rate and terms of trade is negative. It is interesting to note that, the correlation of savings and the explanatory variables are below 50% exhibiting very low relationships. However, these preliminary results are not sufficient to arrive at a conclusion. Further tests will be reviewed in the remaining sections.

5.3 Pre Estimation Sensitivity Analysis

This section presents and discusses the pre estimation sensitivity analysis to check stationarity properties of the variables.

5.3.1 Stationarity or Unit Root Test

The results of Stationarity test is shown in Appendix A. For the null hypothesis of unit root, it can be shown that at least one of the panels has no unit root. As a measure of robustness, four different unit root test statistics were computed and they all rejected the null hypothesis that all the panels contain unit roots. According to Choi (2001), the inverse $\chi^2$ test is applicable when the number of panels is finite. Since the study has a finite number of panels, and on the basis of the inverse $\chi^2$ test, we reject the null hypothesis of unit root and conclude that the panel data is stationary. This removes the tendency of possible spurious regressions or unrelated regressions.
5.4 System GMM Estimation Results

5.4.1 Domestic Resource Mobilisation and Financial Deepening

In the first objective, the study seeks to investigate whether there has been a statistically significant increase in the level of domestic savings due to financial deepening in Africa. Two indicators were used to measure financial deepening – broad money (% of GDP) in the first estimation and domestic credit to private sector (% of GDP) in the second estimation.

The results shown in Table 5.4 are the outputs of the GMM estimation. Financial deepening (as measured by broad money (% of GDP) and domestic credit to private sector (% of GDP), lagged gross domestic saving (% of GDP), per capita income growth, inflation, age dependency and real interest rates are employed as independent variables.

A positive and significant relationship exists between growth in per capita income and gross domestic saving (% of GDP) in both estimations. This result is consistent with the life cycle hypothesis as well as priori expectations and corroborate the findings of Modigliani (1970), Loayza et al. (2001) and Ang (2010). This suggests that, the level of gross domestic saving (% of GDP) in the African region grows with an increase in per capita income. Thus, the Keynesian ‘Absolute Income Hypothesis’ holds for savings behavior in Africa. There is therefore a need to pursue growth-enhancing policies which are likely to result in higher productivity, hence increasing overall growth, contributing to higher savings in the African region.
Table 5.3: System GMM dynamic Panel estimation results (1998-2013)

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gross Domestic</td>
<td>Gross Domestic</td>
</tr>
<tr>
<td></td>
<td>Savings (% of GDP)</td>
<td>Savings (% of GDP)</td>
</tr>
<tr>
<td>Lagged Gross Domestic Savings (% of GDP)</td>
<td>0.900***</td>
<td>0.917***</td>
</tr>
<tr>
<td></td>
<td>(0.0320)</td>
<td>(0.0200)</td>
</tr>
<tr>
<td>Broad Money (% of GDP)</td>
<td>0.0225</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0501)</td>
<td></td>
</tr>
<tr>
<td>GDP Per Capita Growth</td>
<td>0.884***</td>
<td>0.328***</td>
</tr>
<tr>
<td></td>
<td>(0.282)</td>
<td>(0.0550)</td>
</tr>
<tr>
<td>Inflation</td>
<td>-0.819**</td>
<td>-0.0893</td>
</tr>
<tr>
<td></td>
<td>(0.399)</td>
<td>(0.0810)</td>
</tr>
<tr>
<td>Age Dependency</td>
<td>0.126</td>
<td>-0.0872*</td>
</tr>
<tr>
<td></td>
<td>(0.100)</td>
<td>(0.0507)</td>
</tr>
<tr>
<td>Real Interest Rate</td>
<td>-0.368**</td>
<td>-0.0164</td>
</tr>
<tr>
<td></td>
<td>(0.149)</td>
<td>(0.0191)</td>
</tr>
<tr>
<td>Domestic Credit to Private Sector (% of GDP)</td>
<td></td>
<td>-0.0304*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0167)</td>
</tr>
<tr>
<td>Constant</td>
<td>-2.710</td>
<td>9.023**</td>
</tr>
<tr>
<td></td>
<td>(7.596)</td>
<td>(3.962)</td>
</tr>
<tr>
<td>Observations</td>
<td>297</td>
<td>293</td>
</tr>
<tr>
<td>Number of ctry_code</td>
<td>32</td>
<td>33</td>
</tr>
<tr>
<td>Sargan Test (p-value)</td>
<td>1.0000</td>
<td>0.652</td>
</tr>
<tr>
<td>AR(1) Test (p-value)</td>
<td>0.096</td>
<td>0.073</td>
</tr>
<tr>
<td>AR(2) Test (p-value)</td>
<td>0.398</td>
<td>0.406</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: The robust standard errors are in parentheses. AR (1) and AR (2) is a test for first and second-order serial correlation, which is asymptotically N (0,1) under the null of no second-order serial correlation. The significance levels at the 1%, 5% and 10% are identified by ***, ** and *, respectively.
Real interest rate coefficient is negative and significant to gross domestic savings (% of GDP) in the first equation but insignificant in the second equation. A coefficient of -0.368 implies that a proportionate increase in real interest rate will reduce gross domestic saving (% of GDP) by about 36 percent (%). Thus, real interest rate does not explain savings in Africa which is in contrast to the McKinnon and Shaw theory that savings positively depends on interest rate. This is where Keynes argument becomes more interesting. Thus, the positive relationship between income and savings coupled with the negative relationship of real interest rate and savings means that savings in the region depends more on income than on real interest rate. Thus, if one does not have income to survive, no matter the interest rate they will not save. This is consistent with the findings of Giovanni (1985) and Odhiambo (2006). The results of this finding may be as a result of poor and administered interest rate and the dominants of informal sectors in granting facility to various economic agents across the region.

The relationship between gross domestic saving (% of GDP) and inflation showed a negative and significant impact in both estimations. A coefficient of -0.819 implies that inflation impacts negatively on savings by about 81 percent across the region. Thus, when prices are high then people will have to pay more money to buy goods and services which then reduces their savings. This result is consistent with Ilyas et al., (2014).

The age dependency ratio had a positive and insignificant effect on gross domestic saving (% of GDP) in the first estimation but negative and significant effect on gross domestic saving (% of GDP) in the second equation. Thus, a coefficient of -0.0872 implies that the age structure of the population significantly reduces gross domestic savings (% of GDP) by approximately 8.7 percent. This is consistent with the work of Keho, (2011); Bayar, (2014).
The two indicators for financial deepening; proxied by broad money (% of GDP) was positive and insignificant to gross domestic savings (% of GDP) in the first estimation but the domestic credit to private sector as a percentage of GDP) was negative but statistically significant to gross domestic savings in the second estimation. This shows that, the development of financial system in the African regions is not enough to stimulate domestic resource mobilisation. A coefficient of -0.0304 (for domestic credit to private sector as a percentage to GDP) implies that a proportionate increase in financial deepening in the region will lead to about 3 percent (%) reduction in gross domestic savings. Africa has one the lowest access to formal financial services of any developing region. According to Basu et al., (2004), in Ghana and Tanzania, only 5 to 6 percent of the population has access to the formal banking sector. Nissanke and Aryeetey (1998) also suggested reasons for the financial systems not been able to mobilise domestic resources and according to them, financial markets in Africa are highly fragmented and that high transaction costs for economic agents trying to move across different segments acts as a disincentive in savings mobilisation. This implies that governments in the region should pursue policies aimed at developing the financial system as well as expanding the access of it to the general masses since it facilitates the mobilization of savings. Also, there have been few innovative savings instruments developed with a view of reaching untapped segments of the financial systems. This point to the confidence that people have on the financial system given that majority of countries in the African region did not experience financial crises.

This result is consistent with the works of Masson et al. (1998); Loayza, Schmidt-Hebbel and Serven (1999); Soho and Dash (2013).
5.4.2 Financial Deepening and Growth

The second objective for this study is to investigate whether financial deepening has had a positive impact on growth of per capita income in Africa.

We first consider the estimated effects of the control variables as shown in Table 5.4.1

Lagged per capita growth is found to be positively and significantly related to current per capita income growth in both estimations which shows a clear indication of divergence among the regions in Africa. Thus, there is no evidence of countries in the region exhibiting convergence to a common steady growth path and as a result, the regions in Africa do not form a convergence. This finding is consistent with the findings of Zhang et al., (2012).

Government expenditure (% of GDP) has a negative and significant impact on growth in both estimations. A coefficient of -0.155 implies that a proportionate increase in government expenditure will reduce per capita income growth in the region by 15.5 percent (%). This means that, the increase in expenditure in the region is crowding out private investment which hampers economic growth. Thus, macroeconomic instability and a relative small private sector are harmful to growth. This result is consistent with the work of Barro, (1991)
Table 5.4.1: System GMM dynamic Panel estimation results (1998-2013)

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GDP Per Capita Growth</td>
<td>GDP Per Capita Growth</td>
</tr>
<tr>
<td>Lagged GDP Per Capita Growth</td>
<td>0.190***</td>
<td>0.106*</td>
</tr>
<tr>
<td></td>
<td>(0.0447)</td>
<td>(0.0563)</td>
</tr>
<tr>
<td>Broad Money (% of GDP)</td>
<td>0.0143</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0130)</td>
<td></td>
</tr>
<tr>
<td>Trade Openness (% of GDP)</td>
<td>3.842**</td>
<td>4.343**</td>
</tr>
<tr>
<td></td>
<td>(1.946)</td>
<td>(1.804)</td>
</tr>
<tr>
<td>Government Expenditure (% of GDP)</td>
<td>-0.155*</td>
<td>-0.150*</td>
</tr>
<tr>
<td></td>
<td>(0.0875)</td>
<td>(0.0903)</td>
</tr>
<tr>
<td>Inflation</td>
<td>0.0827*</td>
<td>0.111*</td>
</tr>
<tr>
<td></td>
<td>(0.0498)</td>
<td>(0.0638)</td>
</tr>
<tr>
<td>Government Revenue (% of GDP)</td>
<td>0.0616*</td>
<td>0.0644</td>
</tr>
<tr>
<td></td>
<td>(0.0341)</td>
<td>(0.0406)</td>
</tr>
<tr>
<td>Domestic Credit to Private Sector (% of GDP)</td>
<td>0.00720</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.00553)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.221</td>
<td>-0.0907</td>
</tr>
<tr>
<td></td>
<td>(1.061)</td>
<td>(0.916)</td>
</tr>
<tr>
<td>Observations</td>
<td>483</td>
<td>484</td>
</tr>
<tr>
<td>Number of ctry_code</td>
<td>41</td>
<td>42</td>
</tr>
<tr>
<td>Sargan Test (p-value)</td>
<td>0.930</td>
<td>0.940</td>
</tr>
<tr>
<td>AR(1) Test (p-value)</td>
<td>0.002</td>
<td>0.005</td>
</tr>
<tr>
<td>AR(2) Test (p-value)</td>
<td>0.483</td>
<td>0.314</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: The robust standard errors are in parentheses. AR (1) and AR (2) is a test for first and second-order serial correlation, which is asymptotically N (0,1) under the null of no second-order serial correlation. The significance levels at the 1%, 5% and 10% are identified by ***, ** and *, respectively.
Trade openness (% of GDP) has a positive and significant impact on per capita income growth in both estimations. Thus, a coefficient of 4.343 implies that as the region opens up its trade to the international markets, growth in GDP per capita increases by about 434 percent (%). This is consistent with classical view that free trade would promote economic growth and maximize world welfare (Salvatore, 1996). Indeed openness to trade provides access to imported inputs embodying new technologies, increase the size of market faced domestic producers, raising the returns to innovations and facilitates a country’s specialization in research incentive production. This result is consistent with Sakyi, (2011).

Inflation has a positive and significant impact on per capita income growth in both estimations. Thus, a coefficient of 0.111 implies that inflation in the region positively and significantly enhances economic growth by approximately 11 percent (%). Theoretically, a high inflation rate is expected to be deleterious to growth in GDP per capita as it raises the cost of borrowing which in turns dampens the rate of investment by the private sector and thus, decreases real output. While the result of the study suggests the reverse, it can be argued as being consistent with the structuralist view that inflation is essential for economic growth and therefore the positive effect. This assertion is based on the contention that inflation is a mechanism which induces forced savings. When most governments in the region finds that its fiscal system is inadequate, they resort to borrowing from the central bank to finance spending and this creates inflationary finance that increases capital movements necessary for economic growth (Jung & Marshall, 1986).

Turning to the financial deepening indicators, broad money (% of GDP) as well as domestic credit to private sector (% of GDP) were both positive as theoretically expected, but statistically insignificant. A coefficient of 0.0143 (for broad money as a percentage of GDP) implies that the
development of the financial sector in the region will increase per capita income growth by 1.4 percent (%). Thus, financial deepening has not stimulated growth at least in the short run for African regions. The reason for such outcome is, firstly, majority of countries in Africa are driven by natural resource endowments (like oil, cocoa, and gold) which generates foreign exchange for economic development. Secondly, most regions in Africa are characterized by low levels of deepening of their financial sector (Standley, 2010). For instance, the banking sector which is the dominant financial sector accounts for majority of financial assets and liabilities and therefore prone to excess liquidity, preference for government security and short term lending with maturity periods of less than a year. Thirdly, as a result of numerous banking crisis caused by the large proportion of non-performing loans in the region (which was found to exceed 50 percent of total loans in 2004 according to Daumont et al., (2004) in Benin, Cameroon, Cote D’Ivoire, Guinea, Senegal and Uganda), credits are not been given to private companies though this is essential for financing investment projects which intends affect growth positively in the long run. In 2005 for instance, the private sector credit as a ratio of GDP was 18 percent in Africa, compared with 30 percent in South Asia and 107 percent in high income countries according to Honohan and Beck (2007).

These factors in addition to low income levels, large informal sector as well as huge infrastructural gaps inhibit the effectiveness of the capital accumulation channels through which finance contributes to economic growth. These results also raises concerns on the effectiveness of financial reforms experienced in the region during the early 1990s. This result is consistent with Demetriades and Law (2006), Fadare (2010) and Effiong (2015).
5.4.3 Post Estimation Test Results

An autocorrelation test was conducted to test for the presence of autocorrelation in the model. The sargan test was then conducted to test for the validity of the instruments used in the model. All these tests are used to check the accuracy and robustness of the system GMM estimator. The results of these tests are reported in Table 5.4.

The autocorrelation test was conducted with the null hypothesis that there is no autocorrelation in the data set. A Sargan test, to check the validity of the instruments used was conducted with the null hypothesis that, the over-identifying restrictions are valid. From the results presented in Tables 5.4 and 5.4.1, the p-values are greater than 0.05, so we do not reject the null hypothesis and conclude that the over-identifying restrictions for both models are valid. The implication here is that the instruments used in the system GMM estimation are valid instruments and also the instruments as a group are exogenous.

5.5 Conclusion

The chapter analysed the panel dataset of 42 countries to investigate the impact of financial deepening on domestic resource mobilisation as well as growth in per capita income in the African region. The results were also presented and discussed in order to explain the findings and also facilitate comparisons with other related studies.

Before the estimation of the baseline regression, a unit root test was first conducted to ascertain the stationarity or otherwise of the dataset. The results of the fisher type, using the Augmented Dickey-Fuller (ADF) test confirmed the stationarity of panel dataset. In order to investigate the impact of financial deepening on domestic resource mobilisation and growth, the study
employed the System GMM dynamic panel estimation model. In order to appropriately employ this estimation method, the fixed effect model of the panel dataset was tested using the Hausman test and the results proved that the fixed effect model was appropriate. We then went on to estimate our System GMM model after we have tested for endogeneity in the model using the Durbin Wu-Hausman test for endogeneity.

The result of the System GMM model suggests that, financial deepening (as proxied by the ratio of broad money to GDP and domestic credit to the private sector to GDP) has not been able to stimulate domestic resource mobilisation and per capita income growth in Africa.
CHAPTER SIX
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.0 Introduction
This chapter presents the summary and conclusions of results as well as the findings of the study. Also, some recommendations for policy and further research are offered. The first section of this chapter looks at the summary and conclusions of the study while the subsequent section presents the recommendations of the study. The final section of this chapter entails the limitations of the study.

6.1 Summary and Conclusions
This study sought to investigate whether the deepening of the financial sector has been able to stimulate domestic resource mobilisation as well as growth in per capita income for a panel of 42 countries in the African region for the period 1998 - 2013. The study was motivated by mixed evidence from empirical literature on whether the development of the financial system has been able to stimulate domestic savings so as to reduce the regions’ over dependence of foreign resource mobilisation which in itself has some disadvantages.

The importance and determinants of savings and growth were reviewed in the study and based on the review of literature on the link between financial deepening and savings as well as financial deepening on growth, background to savings and growth behaviour in the African region, and the availability of data; an empirical model linking savings to its determinants and growth to its determinants were specified to include the impact of financial deepening in both models. Two different models were estimated with each model having two different estimations (with the indicators of financial deepening run separately). The variables employed in the study as determinants of savings and growth in the region were initial savings, initial growth, broad
money (% of GDP), domestic credit to the private sector(% of GDP), real interest rates, trade openness (% of GDP), age dependency, inflation, government revenue (% of GDP) and government expenditure (% of GDP). Two measures of financial deepening were employed in the study.

The results for the first model in table 5.4 indicate that, financial deepening has not been able to stimulate domestic resource mobilisation in the African regions. The results also indicate that, growth in income has a positive and significant relationship on savings suggesting that, the level of gross domestic savings in the African region grows with the increase in income. This supports Keynes argument that savings increases with income and not savings increasing with interest rate as suggested by McKinnon and Shaw theory.

Inflation and real interest rate have a negative impact on savings while age dependency exhibits a positive and significant impact on savings. The negative impact of real interest rate on savings confirms Keynes argument that savings depends on income rather than interest rate as suggested by McKinnon and Shaw. Thus, incomes in the region is low and because of that, people do not have enough to consume not to even talk of save. As a result, people will not want to save irrespective of the interest rate.

The results from the second model also found a positive but insignificant relationship between financial deepening and growth in Africa. While not surprising, the financial deepening in the region is generally low with a dominant banking system and characterized by excess liquidity. These results emphasizes that financial reforms has not achieve the desired deepening of the financial systems, let alone stimulate domestic savings and growth.
The results also indicated that, initial growth has a positive and significant impact on current growth which is a clear indication of divergence in the African regions.

The models in the study were subjected to a number of diagnostic tests for robustness. The results indicated that, the panel dataset were all stationary, endogenous test was conducted for all the variables, the instrument used were also valid (as per results from the Sargan test being insignificant), an autocorrelation test was also conducted and was insignificant and finally, a test for multicollinearity using the VIF among the regressors and found none.

6.2 Recommendations for Policy and Future Research

Based on the above estimations, findings and conclusions, the study recommends the following:

The positive but insignificant impact of financial deepening on domestic resource mobilisation means that the financial system in Africa has not been developed enough to increase domestic savings. Therefore, the ongoing financial sector reform in most of the regions in Africa needs to be intensified so that the financial sector can focus on its primary role of mobilizing and allocating resources.

In order to ensure an effective financial development and resource mobilisation, governments in the region should stabilize the macroeconomic environment. Thus, efforts should be made by governments in the region to improve the state of their economies in order to enhance the mobilization of domestic resources. Investment in domestic financial assets will only be successful if the domestic currency is stable, interest rates are positive and local banks and non-banking financial institutions are managed prudently and safely. This means that, governments in the region should reduce macroeconomic uncertainties by taming inflation towards growth-enhancing targets while promoting policies to reduce high lending rates on credits.
Based on the results of the study, we recommend the need to address the problem of persistent terms of trade instability in the region. Promotion of industrialization and export will make the region get out of the terms of trade instability as a result of greater dependence on primary product exports.

Again, institutional changes should be in the forefront of financial sector reforms in Africa. These should include a strong infrastructure that will provide for adequate information flow, credit appraisal and rating, and legal and accounting systems and development of equity financing. Firms’ vulnerability to interest rate shocks would then be reduced, allowing more room for interest rate liberalization.

Furthermore, deposit insurance schemes should be instituted to safeguard depositors. This will encourage savers to put more money at the bank which could be channeled to investors to produce more to increase the gross domestic product of GDP.

**General Recommendations**

Following from the key findings, we recommend caution in the choice of financial deepening indicators as policy instruments in the design and implementation of growth policies. On the basis of evidence, policies that improve access to affordable credits by the private sector, including small and medium enterprises as well as productive sectors, would propel the needed innovation and expansion in plant capacity in agriculture, industry and manufacturing to generate desired levels of employment, incomes and overall growth of the economies in the region.

Also, governments in the region should encourage financial institutions to extend financial services into the rural areas. The major impediment for financial institutions to settle in rural
areas is mainly the poor infrastructure in these areas, especially, poor road networks and lack of access to electricity. Governments should therefore focus on providing conducive and enabling environment where these financial institutions will find it easier and convenient to do business in these rural areas.

6.3 Directions for Future Studies

With regards to the current study, future works on the impact of financial deepening on domestic savings and growth should differentiate financial savings in the organized financial sectors from financial savings in the unorganized financial sectors.

Future studies should also look at whether the effect of financial deepening will be different for countries with different levels of economic development as well as the determinants of credit in the region.

6.4 Limitations of the Study

The study focused on investigating the impact of financial deepening on domestic resource mobilisation and growth in Africa. An important feature which has confronted most researchers especially in Africa is the availability of data. Only 42 African countries were selected for the study because of unavailability of data for some of the countries. This means that, some variables could have been omitted as a result of lack of available data.

Data on the variables are not consistently within the time frame, thus from 1990 to 2014 which was the original sample period of the study. As a result of that, the study has to settle on 1998 to 2013 as the study period and even with that, some countries still needed to be dropped. In fact, it worthy to emphasize here that, no country actually had consistent data on all the chosen variables for the period under study. This compelled the study to conduct the various estimations using an
unbalanced panel dataset. This can have an impact on the efficiency of the results of the study in ways that may be undesirable.
REFERENCES


International Monetary Fund. 2015. Regional Economic Outlook: Sub-Saharan Africa. Washington, D.C.


Keen, M. M. and M. T. Baunsgaard (2005). Tax revenue and (or?) trade liberalization, International Monetary Fund.


APPENDICES

Appendix A

List of African Countries Selected for the Study

<table>
<thead>
<tr>
<th>Country</th>
<th>Country</th>
<th>Country</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>Cote D'ivoire</td>
<td>Libya</td>
<td>Senegal</td>
</tr>
<tr>
<td>Benin</td>
<td>Equatorial Guinea</td>
<td>Malawi</td>
<td>Sierra</td>
</tr>
<tr>
<td>Botswana</td>
<td>Ethiopia</td>
<td>Mali</td>
<td>South Africa</td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>Gabon</td>
<td>Mauritius</td>
<td>Swaziland</td>
</tr>
<tr>
<td>Burundi</td>
<td>Gambia</td>
<td>Mauritania</td>
<td>Tanzania</td>
</tr>
<tr>
<td>Cameroon</td>
<td>Ghana</td>
<td>Mozambique</td>
<td>Togo</td>
</tr>
<tr>
<td>Cape Verde</td>
<td>Guinea</td>
<td>Morocco</td>
<td>Uganda</td>
</tr>
<tr>
<td>Chad</td>
<td>Guinea-Bissau</td>
<td>Namibia</td>
<td>Zambia</td>
</tr>
<tr>
<td>Comoros</td>
<td>Kenya</td>
<td>Niger</td>
<td>Zimbabwe</td>
</tr>
<tr>
<td>Congo DR</td>
<td>Lesotho</td>
<td>Nigeria</td>
<td></td>
</tr>
<tr>
<td>Congo Republic</td>
<td>Liberia</td>
<td>Rwanda</td>
<td></td>
</tr>
</tbody>
</table>

Stationary Test Results

Fisher-type unit-root test for s
Based on augmented Dickey-Fuller tests

<table>
<thead>
<tr>
<th>Statistic</th>
<th>p-value</th>
<th>Statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inverse chi-squared(84) P</td>
<td>0.0000</td>
<td>Inverse normal Z</td>
<td>0.0000</td>
</tr>
<tr>
<td>Inverse logit t(214) L</td>
<td>0.0000</td>
<td>Modified inv. chi-squared Pm</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.
**Fisher-type unit-root test for fd1**
Based on augmented Dickey-Fuller tests

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Number of panels</th>
<th>Avg. number of periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ho: All panels contain unit roots</td>
<td>42</td>
<td>14.19</td>
</tr>
<tr>
<td>Ha: At least one panel is stationary</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**AR parameter:** Panel-specific
**Panel means:** Included
**Time trend:** Included
**Drift term:** Not included

<table>
<thead>
<tr>
<th>Statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
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<td>Inverse chi-squared(84) F</td>
<td>96.5467</td>
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<td>Inverse normal Z</td>
<td>-0.1149</td>
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<tr>
<td>Inverse logit t(199) L*</td>
<td>-0.4213</td>
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<td>0.9680</td>
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P statistic requires number of panels to be finite, Other statistics are suitable for finite or infinite number of panels.

**Fisher-type unit-root test for fd2**
Based on augmented Dickey-Fuller tests

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<th>Avg. number of periods</th>
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<tr>
<td>Ho: All panels contain unit roots</td>
<td>42</td>
<td>14.36</td>
</tr>
<tr>
<td>Ha: At least one panel is stationary</td>
<td></td>
<td></td>
</tr>
</tbody>
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**AR parameter:** Panel-specific
**Panel means:** Included
**Time trend:** Included
**Drift term:** Not included

<table>
<thead>
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<td>Inverse normal Z</td>
<td>3.0335</td>
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<td>Inverse logit t(214) L*</td>
<td>2.7934</td>
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<tr>
<td>Modified inv. chi-squared Pm</td>
<td>-1.1905</td>
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P statistic requires number of panels to be finite, Other statistics are suitable for finite or infinite number of panels.

**Fisher-type unit-root test for growth**
Based on augmented Dickey-Fuller tests

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**AR parameter:** Panel-specific
**Panel means:** Included
**Time trend:** Included
**Drift term:** Not included

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<th>Statistic</th>
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<tr>
<td>Inverse chi-squared(84) F</td>
<td>501.5864</td>
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<td>Inverse normal Z</td>
<td>-15.2616</td>
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<td>Inverse logit t(214) L*</td>
<td>-20.7774</td>
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<td>Modified inv. chi-squared Pm</td>
<td>32.2175</td>
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P statistic requires number of panels to be finite, Other statistics are suitable for finite or infinite number of panels.
Fisher-type unit-root test for rir
Based on augmented Dickey-Fuller tests

Ho: All panels contain unit roots | Number of panels = 33
Ha: At least one panel is stationary | Avg. number of periods = 12.21

AR parameter: Panel-specific | Asymptotics: T -> Infinity
Panel means: Included | Cross-sectional means removed
Time trend: Included | ADF regressions: 0 lags
Drift term: Not included

<table>
<thead>
<tr>
<th>Statistic</th>
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</thead>
<tbody>
<tr>
<td>Inverse chi-squared(66)</td>
<td>P</td>
</tr>
<tr>
<td>Inverse normal</td>
<td>Z</td>
</tr>
<tr>
<td>Inverse logit t(164)</td>
<td>$L^*$</td>
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<tr>
<td>Modified inv. chi-squared Pm</td>
<td></td>
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</tbody>
</table>

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Fisher-type unit-root test for inf
Based on augmented Dickey-Fuller tests

Ho: All panels contain unit roots | Number of panels = 42
Ha: At least one panel is stationary | Avg. number of periods = 15.93

AR parameter: Panel-specific | Asymptotics: T -> Infinity
Panel means: Included | Cross-sectional means removed
Time trend: Included | ADF regressions: 0 lags
Drift term: Not included

<table>
<thead>
<tr>
<th>Statistic</th>
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<tbody>
<tr>
<td>Inverse chi-squared(84)</td>
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<tr>
<td>Inverse normal</td>
<td>Z</td>
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<tr>
<td>Inverse logit t(214)</td>
<td>$L^*$</td>
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<tr>
<td>Modified inv. chi-squared Pm</td>
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P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.
Fisher-type unit-root test for \( g_r \)
Based on augmented Dickey-Fuller tests

<table>
<thead>
<tr>
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<th>Number of panels = 42</th>
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<tbody>
<tr>
<td>Ha: At least one panel is stationary</td>
<td>Avg. number of periods = 15.07</td>
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</tbody>
</table>

AR parameter: Panel-specific
Panel means: Included
Time trend: Included
Drift term: Not included

<table>
<thead>
<tr>
<th>Statistic</th>
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<tr>
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<td>Inverse logit ( t(214) ) ( L^* )</td>
<td>-7.9038</td>
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<tr>
<td>Modified inv. chi-squared ( Pm )</td>
<td>10.4226</td>
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P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Fisher-type unit-root test for \( g_e \)
Based on augmented Dickey-Fuller tests

<table>
<thead>
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<th>Ho: All panels contain unit roots</th>
<th>Number of panels = 42</th>
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<tbody>
<tr>
<td>Ha: At least one panel is stationary</td>
<td>Avg. number of periods = 14.98</td>
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AR parameter: Panel-specific
Panel means: Included
Time trend: Included
Drift term: Not included

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<tr>
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<td>Inverse normal ( Z )</td>
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<td>Modified inv. chi-squared ( Pm )</td>
<td>5.5999</td>
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P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.
Fisher-type unit-root test for ad
Based on augmented Dickey-Fuller tests

Ho: All panels contain unit roots
Ha: At least one panel is stationary

AR parameter: Panel-specific
Panel means: Included
Time trend: Included
Drift term: Not included

Number of panels = 42
Number of periods = 14
Asymptotics: T -> Infinity
Cross-sectional means removed

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<tr>
<td>Inverse logit t(179)</td>
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<td>Modified inv. chi-squared</td>
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P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Multicollinearity Test

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<tr>
<th>Variable</th>
<th>VIF</th>
<th>1/VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>fd1</td>
<td>2.94</td>
<td>0.340405</td>
</tr>
<tr>
<td>ad</td>
<td>2.10</td>
<td>0.477249</td>
</tr>
<tr>
<td>fd2</td>
<td>1.93</td>
<td>0.518198</td>
</tr>
<tr>
<td>rir</td>
<td>1.12</td>
<td>0.896369</td>
</tr>
<tr>
<td>inf</td>
<td>1.11</td>
<td>0.903186</td>
</tr>
<tr>
<td>growth</td>
<td>1.03</td>
<td>0.970112</td>
</tr>
</tbody>
</table>

Mean VIF 1.70

<table>
<thead>
<tr>
<th>Variable</th>
<th>VIF</th>
<th>1/VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>ge</td>
<td>1.02</td>
<td>0.331411</td>
</tr>
<tr>
<td>gr</td>
<td>2.89</td>
<td>0.340656</td>
</tr>
<tr>
<td>fd1</td>
<td>2.24</td>
<td>0.447279</td>
</tr>
<tr>
<td>fd2</td>
<td>2.02</td>
<td>0.495864</td>
</tr>
<tr>
<td>tot</td>
<td>1.23</td>
<td>0.812628</td>
</tr>
<tr>
<td>inf</td>
<td>1.03</td>
<td>0.972220</td>
</tr>
</tbody>
</table>

Mean VIF 2.07
Hausman Test

Fixed-effects (within) regression  Number of obs  =  337
Group variable: ctry_code  Number of groups  =  33

R-sq: within  =  0.4676  Obs per group: min  =  1
between  =  0.9310  avg  =  10.2
overall  =  0.7825  max  =  13

\[ F(7, 297) = 37.26 \]
\[ \text{Prob} > F = 0.0000 \]

corr(u_i, Xb)  =  0.7064

| \( s \) | Coef. | Std. Err. | t  | P>|t| | [95% Conf. Interval] |
|---|---|---|---|---|---|
| L1. | .5790088 | .0395353 | 14.65 | 0.000 | .501204 .6568136 |
| fd1 | -.2421638 | .1304568 | -1.86 | 0.064 | -.4989006 .0145731 |
| fd2 | .0178282 | .1631937 | 0.11 | 0.913 | -.3033343 .3399908 |
| growth | -.1005737 | .1323845 | -0.76 | 0.448 | -.3611041 .1599567 |
| inf | -.0315428 | .0746923 | -0.42 | 0.673 | -.178536 .1154503 |
| ad | -.1347408 | .189741 | -0.71 | 0.478 | -.508148 .2386664 |
| rir | -.091749 | .0458321 | -2.00 | 0.046 | -.1819459 -.001552 |

\_cons 25.12199 16.56572 1.52 0.130 -7.479088 57.72306

\( \sigma_u \) 12.114258
\( \sigma_e \) 11.58118
\( \rho \) .5224857 (fraction of variance due to \( \mu_i \))

F test that all \( u_i = 0 \):  \( F(32, 297) = 3.56 \)
\[ \text{Prob} > F = 0.0000 \]
### Random-effects GLS regression

| Coefficients | Std. Err. | z | P>|z| | 95% Conf. Interval |
|---------------|-----------|---|------|-------------------|
| s             | 0.8957933 | 0.0252103 | 35.53 | 0.0000 | 0.846382 to 0.9452046 |
| L1            | -0.067287 | 0.0561203 | -1.22 | 0.2208 | -0.1067725 to 0.0122015 |
| growth        | 0.381153  | 0.1183924 | 3.19  | 0.0015 | 0.146189 to 0.616036 |
| rho           | 0          |           |      |       |                     |
| sigma_e       | 11.58118  |           |      |       |                     |
| sigma_u       | 0          |           |      |       |                     |
| rir           | -0.047562 | 0.038936  | -1.24 | 0.2144 | -0.124123 to 0.030999 |
| _cons         | 15.98543  | 7.000564  | 2.28 | 0.0233 | 2.264574 to 29.70628 |
|                |            |           |      |       |                     |
|                |            |           |      |       |                     |

### Coefficients

<table>
<thead>
<tr>
<th>Coefficients</th>
<th>(b)</th>
<th>(B)</th>
<th>(b-B)</th>
<th>sqrt(diag(V_b-V_B))</th>
</tr>
</thead>
<tbody>
<tr>
<td>s</td>
<td>0.5790088</td>
<td>0.8957933</td>
<td>-0.3167845</td>
<td>0.0304546</td>
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<tr>
<td>L1</td>
<td>-0.2421638</td>
<td>-0.0967287</td>
<td>-0.145435</td>
<td>0.1177688</td>
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<tr>
<td>growth</td>
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<td>-0.0005062</td>
<td>0.0183344</td>
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<td>rho</td>
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<td>sigma_e</td>
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<td>sigma_u</td>
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<td>-0.1353867</td>
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<td>0.1759333</td>
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<td>rir</td>
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<td>-0.0476756</td>
<td>-0.0440733</td>
<td>0.0285676</td>
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</tr>
</tbody>
</table>

### Test: Ho: difference in coefficients not systematic

\[ \text{ch2}(7) = (b-B)'[(V_b-V_B)'^{-1}](b-B) \]

\[ = 130.84 \]

\[ \text{Prob > chi2} = 0.0000 \]

(V_b-V_B is not positive definite)