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FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH IN SUB-SAHARAN AFRICA: A PANEL DATA APPROACH

By: Yabibal Mulualem Walle

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"Financial Development and Economic Growth in Sub – Saharan Africa: A Panel Data Approach."

By

Yabibal Mulualem

Approved by the Board of Examiners:

Gebreliwot Ageba **Advisor**	**Signature**
Alemayehu Geda **Examiner**	**Signature**
Brixiova Z. **Examiner**	**Signature**

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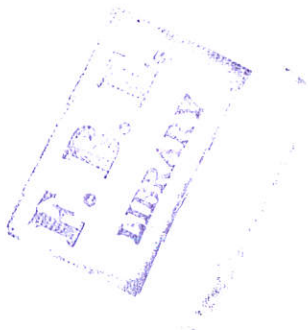

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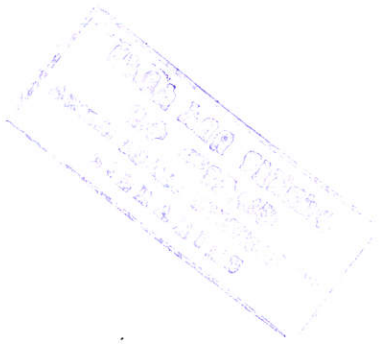

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List of Acronyms

CPI	Consumers Price Index
CREDIT	Credit to the Private Sector as a ratio of GDP
DLA	Total Factor Productivity Growth
DLGDP	Logarithmic Growth Rate of Per Capita GDP
DLKPC	Logarithmic Growth Rate of Per Capita Capital
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
IFS	International Financial Statistics
IMF	International Monetary Fund
KPC	Capital Per Capita
M1	Currency plus demand deposits
M2	M1 plus saving deposits and small time deposits
M3	M2 plus large time deposits, Eurodollars
OLS	Ordinary Least Squares
SSA	Sub- Saharan Africa
UNESCO	United Nations Education, Science and Culture Organization
VAR	Vector Autoregressive
WDI	World Development Indicators

Abstract

The impact of financial development in economic growth remains to be controversial despite intensive research on the issue. Moreover, the correlation between financial development and the level of economic development is not clear. This, along with the lack of econometrically strong empirical studies, is the motive to undertake a separate study in SSA.

Using a panel data set of 27 SSA countries for the period 1974-2003, three different growth models are estimated by the systems GMM estimator that is found to be effective in solving the problems of endogeneity and omitted variable bias, which are common in pure cross-country regressions. We obtained a negligible support to the view that finance leads economic growth. Though financial development is found to positively influence physical capital growth in SSA, its insignificant impact on Total Factor Productivity has led financial development be unimportant factor for economic growth. This may reflect the smallness of the financial sector and the repressive financial policies, which were common in the region.

Hence, policy measures geared towards improving the efficiency promoting role of the financial sector should be given due emphasis if the economy is to benefit from financial development.

Introduction

1.1 Background of the Study

The literature -both the theoretical and empirical- is inconclusive on the issue of whether financial development promotes economic growth. Schumpeter (1912) argues that the services provided by financial intermediaries are of paramount significance for technical innovation and economic growth. A number of economists like McKinnon (1973), Shaw (1973), Fry (1978, 1995), and the World Bank (1989) view financial development as playing a key role in the process of economic growth. They emphasize that the financial system through its capacity to mobilize savings, evaluate projects, manage risks, monitor managers, and facilitate transactions increases the level of investment and enhances the allocative efficiency of investment. The Bank states: "*efficient financial systems help to grow partly by mobilizing additional financial resources and partly by attracting those resources to the best uses.*"(World Bank, 1989)[1]

But, there are other famous economists who are doubtful of the view that finance plays any major role in economic development. Robinson (1952) argues that finance do not bring economic growth, rather it simply responds to economic growth saying, "*where enterprise leads finance follows.*" And more recently, Lucas (1988) states, "*the importance of financial matters is very badly over-stressed.*" Thus, finance is viewed as handmaiden to enterprise by responding to the demand for the particular types of financial services generated by economic development.

The third group of economists claims a bi-directional relationship between financial development and economic growth- financial markets develop as a consequence of economic growth that in turn feed back as a stimulant to real growth (Patrick, 1966[2]; endogenous growth models of Greenwood and Jovanovic, 1990).

[1] In general the channels through which financial development is argued to bring economic growth are: increasing the volume of investment and promoting allocative efficiency of investment.

[2] Patrick (1966) is known to be the first to postulate a bi-directional relationship between financial development and economic growth and to give the names "demand following" and "supply leading" hypotheses.

Even though a number of empirical studies, supported by a great advancement in the econometric methodology, have been undertaken to solve the theoretical controversy, they usually end up supporting one or two of the three categories making the debate still active in the academic circle. Recent interest in the area was motivated by the coming of new growth theories which managed to explicitly incorporate financial intermediation in the growth model (Pagano, 1993).

The empirical investigation takes usually three strands of methodology: single cross-country regressions, time-series analyses and dynamic panel data approaches. The cross-sectional analysis takes the precedence as a number of works like the World Bank (1989), and the most influential one by King and Levine (1993a) popularized the method first. These studies employed single cross-section regressions using averaged data for long periods of 25 or 30 years. And most of them concluded that higher levels of financial development are significantly correlated with faster current and future rates of growth. King and Levine (1993a) illustrate *"higher levels of financial development are significantly and robustly correlated with faster current and future rates of economic growth, physical capital accumulation, and economic efficiency improvements...finance seems importantly to lead economic growth."*

However, several economists have reservations on conclusions put forwarded by cross-sectional evidence because single cross-section regressions suffer from omitted variable bias and potential biases induced by endogeneity (Arestis and Demetriades, 1996, 1997[3]; Hoeffler, 2000; Ram, 1999; Anderson and Tarp, 2003).

It is in an attempt to address these econometric shortcomings of the single cross-country regressions that time-series applications for individual countries become prevalent in the finance-growth debate. Some of the time-series evidences are also in conformity with the conclusions of the cross-country regressions that financial development plays a role in economic growth (Arestis and Demetriades, 1997). Yet, bi-directional causality is a common result in such studies. However, there are also other time-series studies that find a negligible role of the financial sector on economic growth. Demetriades and Hussein (1996), using data

[3] Arestis and Demetriades (1997) have done an excellent survey of the empirical evidence and strongly argued that cross-country regressions are far from satisfactorily solving the finance-growth nexus and recommend a time-series approach.

from 16 countries obtain "*little support to the view that finance is a leading sector in the process of economic development.*" Rather, they get a significant support of bi-directionality and some evidence of reverse causation. Luintel and Khan (1999) obtain bi-directional causality in all the 10 countries they examine while Boulila and Trabelsi (2004) find a support from Middle East and North African countries to the hypothesis that causality runs only from the real to the financial sector, making the debate inconclusive.

The other cluster of empirical studies tries to capitalize on recent developments in the dynamic panel data analysis like the Generalized Method of Moments (GMM) and managed to incorporate both cross-sectional and time-series variations in the data in addition to avoiding endogeneity and omitted variable biases. Levine et al. (2000) notes that the '*exogenous*'[4] component of financial development is positively associated with economic growth and financial development might influence growth via improvements in technology (through better allocation of savings) or via a more rapid capital accumulation (by increasing domestic savings rates and attracting foreign capital). Benhabib and Speigel (2000) obtain a positive correlation between indicators of financial development and both total factor productivity growth and investment. Moreover, panel data analysis is recently used to test for the causality issue. Calderon and Liu (2003) employ the Geweke decomposition test on pooled data of 109 countries and concluded that while financial development generally leads to economic growth, bi-directional causality is also obtained from the Granger causality test. Nevertheless, there are some panel data studies like Anderson and Tarp's (2003) that showed a negligible finance-growth association.

The above synopsis demonstrates that theoretical predictions and existing empirical evidences regarding the finance-growth nexus are inconclusive and mixed necessitating further studies backed by advancements in econometric methodology.

[4] 'Exogenous' component of financial development is that portion of financial development which created deliberately in advance of the demand for financial assets, liabilities or services and econometrically, once the model accounts for the problem of endogeneity, the remaining effect of financial development is assumed to be the exogenous part of financial development (see for e.g., Levine et al., 2000; Beck et al., 2000)

1.2 Statement of the Problem

A separate study of the finance-growth link on Sub-Saharan Africa (henceforth SSA) is justified by two basic reasons. The first is the fact that economic theory is ambiguous on the issue of whether the effectiveness of financial development in promoting economic growth depends on the level of economic development. There are some who argue that, financial development occurs endogenously as the economy reaches a critical threshold of economic development (Deidda, 2006) while others contend that countries at their early stage of development benefit more from financial development (McKinnon, 1973; Fry, 1995). Interestingly, there are empirical studies that support both of these opposing views. Xu (2000) finds that 9 of the 14 from countries with negative (27 showed positive) long-term effects of financial development on economic growth are concentrated in Africa geographically and in the low and middle-income group economically. In sharp contrast to Xu's finding, Odedokun (1996) concludes from his study that *"the growth-promoting effects of financial intermediation are more predominant in low-income than in high-income LDCs; and the growth-promoting effects of financial intermediation are practically invariant across the various regions of the globe."*

The second motive is the disagreement on the view that determinants of economic growth for Africa are similar to those for the world. Since Barro's (1991) finding of a negative African dummy, there are many like Masanjala and Papageorgiou (2003), who claim that "*Africa Does Grow Differently*"-Africa's growth determinants are different from text book growth factors. However, this view is not acceptable by others like Hoeffler (2000)[5], who argue that with the advancement in dynamic panel data analyses, Africa's growth can sufficiently be explained by textbook growth determinants. This controversy necessitates a separate testing of growth hypotheses by African data before accepting or rejecting them.

A few studies have been undertaken to see the finance-growth link in SSA. Ghirmay (2004) has employed a time-series analysis taking 13 countries (selected by having time-series data for at least 28 years) and found a long-term relationship between finance and growth in 12 of the 13 countries and bi-directional causality in 6 of the countries. Nevertheless, as the sample

[5] Hoeffler (2000) argues that the Systems GMM estimators, after Blundell and Bond (1998), can explain the African Dummy.

is small and not representative, his conclusions are far from being generalized to all SSA countries.

Utilizing averaged data from 1980 to 1990 for a single cross-section regression, and applying OLS, Ndebbio (2004) gets a positive impact of financial deepening on economic growth. But, we have seen earlier that cross-sectional analysis is highly criticized for introducing endogeneity and omitted variables bias. Moreover, he uses M2 to GDP ratio as a measure of financial deepening which was common in earlier studies but recognized later (Demetriades and Hussein, 1996; Ghirmay, 2004) as being inappropriate for it measures the extent to which transactions are monetized than the degree of financial intermediation. Consequently, as Demetriades and Hussein (1996) noted, a rising ratio of broad money to GDP may be common at an early stage of economic development in which barter transactions are being replaced by market exchange and the positive results in the above study may not be surprising.

Ndikumana (2000) conducts a much better study that tries to see the impact of financial development on domestic investment in a sample of 30 SSA countries. Using the GMM estimators, he finds a positive relationship between domestic investment and different indicators of financial development. Yet, it is a study to see the impact of financial development on domestic investment and then the impact on economic growth is only implicitly shown.

Findings show that the main channel of transmission from financial development to growth is the efficiency, rather than the volume, of investment (De Gregorio and Guidotti, 1995; Benhabib and Speigel, 2000; Beck et al., 2000). De Gregorio and Guidotti (1995) explain, "*approximately one-fourth of the effect of CREDIT on growth is transmitted through the volume of investment, while the remaining three fourths reflect the effect of CREDIT on the efficiency of investment.*" Hence, in finding the net effect of financial development on economic growth, the result from the investment equation cannot substitute the growth equation.

In sum, from the existing empirical studies, the finance growth link in SSA is not satisfactorily established. It is the intent of this research to draw a more acceptable conclusion

on the issue by applying the systems GMM estimators (after Blundell and Bond, 1998) on a balanced panel data of about 27 SSA countries for the years 1974-2003.

1.3 Objectives of the Study

The main objective of the study is to examine whether or not financial development promotes economic growth in SSA countries using a dynamic panel data approach. Besides, the study has the following specific objectives.

- To see the impact of financial development on economic growth in SSA countries.
- To investigate whether or not financial development brings about a growth in the rate of physical capital accumulation.
- To look into the effect of financial development on Total Factor Productivity.

1.4 Research Hypotheses

The study has the following three hypotheses to be tested:

a) The exogenous component of financial development is positively related to economic growth in SSA countries.

b) Financial development significantly determines the growth in the rate of physical capital accumulation.

c) Financial development improves the efficiency through which savings are allocated to best investment opportunities in the countries.

1.5 Methodology and Data Source

Following Levine et al. (2000), Beck et al. (2000) and Benhabib and Speigel (2000), we utilize the GMM dynamic panel estimators, which, in addition to introducing cross-country and time-series information, are specifically designed to address the econometric problems induced by unobserved country specific effects and joint endogeneity of the explanatory variables in lagged dependent variable models, such as growth regressions. Moreover, we exploit the advantage Systems GMM estimators (after Arellano and Bover, 1995 and Blundell

and Bond, 1998) exhibit over Difference GMM estimators (after Arellano and Bond, 1991) in explaining growth empirics.[6]

We pull together a panel data set of 27 countries, selected by data availability, where the data is averaged over each of the six 5-year intervals for the period 1974-2003. Averaging data in growth regressions is very important to eliminate business cycle effects (Bond et al., 2000; Levine et al., 2000; Calderon and Liu 2003).

The dependent variables are measures of economic growth (for hypothesis 1), capital per capita growth (for hypothesis 2) and productivity growth (for hypothesis 3). The regressors include the ratio of credit to the private sector, the level of financial intermediary development, along with a broad set of variables that serve as conditioning information.

We follow Beck et.al (2000), and Calderon and Liu (2003) to construct measures of economic growth, capital per capita growth and productivity growth. First, we calculate real per capita GDP growth (DLGDP) as the logarithmic rate of growth for each of the 5-year periods in the panel data. Second, we use investment data to generate capital stock data and then the growth rate of the physical capital stock per capita (DLKPC). Finally, our measure of the productivity growth is consistent with the neoclassical production function with physical capital (K) and labor (L). Assuming a capital share of 0.3, Total Factor Productivity (DLA) is given by: DLA=DLGDP-0.3*DLKPC.

In this study, we use the ratio of domestic credit to the private sector to GDP as a proxy for the degree of financial intermediation. According to Levine et al. (2000), it corresponds to credit granted to the private sector as a fraction of GDP: we henceforth refer to this variable as CREDIT. The main advantage of CREDIT over other monetary aggregates is that because it excludes credit to governments, government agencies, and public enterprises, it represents more accurately the role of financial intermediaries in channelling funds to private market participants. This is the definition of financial intermediation that should be more closely related to the level and efficiency of investment, and hence to economic growth. Higher

[6] Bond et.al (2000) showed that large finite sample biases occur in the first difference GMM estimators in empirical growth models as output is persistent series and the number of the time-series observations is made small to avoid modeling cyclical dynamics.

CREDIT is interpreted as an indication of more financial services and therefore greater financial intermediary development.

A number of control variables are included in the growth equation: initial income level, initial human capital, a measure of government size, inflation and a measure of openness to international trade. The convergence effect is captured by the lagged per capita GDP (initial income), whereas the level of human capital is proxied by the literacy rate. The ratio of government spending to GDP is used as a measure of the debated role of government consumption in the economy (Calderon and Liu, 2003), and the ratio of imports and exports to GDP as a measure of international trade openness. Inflation is also another control variable.

1.6 Significance of the Study

This study is hoped to contribute to the unsettled debate over the finance-growth nexus in general and may give a better insight to the issue in SSA. In addition, it may carry an important policy implication. If an exogenous component of financial development is positively correlated with economic growth, as a means to draw the countries out of the lower economic growth trap, attempts to develop the financial sector have to be given due emphasis. If not, resources being devoted to exogenously developing the financial system should be directed to other growth enhancing sectors.

1.7 Limitations of the Study

Lack of long time-series data for financial development measures and basic control variables has led us select only 27 countries out of the 48 SSA countries. On the one hand, this means a loss of degrees of freedom that makes some of the coefficients insignificant. On the other hand, it makes the Hansen test of over identification very weak forcing us to use only the first appropriate lags of the covariates as instruments. Moreover, the data on capital stock is not readily available for such a long time period, even for developed countries. As a result, we are forced to generate the capital stock data from investment data using one of the suggested ways of creating capital stock data. Hence, results that are based on this generated or unreal capital stock data should be considered only as suggestive.

1.8 Organization of the Thesis

The second chapter reviews the theoretical and empirical literature on financial development and economic growth in the world and in Africa. The third chapter specifies the theoretical and econometric models while the fourth estimates the models and interprets the results. The last concludes.

2 Review of the Literature

This chapter is devoted to a survey of the literature surrounding the finance-growth linkage. The first part, defines financial development, and discusses the historical developments in the theoretical debate on the issue, the main functions of the financial system, and the channels through which these functions may affect the general economy. Moreover, theories that predict a possible causation from development in the real sector to that in the financial sector are also briefly surveyed.

The second part of this chapter focuses on the survey of empirical studies on the subject. Here, the evidence is reviewed in separate sub-sections that are classified according to the econometric methodology employed in each study.

2.1 Survey of the Theoretical Literature

2.1.1 What is Financial Development?

Financial institutions such as commercial banks, savings and loan associations, credit unions, insurance companies, mutual funds, and pension funds are intermediaries between primary lenders and borrowers. According to Fry (1995), financial intermediaries perform two major economic functions. First, they create money and administer the payments mechanism. Second, they bring together savers and investors, lenders and borrowers. As a result financial intermediation can be defined as " *the activity of obtaining funds from lenders to pass on to borrowers"*(Fry, 1995). The question is: what is financial intermediary development or simply financial development?

That in the real world making transactions (Benston, 1976) and acquiring information (Leland and Pyle, 1977)[7] are costly is behind the emergence of financial markets and institutions, and different mix of information and transaction costs motivates distinct financial contracts, markets and institutions. According to Levine (2005), financial development occurs when financial instruments, markets, and intermediaries ameliorate – though do not necessarily

[7] Leland and Pyle (1977) argue that informational asymmetries may be a primary reason that intermediaries exist, though transaction costs could also explain intermediation.

eliminate – the effects of information, enforcement, and transactions costs and therefore do a correspondingly better job at providing the financial functions that he classified into five categories. To be more precise, financial development involves improvements in the (i) production of ex ante information about possible investments, (ii) monitoring of investments and implementation of corporate governance, (iii) trading, diversification, and management of risk, (iv) mobilization and pooling of savings, and (v) exchange of goods and services.

This means that to have a better concept of financial development, it is imperative to understand the five major functions of financial markets, institutions, and assets. As different economists stress different financial functions, we find it useful to discuss these functions jointly with the historical survey of the theoretical development in the finance- growth nexus.

2.1.2 A Brief Historical Survey of the Theoretical Development

Though the debate on the role of financial services on the real economic growth became very active in the last two decades with the coming of endogenous growth models, the importance of financial services in promoting economic growth was recognized by economists at least as early as the time of Schumpeter (1912). Schumpeter stresses that it is a must for the entrepreneur to get credit to produce real out put .To use his words, "*one can only become an entrepreneur by previously becoming a debtor... What (the entrepreneur) first wants is credit. Before he requires any goods whatsoever, he requires purchasing power. He is a typical debtor in capitalist society.*"[8]

However, many years had to pass before economists building on Schumpeter's view strongly argue that more developed financial markets promote economic growth through mobilizing savings and facilitating investment (Gurley and Shaw, 1955; Patrick, 1966; Goldsmith, 1969; McKinnon, 1973; Shaw, 1973). McKinnon (1973) and Shaw (1973) forwarded the so called 'liberalization thesis' contending that government interventions in the financial system adversely affect the quantity and quality of investment. The World Bank (1989) also supports

[8] Schumpeter's (1912) explanation as to the importance of financial intermediaries in economic development is also worth quoting here: " *The banker, therefore, is not so much primarily the middleman in the commodity 'purchasing power' as a producer of this commodity. However, since all reserve funds and savings to-day usually flow to him, and the total demand for free purchasing power, whether existing or to be created, concentrates on him, he has either replaced the private capitalists or become their agent; he has himself become the capitalist par excellence. He stands between those who wish to form new combinations and the possessors of productive means... He is the ephor of the exchange economy.*"

these liberal views by stressing the roles of the financial system as, "*efficient financial systems help to grow, partly by mobilizing additional financial resources and partly by attracting those resources to the best uses*"(World Bank, 1989).

All these works, however, as Pagano (1993) notes, lack analytical foundations which renders due importance for the use of endogenous growth models. The recent revival of interest in the finance growth-nexus comes from the implications of endogenous growth models that show that there can be self-sustaining growth without exogenous technical progress and that the growth rates can be related to preferences, technology, income distribution, and institutional arrangements. This, as Pagano (1993) puts, "*provides the theoretical underpinning that early contributors lacked: financial intermediation can be shown to have not only level effects but also growth effects.*"

A number of endogenous growth models are constructed to demonstrate how financial development affects economic growth and different models emphasis different functions of the financial sector in promoting economic growth. Greenwood and Jovanovic (1990) present a model in which both financial development and economic growth are endogenously determined. They emphasise two functions of financial intermediaries in fostering economic growth: (1) collecting and analysing information that lets investors' resources flow to their most profitable use, and (2) pooling risks across large numbers of investors thereby allowing individuals to obtain both a higher and a safer return.

Bencivenga and Smith (1991) build another model in which the development of financial intermediaries ameliorate liquidity risk, i.e., help an economy minimize the fraction of its savings held in the form of unproductive liquid assets and then channel such funds towards illiquid but more productive activities. Moreover, the importance of portfolio diversification and risk sharing via stock markets in inducing sustained growth is also suggested in other growth models (e.g. Levine, 1991; Saint-Paul, 1992).

The model by Saint-Paul (1992) highlights the role played by financial markets in providing an insurance against risk for investors helping them choose a technology which is risky but productive against poorly productive but 'flexible' technologies.

King and Levine (1993b) suggest another importance of financial intermediaries: they may also facilitate the rate of technological innovation by identifying those entrepreneurs with the best chances of successfully initiating new goods and productive processes.

Greenwood and Smith (1995) model the connection between exchange, specialization and innovation. They assume that more specialization requires more transactions and financial arrangements that lower transaction costs will facilitate greater specialization. Consequently, markets that promote exchange encourage productivity gains and hence economic growth.

Levine (2005) has a detailed survey of this theoretical literature in which he generally classifies the basic growth enhancing functions of the financial system as:

1. Producing information ex ante about possible investments and allocate capital (Schumpeter, 1912; Greenwood and Jovanovic, 1990; King and Levine, 1993b).

2. Monitoring investments and exert corporate governance after providing finance. To the extent that shareholders and creditors effectively monitor firms and induce managers to maximize firm value, this will improve the efficiency with which firms allocate resources and make savers more willing to finance production and innovation (Diamond, 1984; Bencivenga and Smith, 1993).

3. Facilitating the trading, diversification and management of risk. High return projects tend to be riskier than low return risks. Yet, savers in general do not like risk. Thus, financial markets that make it easier for people to diversify risk may result in a portfolio adjustment towards more risky but profitable projects (Gurley and Shaw, 1955; Patrick, 1966; Greenwood and Jovanovic, 1990; Saint-Paul, 1992). In addition, financial services may also mitigate liquidity risks thereby increasing investment in high return illiquid assets (e.g. Bencivenga and Smith, 1991) and share intertemporal risks which may reduce premature liquidity of projects and thereby foster investment in longer gestation, high return projects (Levine, 2005).

4. Mobilizing and pooling savings. This is the costly process of agglomerating capital from disparate savers for investment. Levine (2005) summarizes the main problems

in mobilizing savings in to two: (a) overcoming transaction costs of collecting savings from different individuals, and (b) overcoming the informational asymmetries associated with making savers feel comfortable in relinquishing control of savings. Financial systems that are more effective at pooling savings can affect economic growth by increasing savings, exploiting economies of scale, overcoming investment indivisibilities, and even improving resource allocation and boosting technological innovation.

5. Ease the exchange of goods and services. The model by Greenwood and Smith (1995) underscores that financial systems reducing transaction costs may encourage technological innovation as innovation demands specialization that entails an increased number of transactions.

2.1.3 Measuring Financial Development

The first common indicator of financial development is the ratio of some broad measure of the money stock, usually M2, to the level of nominal GDP or GNP (e.g. Gelb, 1989; World Bank, 1989). This is in line with McKinnon's (1973) outside money[9] model in which the accumulation of real money balances is necessary before self-financed investment can take place. It is, however, less in line with the debt-intermediation approach developed by Gurley and Shaw (1955) and Shaw (1973) and the endogenous growth literature (Greenwood and Jovanovic, 1990; Bencivenga and Smith, 1991; King and Levine, 1993a). This is because a large component of the broad money stock in developing economies is currency held outside the banking system. The latter has more to do with the extent to which transactions are monetized than with the degree of financial intermediation (Demetriades and Hussein, 1996). In principle, a rising ratio of broad money to GDP may reflect more extensive use of currency rather than an increase in the volume of bank deposits. This may be common at an early stage of economic development in which barter transactions are being replaced by market exchange. Hence, it may not accurately gauge the performance of the financial sector in delivering different functions like risk management and information processing (King and Levine, 1993a).

[9] Any money that on net is an asset of the private economy is *outside money*. This includes currency, bank reserves and high-powered money or money base. However, most money in modern economies is *inside money*, which is simultaneously an asset and liability of the private sector. Inside money takes the form of bank deposits, which are an asset to their holders and a liability of the banks (Blanchard and Fischer, 1989).

In addition to the above measure, we mention below the four measures of financial development that King and Levine (1993a) used and subsequently become very common in the empirical literature. As in Goldsmith (1969) and McKinnon (1973), Levine et al. (2000), Beck et al. (2000), King and Levine (1993a) used LIQUID LIABILITIES, which is meant to measure the size of financial intermediaries, as the first indicator. It equals liquid liabilities of the financial sector (currency plus demand and interest bearing liabilities of banks and non-bank financial intermediaries) divided by GDP. Even though it is broader, the fact that it still consists of currency, which is criticized earlier for measuring the degree of monetization than financial intermediation, is the major weakness of this measure. In addition, LIQUID LIABILITIES 'double counts' by including deposits of one financial intermediary in another (Levine et al., 2000).

The second, labelled BANK, is intended to show the relative degree to which the central bank and commercial banks allocate credit. It equals the ratio of bank credit divided by bank credit plus central bank domestic assets. The assumption behind constructing this measure is that commercial banks are more likely to provide the above-mentioned functions than central banks. The fact that it excludes financial development outside the banking sector and banks may simply lend to the government or public enterprises are demerits of this measure.

The intuition that a financial system which lends its resources to the government and state-owned enterprises may not have the power and the motivation to evaluate managers, select profitable investment projects, pool risks and provide financial services in the same degree as financial systems that allocate credit to the private sector is behind the third and fourth measures. PRIVATE, the third indicator that equals the ratio of claims on the non-financial private sector to total domestic credit (excluding credit to money banks), measures the proportion of credit allocated to private enterprises by the financial system. The last, PRIV, equals the ratio of claims on the non-financial private sector to GDP. Again, neglecting the non-bank financial sector is a weakness of these two indictors.

2.1.4 Transmission Channels

This section examines the possible channels through which the above-mentioned functions of the financial system may affect economic growth. The famous channels in the literature are:

via increasing the amount of savings and hence, volume of investment (capital accumulation) and by promoting the efficiency through which these resources are allocated (technological innovation). The Bank succinctly puts them as, "*efficient financial systems help to grow, partly by mobilizing additional financial resources and partly by attracting those resources to the best uses.*" (World Bank, 1989) [10]

In analytically tracing the exact channels, endogenous growth models[11] are of great significance. Pagano (1993) manages to explicitly demonstrate the possible avenues of transmission in the following growth equations.

He considers the simplest endogenous growth model-the 'AK'[12] style growth model (Romer, 1986; Lucas, 1988 and Rebelo, 1991), where aggregate output (Y) is a linear function of the aggregate capital stock (K).

$$Y = AK_t \quad \ldots\ldots (1)$$

, where A is the technological parameter.

Assuming that the population is stationary and the economy produces a single good that can be invested or consumed and, if invested capital depreciates at the rate of δ per period, gross investment then equals

[10] It has to be noted that this argument assumes competitive financial systems that may not be the case in many developing countries. Yet, the possibility that inefficient financial systems may still perform better in allocating resources than absence of financial systems needs to be assessed empirically.

[11] According to endogenous growth models (e.g. Romer, 1986; Lucas, 1988; Rebelo, 1991; Romer, 1990, Grossman and Helpman, 1991; Aghion and Howitt, 1992), permanent changes in certain policy variables have permanent effects on the rate of economic growth. This view stands in marked contrast to the neoclassical growth model of Solow (1956), in which long run economic growth depends only on exogenous technological progress.

[12] These Y= AK or simply AK models are endogenous growth models which imply a linear relationship between capital per worker and output. According to these models, both capital and output can increase forever and savings and investment determine the rate of growth. This absence of diminishing returns to capital is the key difference between AK models and the Solow model. However, AK models follow two underlying frameworks. Some like Romer (1986) assume productivity to be an increasing function of capital stock that exactly offsets the decreasing returns of capital in the output equation thereby producing a linear relationship between capital and output. Others assume K to be a composite of physical and human capital as in Lucas (1988), and the possibility that investments in physical and human capital can generate externalities and productivity improvements that exceed private gains by an amount sufficient enough to offset diminishing returns, leading to the same implications as the first class of AK models.

$$I_t = K_{t+1} - (1-\delta)K_t \quad \ldots\ldots (2)$$

In a closed economy with no government, capital market equilibrium requires that gross saving S_t equals gross investment I_t. The fraction $(1-\phi)$ of the saving goes to banks as the spread between lending and borrowing rates, and to the securities, brokers and dealers as commissions, fees and the like.

Hence,

$$\phi S_t = I_t \quad \ldots\ldots (3)$$

From (1), the growth rate at time $t+1$ is $g_{t+1} = {Y_{t+1}}/{Y_t} - 1 = {K_{t+1}}/{K_t} - 1$

Using equation (2) and dropping the time indices, the steady state growth rate can be written as,

$$g = A{I}/{Y} - \delta = A\phi s - \delta \quad \ldots\ldots (4)$$

, where in the second the capital market equilibrium condition (3) is used and the gross saving rate ${S}/{Y}$ is denoted by s.

The model, like other AK models, shows that steady-state growth rate depends positively on the savings rate and negatively on the depreciation rate, neither of which had any effect on long-run growth in the Solow (1956) model. Besides, the fact that the level of technological efficiency, A, which is now endogenously determined in the model, has an effect on the growth rate has an important implication that government actions aimed to improve technological efficiency may affect growth rate[13]. Unlike other AK models, Pagano's (1993) model, however, includes ϕ, the proportion of savings funnelled to investment, as a determinant of long run economic growth rate.

[13] Different varieties of endogenous growth theories and extensions of the AK models incorporate two basic common assumptions: the existence of positive externalities and increasing returns. Spillovers occur when the accumulation of an input has an unintended positive effect on productivity. For instance, Arrow (1962) proposed that a firm could make more productive use of capital when aggregate stock of capital is higher because people learn collectively through experience. He called this effect "learning by doing". Hence, productivity increases as capital is accumulated, calling for investment-promoting policies. Similarly if we assume that productivity increases as human capital is accumulated (e.g., Lucas, 1988), an implication of the resulting model would be that subsidies to human capital could bring economic growth. Other models emphasize knowledge, research or ideas as having spillover effects and increasing returns and thus becoming an important source of economic growth. These models imply due attention to research and development.

What is the relevance of this model to financial development? Equation (4) shows precisely how financial development can affect growth: (1) it can raise ϕ, the proportion of savings funnelled to investment; (2) it may increase A, the social marginal productivity of capital; (3) and it can influence s, the private saving rate. Having such an analytical insight, let us expound on the two channels underlined by the literature.

2.1.4.1 Increasing the Volume of Investment

This refers to the role of financial development in reducing leakages of resources during financial intermediation, $(1-\phi)$ in Pagano's (1993) model, and to their function in raising private saving rates (s).

These roles, particularly of increasing private saving rates, are emphasized in the 'liberalization thesis' by McKinnon (1973) and Shaw (1973) which stresses that interest rates are artificially held down by government intervention and saving rate is lowered as a result (because of lack of incentive on the part of the savers). Liberalizing the financial sector and working towards financial development is, therefore, seen as playing a vital role in influencing volume of investment, and hence economic growth.

On the other hand, Roubini and Sala-i-Martin (1992) note that financial intermediaries are often burdened by taxation and restrictive regulations, translating into higher unit margins $(1-\phi)$. As a result, financial development reduces this leakage (raises ϕ) thereby increasing the out put growth rate g.

Because this argument depends mainly on the assumption that investment matters for economic growth, it will be important at this point to briefly discuss the link between investment and economic growth. And to see the link, it is better to emphasize that investment is the main determinant of capital stock. At any point in time, investment increases capital stock while depreciation decreases it. Hence, the question becomes whether capital stock affects economic growth rate. In the Solow (1956) model, only the exogenous technological progress is the source of steady-state economic growth and capital accumulation does not

have any impact in the long run economic growth. This is because of the diminishing returns to capital accumulation. So, only countries that are below their steady-state level of capital stock can achieve a higher economic growth rate as capital stock increases because of investment. Endogenous growth models, however, show that capital accumulation can affect steady-state economic growth. In models that assume the learning-by-doing effect of Arrow (1962), for instance, a higher accumulation of capital stock improves productivity, which is a major source of growth in both the Solow model and the endogenous growth models. In all Y=AK models, for instance, growth in per capita output is the sum of growth in productivity and growth in capital per worker.

For developing countries like SSA countries, which are expected to be far below their steady-state level of capital stock, investment promotes economic growth both in the Solow model and endogenous growth models.

2.1.4.2 Improving the Efficiency in Resource Allocation

This corresponds to increasing A, the social marginal productivity of capital in Pagano's model. One of the earliest clear focuses on this channel is found in Goldsmith (1969) who argues, *"Irrespective of whether or not the existence and development of financial superstructure increases the aggregate volume of saving and investment and thus accelerates the rate of economic growth beyond what would have otherwise been, there is no doubt that it results in, a different allocation of capital expenditures among and within sectors, types of tangible assets and regions"*.

Most of the endogenous growth models stress more on this channel than that of increasing the volume of investment. For example, Greenwood and Jovanovic (1990) underscore the informational role of financial intermediaries that enable investors to choose the most profitable projects and also emphasise the risk pooling function by financial intermediaries with large portfolio to unscramble the aggregate productivity shock, thus helping savings to be allocated to more risky but productive projects.

2.1.5 Causality in the Finance–Growth Nexus

The literature survey thus far focused on how financial services affect real economic growth. It is silent, however, on the possibility of reverse causation i.e., whether or not growth in real economic activity assists the development of financial markets and intermediaries.

An earlier discussion of this idea of reverse causation is found in Robinson (1952) who considers finance as a handmaiden of the real sector saying, *"when enterprise leads finance follows"*. Yet, it is Patrick (1966) who explicitly discussed the two views and brought the debate on causality into the front. Building on him, we can have at least three phenomena.

2.1.5.1 Supply Leading Phenomenon

This is what we are trying to examine in this study i.e., whether 'exogenous' financial development brings economic growth. Patrick (1966) used this term (Supply Leading Phenomenon) to refer to *"the creation of financial institutions and the supply of their assets, liabilities and related financial services in advance of demand for them."* We follow Levine et al. (2000) and Beck et al. (2000) to call this phenomenon 'exogenous' financial development. From the McKinnon (1973)-Shaw (1973) model to the World Bank (1989) the belief that the exogenous creation of financial sector brings economic growth has taken due emphasis. The Bank states, *"It is widely asserted that building deeper and more sophisticated financial systems can contribute significantly to economic performance"*(World Bank, 2001). In addition, following ample support from empirical evidences (which we will see later in section 2.2.), it is evident that policy makers *"prioritise now more emphatically financial strengthening"* (Arestis et al., 2006).

2.1.5.2 Demand Following Phenomenon

This Patrick's (1966) labelling is meant to represent the perspective that *"the demand by investors and savers in the real economy for financial services is responsible to the existence of modern financial institutions, their financial assets and liabilities, and related financial*

services." According to this view, the financial sector passively responds to the demand in the real sector. As noted earlier, Robinson (1952) is of this view.

The policy implication of this perspective is that we do not have to spend much time and energy establishing institutions associated with financial development as the demand can simply create them and deliberate or exogenous actions cannot be met by growth in economic activity.

2.1.5.3 Bi-Directional Causality

The third possible view in the finance-growth nexus is bi-directional causality, that financial development propels economic growth through its crucial functions mentioned earlier while the process of growth has a feed back effect on financial institutions by creating incentive for further financial development (Goldsmith, 1969; and most of the endogenous growth models we reviewed in section 2.1 including Greenwood and Jovanovic, 1990; Bencivenga and Smith, 1991; Saint-Paul, 1992).

For instance, in the model by Greenwood and Jovanovic (1990), financial intermediation promotes economic growth because it allows a higher rate of return to be earned on capital while growth in turn provides the means to implement costly financial structures. According to these models, economic growth reduces the importance of fixed costs associated (incurred in joining the financial market) thereby facilitating the creation and expansion of more financial institutions.

Patrick has a bit different form of bi-directional causality that is referred to by others as 'stage of development hypothesis' (Calderon and Lui, 2003). In this hypothesis, supply-leading financial development can induce real capital formation in the early stages of economic development. However, as the financial and economic development goes on, the supply leading roles of financial services diminish gradually to be eventually dominated by demand following development.

2.1.6 Skepticism on the Role of Financial Development

That financial development -all the efficient functions of financial institutions and assets- stimulate economic development is not the whole story. Rather, there is a good deal of skepticism on the issue.

The first is the perspective that financial development should not be considered as one of the determinants of growth as either it is a passive agent that simply responds to the demand created by the real economic growth (the *demand following* hypothesis of Patrick, 1966; Robinson, 1952) or the relationship between the two is not significant at all. These views are also reflected recently by economists like Lucas (1988) who say, "*financial matters are badly overstressed*". Similarly, Chandavarkar (1992) holds the same view arguing, "*none of the pioneers of development economics, including three Noble Laureates even lists finance as a factor in development*".

The other skeptic, but a bit stronger, position is that financial development can have a negative impact on economic growth. This is the 'neostructuralists' (see Fry, 1995 for a broader discussion of this school of thought) view that in economies where curb markets are dominant enough to finance much of the economies' investments, the development in the formal financial system will lower the supply of investible resources available in the informal sector that raises the curb market rate leading to a lower level of investment and hence slow economic growth (Van Wijnberger, 1983; Buffie, 1984). In addition, the higher curb market rate raises the price level because a rise in the curb market rate increases the cost of working capital.

On the other hand, formal financial institutions are subject to regulatory reserve and liquidity requirements while the curb markets are not. So, the formal financial market, unlike the curb market that gives full intermediation, provides partial intermediation because the reserves are not available for lending and constitute a leakage in the process of financial intermediation. As a result, the total supply of funds for lending, and hence economic growth is likely to decline (Buffie, 1984; Taylor, 1983; Van Wijnberger, 1982). These arguments explain why neostructuralists are against the 'financial liberalization' thesis: "*Once we allow for repercussions in the curb market, financial liberalization becomes a perilous undertaking*" (Buffie, 1984).

However, their arguments can easily be attacked as informal creditors also hold some portion of the savings as a form of deposit insurance. It is known that depositors want to make sure that their creditor (whether formal or informal) is not going to fail and they, by any means, are able to claim back their deposits. One way of insuring the deposits, common in the informal sector, is to seize a portion of the deposits as a buffer, leading to a less than full financial intermediation. Another, which works only in the formal credit market, is to put a segment of the deposit in the central bank as reserve requirements so that the central bank serves as a " *lender of last resort"* and protects serious financial crises such as bank runs (Diamond and Dybvig, 1983). Diamond and Dybvig (1983) indicate that government provision of deposit insurance can produce superior contracts, as the government is not constrained by resources offering "*unconditional guarantee*". Moreover, other forms of leakages are common in the informal sector owing to their lower institutional capacity to monitor borrowers and enforce loan contracts that obliges them to lend only to a relatively fewer borrowers and a smaller amount of loan (Bisley, 1994).

The endogenous growth models on the issue have also shared some of this concern by establishing cases where financial development may negatively affect economic growth.

In his analytical model we discussed in section 2.1.4, Pagano (1993) has pointed cases where financial development may lower s, private saving rate, and as a result the economic growth rate. The first is the fact that diversifying portfolios through securities markets can reduce rate-of-return risk. This, with constant relative risk aversion utility function of savers lowers savings if the risk aversion coefficient is above 1. This effect plagues most of the endogenous growth models we discussed thus far since in most of them one effect of financial intermediation is more efficient risk sharing, which can reduce the saving rate (depending on the relative magnitudes of the income and substitution effects) and thus at least partly offset the growth enhancing effect of more efficient resource allocation (productive investment).

Bencivenga and Smith (1991) acknowledge that, "it *is far from clear that economies with better developed banking systems necessarily have higher saving rates than other economies.*" Yet, even after allowing for this problem in their model, they conclude that financial intermediation can result in higher equilibrium growth rates, even though its development need not tend to raise saving rates.

2.2 Review of the Empirical Literature

Owing to the availability of broader macro economic data, cross-country regressions meant to distinguish the significant determinants of growth have become common since the work of Barro (1991). This development in the debate over the determinants of growth supported by the coming of endogenous growth models that lend analytical tools allowed economists to produce a vast body of empirical literature on the finance-growth nexus in the last two decades.

These studies generally revolve around three issues.

1. Whether or not the exogenous component of financial development stimulates economic growth (with out discussing on the possibility of reverse causation),
2. Solving the causality issue, and
3. Tracing the channels of transmissions.

On the other hand, broadly divided, the following methodologies have been employed to examine the above issues.

1. Pure cross-country growth regressions,
2. Time-series individual country case studies, and
3. Dynamic panel data approaches.

Moreover, later studies try to distinguish between debt finance and equity finance-development in the banking sector vis-à-vis the development in the stock market (see Levine, 2005, for a broad survey of this literature). Nevertheless, this review will largely ignore the evidences related to stock markets since, in most of SSA-which is the focus of this study, they are at their infant stage and financial development can sufficiently be represented by the development in the banking sector.

In addition, it has to be noted that much of the motivations for each newer study stems from either the advancement in econometric methodology or from the availability of a broader or different data set. As a result, we would prefer to organize the survey of the empirical literature according to the econometric approaches followed in each study.

2.2.1 Pure Cross-Country Growth Regressions

The earliest organized attempt to provide empirical evidence for the finance-growth nexus is that of Goldsmith (1969). After compiling the data for 35 countries over the period 1860-1963 on the value of financial intermediary assets as a share of economic output (commonly called Liquid Liabilities), he tried to show that this variable rises as countries develop. Nevertheless, he restrained to show his stand on the causality issue. In general, though path breaking, a number of questions can easily be raised in his study as he did not try to solve either the causality or the channels in addition to not systematically controlling other factors influencing growth.

The work done by King and Levine (1993a) is probably the most prominent cross-country study on the issue. They have brought a tremendous improvement on Goldsmith and other earlier attempts by:(1) broadening the data base to include 77 developing and developed countries over the period 1960-1989;(2) controlling other factors affecting economic growth;(3) employing four different measures of financial development, namely: Liquid Liabilities, Bank, Private and Priv[14];(4) attempting to solve both the issue of causality and transmission channels.

They also compute three economic growth indicators averaged over the period 1960-1989 as dependent variables, namely:(1) average rate of real GDP per-capita growth;(2) average rate of growth in the capital stock per person;(3) total factor productivity growth, which is a 'Solow residual' defined as real per-capita GDP growth minus 0.3 times the growth rate of capital stock per person.

Applying Ordinary Least Squares (OLS) estimation, two sets of conclusions are put forwarded by King and Levine (1993a). The first is the presence of a strong contemporaneous relationship between financial development and the growth indicators i.e. statistically significant coefficients on the three regressions for each dependent variable. Moreover, in their attempt to test whether current levels of financial development predict future economic growth, they get a positive result that leads to the second conclusion that *"...the predetermined component of financial development is a good predictor of long run growth*

[14] The four measures of financial development employed by King and Levine (1993a) are discussed in section 2.1.3.

over the next 10 to 30 years.... Thus finance does not only follow economic activity, and the strong relationship between the level of financial development and the rate of economic growth does not simply reflect a positive association between contemporaneous shocks to both finance and economic development."

Again, notwithstanding the great improvement up on earlier works, qualifications have been raised on the work of King and Levine (1993a).

1. The econometric drawback of cross-country growth regressions is well documented in the literature (Caselli et. al., 1996; Hoeffler, 2000; Bond et. al., 2001). Particularly, there is a possibility for the presence of omitted variable bias since unobserved country specific fixed effects cannot be accounted for in cross-sectional regressions. In addition, these regressions may be affected by endogeneity of the explanatory variables as most theories predict that financial development and economic growth are endogenously determined. Even when the problem of endogeneity for financial development is treated, joint endogeneity of all the explanatory variables remains to be a problem such regressions.

2. The fact that finance predicts economic growth cannot be interpreted as finance causes growth. Hence, causality is not addressed in the study.

3. Like many other studies we will see later, they have ignored financial development out side the banking sector.

The other cross-country study worth noting here is the one by De Gregorio and Guidotti (1995) who try to supplement earlier studies with a broader data set for about 100 countries over the period 1950-85 and utilizes a better methodological approach of estimating the growth equation over the full and disaggregated sample of high, low and middle income countries as well as different time periods. Among the four measures of financial development, they opt for the ratio of credit transferred to the private sector to GDP (called CREDIT in their analysis) arguing that as compared to other measures it represents the actual volume of funds channelled to the private sector and therefore it is "*more directly linked to investment and economic growth.*"

To account for potential endogeneity, they use the value of CREDIT measured around 1960 though they acknowledge that this approach does not capture the dynamic interaction between financial development and growth and warn that the empirical results should be interpreted cautiously, suggestive of general correlations than causality.

Applying OLS estimation, De Gregorio and Guidotti (1995) obtain that CREDIT is positively correlated with growth in the large cross-country sample, but the impact tends to be lower in high-income countries than low-income countries and in the time period over 1970-1985 than 1960-85. This may reflect, as recognized by De Gregorio and Guidotti (1995), the inability of CREDIT to capture financial development outside the banking industry that high-income countries exhibited in the 1970s and 1980s.

A somewhat strange methodology is employed by De Gregorio and Guidotti (1995) in their attempt to trace the exact channels of transmission. They conjecture that the coefficient of CREDIT should increase substantially when investment is excluded as an explanatory variable from the growth regression if the main channel of transmission is the volume of investment. Accordingly, the increase in the coefficient of CREDIT from 0.018 to 0.024 when investment is removed from the equation is interpreted as only one-fourth, (0.024-0.018)/ (0.024), of the effect of CREDIT on growth is transmitted through the volume of investment, while the remaining three-fourth reflects the effect of CREDIT on efficiency of investment.

De Gregorio and Guidotti's (1995) contribution in providing new insights that the impact of financial development on economic growth may vary across regions and time is appreciable. The problems of endogeneity and biasedness that plague cross-county growth regressions remains unsolved putting caveats on the results, however.

2.2.2 Evidence from Panel Data

The empirical literature on finance and growth has benefited from the advances in the dynamic panel data analysis, particularly from the coming of the so-called *difference* Generalized Method of Moments (GMM) estimator by Arellano and Bond (1991) and *systems* GMM estimator of Arellano and Bover (1995) and Blundell and Bond (1998).

Using panel data and these estimators improves on pure cross-section growth regressions in at least three aspects.

First, the introduction of cross-sectional and time-series variability in the data supplies a good deal of information that helps to obtain more precise estimates. Second, the estimators avoid potential biases associated with cross-country regressions, since in cross- country regressions the unobserved country specific effect is part of the error term that, due to the correlation between the country-specific term and the explanatory variables, results in biased coefficient estimates. First differencing the regression equation eliminates the country specific effect, hence the name *difference* GMM estimator (Arellano and Bond, 1991).

Third, by allowing the use of instrumental variables for all regressors, it controls for any potential endogeneity and provides more precise estimates of the finance-growth linkage. The *system* GMM estimator, which is first proposed by Arellano and Bover (1995) and later developed by Blundell and Bond (1998), performs very well in this respect by jointly estimating the regression in levels and in differences so that the likelihood that weak instruments bias the estimated coefficients and standard errors is significantly reduced.

Levine et al. (2000), Beck et al. (2000), Benhabib and Spiegel (2000), and Calderon and Lui (2003) are among the well-known panel data applications in the area.

Levine et al. (2000) examines the relationship between the three measures of financial development (liquid liability, bank, and private credit to GDP ratio, separately) and the rate of economic growth in a panel data for 74 developed and developing countries over the period between 1960-1995(the data are averaged over each of the seven 5-year interval). Applying the *system* GMM estimator, they find a significant positive effect of all the proxies of financial development on the growth rate of real GDP.

In addition, in an attempt to have a consistency check on panel findings, Levine et al. (2000) also apply a cross-sectional estimator on the data set for 71 countries that are averaged over the period 1960-1995 so that there is one variable for each country. Unlike earlier cross-sectional analyses, they use one instrumental variable to extract the exogenous component of financial development. For this purpose, the national legal origin which is supposed to

strongly influence the functioning of the financial system, but which is reasonably exogenous (as it is historically given by occupation or colonization from English, French, German or Scandinavian) is found to be most appropriate. The results are very similar to the panel data analysis that the exogenous component of financial development is positively and robustly linked with economic growth.

Utilizing the same data set and methodology as Levine et al. (2000), Rioja and Valev (2004) extend the analysis to distinguish among regions of lower, medium and higher levels of financial development. They find an uncertain impact of financial development on economic growth in regions of lower financial development while a positive result is found in the intermediate region. The positive effect declines further as financial development becomes higher. As a result, they question the validity of studies that incorporate countries of varying stage of financial development in one analysis.

Applying the same systems GMM estimator and instrumented cross-section estimator in a similar data set for 63 countries but focusing on the relationship between financial development and the sources of growth (productivity growth, physical capital accumulation and savings), Beck et al. (2000) obtain strong and robust relationship between all indicators of financial intermediary development and total factor productivity growth. Yet, the relationship between physical capital growth rate and private saving rate is not robust to alternative specifications and use of different financial development indicator. Specifically, only private credit to GDP ratio has a robustly positive impact. This result is in line with the cross-sectional result by De Gregorio and Guidotti (1995) that improvement in efficiency than capital accumulation is the most important channel through which functions of the financial system affect economic growth.

Benhabib and Spiegel (2000) use all the four financial development measures used by King and Levine (1993a) in their effort to explore the link between financial development and economic growth, total factor productivity growth, and physical and human capital accumulation. They use GMM panel estimators. However, they do not use the systems GMM estimator described above that allows for endogeneity of all the regressors. In addition, they do not systematically control for further growth determinants.

That different indicators of financial development are linked with different components of growth is their main finding. While only the ratio of private sector liabilities to GDP has a fairly robust impact on total factor productivity growth, the relative size of the banking sector (BANK) is found to be the only one to significantly explain growth in both the physical and human capital accumulations with and with out the inclusion of country specific fixed effects. Notwithstanding the limitation in the methodology, their study raises an important qualification that Levine (2005) persistently argues, *"...it is difficult to measure financial development and link empirical constructs with theoretical concepts."*

Another panel data evidence, but with a different estimation method, is that of Calderon and Lui (2003) which utilize Geweke (1982) decomposition test on a data set of 109 countries over the period 1960-1994 to test the causality issue, an issue that has largely been neglected by other cross-sectional and panel data applications. Using M2 per GDP ratio or the ratio of credit to the private sector to GDP does not have a significant difference in all their analyses, which is against most studies on the area (King and Levine, 1993a).

The causality from financial development to economic growth is the only direction obtained to be significant regardless of the sample of countries used (either a group of 22 industrial countries, or a group of 87 developing countries or the total sample). Bi-directional causality is obtained when the sample is split into developing and industrial with the demand following relationship getting stronger in industrial countries. Moreover, financial development has exhibited a better causal contribution on economic growth in developing countries than in industrial. This implies that financial development brings economic growth at a lower level of economic growth. However, this is against some Granger causality tests like Xu (2000), which found a weaker and even a negative causality from finance to growth in lower income countries. Supporting earlier studies, in Calderon and Lui (2003), financial development enhances economic growth more through technological changes than through rapid capital accumulations, even though the impact through both channels is confirmed.

2.2.3 Time-Series Evidences

The methodological limitations of the pure cross-country growth analysis has also called for a substantial amount of time-series econometric applications on individual country basis which frequently use the Granger causality tests and the vector autoregressive (VAR) procedures to

examine the nature of finance-growth linkage (e.g., Demetriades and Hussein, 1996; Arestis and Demetriades, 1997; Xu, 2000).

While considering small number of countries remains a problem in generalizing time-series evidences to other countries, the smallness in the sample size has on the other hand allowed researchers to examine individual countries in depth, test a variety of financial development measures and employ more powerful econometric techniques.

In their study on 16 middle-income countries with at least 27 years data, Demetriades and Hussein (1996) use both the ratio of bank deposits (M2-M1) to GDP and the ratio of bank claims on the private sector to GDP. They find bi-directional causality in most of the countries, and contrary to cross- country evidences very little support to the view that finance causes growth.

Similarly, although they are interpreted as a result of strict government control and delay in implementation of financial reforms, very little support to the supply leading hypothesis but a better support to the demand following hypothesis is found in Boulila and Trabelsi (2004) who explore the causality issue in 16 countries from the Middle East and North Africa region over the period 1960-2002. The results are robust to the use of three different measures of financial development namely: the ratio of M3 to GDP, the ratio of credit to the private sector to GDP and the ratio of M3 minus M1 to GDP.

As output from bi-variate models can be seen in caveats for the probable existence of model misspecification, multi-variate analysis has also been undertaken. In their multivariate VAR model that includes the ratio of M2-M1 to GDP lagged one period, per capita GDP, real interest rate and real per capita capital stock for ten countries for a time span of 36 to 41 years, Luintel and Khan (1999) obtain bi-directional causality in all the sample countries taken.

On the other hand, Xu (2000) in a multivariate VAR approach examines the relationship between investment, GDP and the ratio of liquid liabilities (M2 minus currency) to GDP for 41 countries over the period 1960-1993. As opposed to the above time-series studies, the results show strong evidence that financial development is important to economic growth both

in the short term and long term and investment is an important channel. Still, 14 of the 41 countries display negative long-term cumulative effects of financial development on economic growth and investment. Most of these countries with negative effect are concentrated in Africa geographically and in low and middle-income group, economically. This is in sharp contrast to both the theoretical hypothesis (Patrick, 1966; Deidda, 2005) and some empirical findings (Odedokun, 1996) that financial development has a better growth promoting effect at a lower stage of economic development. In addition many countries are able to turn their short-term negative effects into long-term one, explaining a better long run impact of financial development. However, his model does not say anything about the impact of financial development on total factor productivity growth.

- Ghirmay (2004), selecting 13 Sub- Saharan African countries based on having a long time-series data of at least 28 years and using the ratio of credit to the private sector to GDP as a measure of financial development, employs a VAR analysis in which he obtains evidence of financial development causing economic growth in eight countries, economic growth causing financial development in nine countries and bi-directional causality in six countries, which renders the issue of causality unsolved. Yet, it can at least be used as an indication that finance has a positive effect in economic development in some of SSA countries. This is in direct contradiction to the outcome by Xu (2000), which stress that most of the countries with negative impact of financial development on economic growth are concentrated in Africa. Their usage of different measures of financial development and different data set, as they have only four countries in common[15], may be one reason to explain their contradicting results.

More recently, Christopoulos and Tsionas (2004) have noted that many time-series studies yield unreliable results due to the short time spans of typical data sets. Thus, they use panel unit root tests and panel co-integration analyses to examine the relationship between financial development and economic growth in ten developing countries to yield causality inferences within a panel context that increases sample size. They find strong evidence in favour of the hypothesis that long-run causality runs from financial development to growth and that there is no evidence of bi-directional causality.

[15] Ghirmay (2004) studies on Benin, Cameroon, Ethiopia, Ghana, Kenya, Malawi, Mauritius, Nigeria, Rwanda, South Africa, Tanzania, Togo, and Zambia while Xu (2000) includes Benin, Burkina Faso, Central Africa, Congo, Egypt, Ghana, Madagascar, Mauritania, Mauritius, Morocco, Niger, Nigeria, Senegal, Sudan and Togo.

In sum, time-series evidences are much more mixed than those of cross-section and panel data. The relatively shorter time-series data, differences in model specification, and deviations in the kind of financial development indicators employed in the studies may be some of the reasons to explain such an inconclusive result.

2.2.4 Review of Studies on Sub-Saharan Africa

Albeit the lack of conclusion on the exact effect, both the theoretical and empirical literature surveys indicate that the impact of financial development may depend on the level of economic growth already achieved (Deidda, 2005; Patrick, 1966; Xu, 2000; Odedokun, 1996). In addition, the institutional set up, particularly the legal origin, of the countries under consideration is noted to affect the finance-growth nexus (Levine, 2004). Therefore, studies for specific regions and even specific countries are found to be of paramount significance in solving the confusions in the area.

Directly or indirectly, a few studies have been undertaken to see the finance-growth link in SSA. As discussed in section 2.2.3, in a time-series analysis, Xu (2000) observes that 9 of the 14 from countries with negative (27 showed positive) long term effects of financial development on economic growth are concentrated in Africa while Ghirmay (2004), unlike Xu (2000), finds a long term relationship between finance and growth in 12 and bi-directional causality in 6 of the 13 SSA countries considered.

In a pure cross-sectional analysis, Ndebbio (2004) utilized averaged data from 1980 to 1990 for a sample of SSA countries using the ratio of M2 to GDP as a measure of financial deepening. Usage of M2 to GDP ratio might be misleading as it measures the extent to which transactions are monetized than the degree of financial intermediation (Demetriades and Hussein, 1996; Ghirmay, 2004) and may be more misleading when applied to least developed countries as a rising ratio of broad money to GDP may be common at an early stage of economic development in which barter transactions are being replaced by market exchange (Demetriades and Hussein, 1996).

Ndikumana's (2000) trial to see the impact of financial development on domestic investment in a sample of 30 SSA countries is unique quite unusual in the literature. Using a panel data over the years 1970 to 1995, he estimates a fixed effects investment model with different

measures of financial development included. Positive effects are found supporting the theory that investment might be one channel of transmission for the effect financial development may have on growth. The fact that most of the indicators of financial development contain the volume of credit channelled to investors and that these credits are most likely to be invested with smaller leakages may make the positive association between these indicators and the volume of investment unsurprising, however.

On the other hand, both the theoretical predictions and empirical findings indicate that the main channel of transmission for the effect from financial development to economic growth is the efficiency, rather than the volume, of investment (Pagano, 1993; Gregorio and Guidotti, 1995; Benhabib and Speigel, 2000; Levine, 2004). Unfortunately, there is no study, as to my knowledge, that tried to see the impact of financial development on the total productivity or efficiency of factors of production in SSA.

In sum, the existing empirical studies, either contain very small number of countries, like time-series studies, or exhibit serious methodological problems (like cross-country studies) calling for further studies to satisfactorily establish the finance growth linkage in SSA. It is the intent of this research to draw up a more acceptable conclusion on the area by applying the Systems GMM estimators (after Blundell and Bond, 1998) on a panel data of 27 SSA countries for the years 1974-2003.

2.2.5 Major Findings

From the above empirical literature survey, the following major findings can be highlighted.

1. There is a problem in measuring financial development. Different measures of financial development utilized in the empirical studies gauge different aspects of the financial system. As a result, comparing studies that utilize different financial development indicators may be misleading. In general it has to be emphasized as Levine (2005) says that *"it is difficult to measure financial development and link empirical constructs with theoretical concepts."*

2. Notwithstanding the above measurement problem and a variety of econometric drawbacks in each sort of analysis, that financial development positively and

significantly affects economic growth seems to be a common result emerging out of most of the studies.

3. Less has been attempted to trace the possible channels through which the various functions of the financial sector affect the growth of the economy. However, studies undertaken so far demonstrate that improving the efficiency through which resources are allocated may be the main channel while results are mixed regarding the improvement in the rate of capital accumulation (which the theory predicts to be another channel).

4. Further researches that are backed by improvements in econometric methodology with better financial development measures are needed to further widen our knowledge about the causality issue in the finance-growth nexus and the possible channels of transmission.

3 Methodology and Data Source

In this chapter, the empirical growth model is specified, various measurement issues and data sources of the variables in the model are discussed and the econometric methodology applied in the study is explained.

3.1 Model Specification

Regarding the way empirical models are set up, there are two broadly divided classes of studies in the literature surrounding the finance-growth nexus. The first group of studies tries to build up on the existing neoclassical growth models so that financial development is incorporated as one determinant of growth in addition to the text book growth factors such as initial level of capital, population growth, investment to GDP ratio and in some studies which follow the human capital augmented growth models, a measure of human capital (Odedokun, 1996; Benhabib and Spiegel, 2000). While the main strength of such studies is their conformity with the theoretical foundation, their inability to include a broad set of conditioning in the equation[16] makes it more likely that the contribution of finance to economic growth will be biased and the ceteris paribus conclusion difficult to be reached.

The second group of studies, and in fact most of the studies on the issue, simply incorporate some measure of financial development with a broad set of conditioning variables in the growth equation. In general, their model looks like the following.

Growth = f (Finance, Conditioning Variables) (Levine et al., 2000)

These models are criticized as lacking " *a framework with standard theoretical underpinnings*" (Odedokun, 1996). As a result, the choice which approach to follow seems to be a trade off between following a consistent framework at a cost of potential bias for lack of full control and building a broader conditioning set so as to isolate the ceteris paribus effect of finance on growth at a cost of losing a firm backing from the theoretical foundation.

[16] This is because most models emphasize on very few variables and a bigger model incorporating all the possible growth factors is lacking in the main stream growth literature

This study joins the second group in not sticking to a single known economic growth model. In addition to the above mentioned merit of providing a wider conditioning set, this approach helps to compare the results with earlier studies on the finance growth linkage and to incorporate few variables that are potential determinants of growth in Africa. Moreover, this approach is very common even in the mainstream empirical growth literature. As Hoeffler (2000) noted most of the empirical studies on growth *" are based on more general models and include a range of other socio-economic variables."* Though these general models cannot be interpreted as the reduced form of a single model, economic theory is used as a base for the choice of possible explanatory variables (Caselli et al., 1996).

As a result, our growth equation includes measures of financial development and control variables that have come to be called as " traditional" variables in the finance-growth nexus. Particularly, we estimate the following equation.

$$Growth_{it} = \alpha + \beta_1 GDP_{it-1} + \beta_2 Credit_{it} + \beta_3 Literacy_{it} + \beta_4 Government_{it} + \beta_5 Inflation_{it} + \beta_6 Opennes_{it} + \varepsilon_{it} \quad (1)$$

,where *Growth* denotes the three measures of economic growth adopted in this study, *Credit* refers to the ratio of credit to the private sector to GDP, which is our preferred measure of financial development, GDP_{it-1} represents lagged per capita GDP, which is used as a proxy for initial level of income to account for the convergence effect, *Government* -the ratio of general government expenditure as a ratio of GDP, *Literacy* -the ratio of literate people in the age group 15-24, *Inflation* -inflation measured by GDP deflator and *Openness* -the ratio of exports plus imports to GDP. We will see in a bit detail issues concerning measurement and data sources of these variables in the ensuing sub-topic.

3.2 Data and Measurement

The study pulls together a panel data set of 27 countries[17], which are selected depending on data availability, where the data is averaged over each of the six non-overlapping 5-year

[17] The countries are: Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Republic of Congo, Cote d'Ivoire, The Gambia, Ghana, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritania, Niger, Nigeria, Rwanda, Senegal, South Africa, Sudan, Swaziland, Togo, Zambia and Zimbabwe. For the 2nd and 3rd hypotheses, Botswana, Central African Republic, Niger, Nigeria and Swaziland are further excluded due to lack of full capital data decreasing our sample size to 22.

intervals for the period 1974-2003. 11 of the 13 countries included in Ghirmay (2004) are covered in this study and we have additional 16 countries to draw a more general conclusion for SSA countries. Our data set has a better similarity with the data set first used by Levine et al. (2000) and again utilized by Rioja and Valev (2004). Their data includes 15 of the countries in our sample for the period 1966-1995. However, ours considerably differs from theirs in three aspects. First, Levine et al. (2000) do not try to distinguish among countries of different stages in economic and financial development. Rioja and Valev (2004) try to fill just this gap by classifying countries into regions of lower, intermediate and higher financial development. Still, SSA countries are not separately treated. This study independently looks the issue for SSA. Second, our sample includes 12 more SSA countries. Third, our data covers the time period from 1974-2003, a difference of 8 years in coverage.

And except Madagascar, Ndikumana's (2000) study on the role of financial development in investment in SSA includes all of the countries in our sample and four more countries over the period 1970- 1995. Hence, we may possibly use the result of this work in our analysis. However, it should be noted that his model is an investment equation, not a capital accumulation equation, a difference not only of the dependent variables but also of the covariates.

Averaging data in growth regressions is very important to eliminate business cycle effects (Bond et al., 2001; Levine et al., 2000; Calderon and Liu, 2003). Though the duration of one business cycle varies from that of another and each county may have its own ups and downs, we follow the tradition in the empirical literature to take a common 5-years averages owing to the broad set of data we are working on and the methodological complexity varying the gaps may create.

3.2.1 Measuring Growth and the Sources of Growth

As stated earlier, the dependent variables are measures of economic growth (for hypothesis 1, to see if financial development brings economic growth), capital per capita growth (for hypothesis 2, to test whether financial development promotes capital accumulation) and

productivity growth (for hypothesis 3, to examine the role of financial development in improving Total Factor Productivity).

We follow King and Levine (1993a), Beck et al. (2000) and Calderon and Liu (2003) to construct measures of economic growth, capital per capita growth and productivity growth. First, we calculate real per capita GDP[18] growth as the logarithmic difference of per capita income for each of the 5-year periods in the panel data, dLGDP.

Calculating the other two measures is first justified by King and Levine (1993a) and has been applied by many since then (see Beck et al., for example). We have seen in section 2.2 that economic theory predicts that financial development may stimulate economic growth through two channels: through increment in the volume of investment (and hence, physical capital accumulation) and improvement in the way resources are allocated (growth in economic efficiency). To examine the impact of financial development on the two predicted channels, we decompose, as in King and Levine (1993a), general economic growth into two parts: the rate of physical capital accumulation and everything else. This can be obtained by specifying the production function as

$$y = k^{\alpha} x, \qquad (2)$$

where y equals real per capita GDP, k equals the real per capita physical stock, x equals other determinants of growth and α is the production function parameter. By taking logarithms and differencing, we get DLGDP=α (DLKPC) + DLA, DLGDP is the growth rate of real per capita GDP, DLKPC is the growth rate of the real per capita physical capital stock and DLA is the growth rate of everything else (called Total Factor Productivity).

Since capital stock data is not readily available, we follow suggested measures of capital stock to construct the data. There are three approaches suggested to calculate physical capital stock (for the detail, see King and Levine, 1994). Two of them use perpetual inventory method after assuming some steady state initial capita level and then accumulating investment using a certain amount of depreciation rate.

[18] Per capita GDP and General Capital Accumulation Data are taken from the2006 edition of World Development Indicators (WDI) of The World Bank.

$$k_t = (1-\delta)k_{t-1} + I_{t-1}, \qquad (3)$$

where k_t denotes capital stock at time t, k_{t-1} equals the initial capital stock , δ represents the depreciation rate and I_{t-1} investment at time $t-1$.

Yet, the two methods differ in their assumption of the initial capital stock level, K_0. One assumes zero while the other some calculated value. Fortunately, it is shown that the two will become very closer as the impact of the initial value dies through time due to depreciation (Easterly and Levine, 2001). Accordingly, we choose to start with 0 initial capital stock, but begin accumulating investment[19] starting from 1965(where data begins), 9 years back from our desired value (of 1974) so that the impact of the initial value can be further diminished.

Specifically, initial capital stock is assumed to be 0 in1965, which amounts to saying $k_{1966} = I_{1965}$. What amount should the depreciation rate take remains controversial and it is obvious that different economies may have different depreciation rates. Again, due to the large number of countries we are working with, we simply adopt a depreciation rate 0f 0.07; a rate employed by Beck et al. (2000) so that

$k_{1967} = 0.93\, k_{1966} + I_{1966}$, and so on.

Now that we have generated capital data for each country for the period 1974-2003, we divide each value by total population, from WDI 2006, to obtain the per capita capital stock. Once per capita capital stock is constructed, a logarithmic growth rate for each five-year average value, DLKPC, is calculated. The last measure, DLA, is then easily calculated assuming a 0.3 share of capital in out put, α. Like depreciation rate, this estimate is another controversial value as it may take different values in different economies. For lack of consensus in the literature, we prefer to follow the tradition in King and Levine (1993a) and Beck et al. (2000) to assume α=0.3[20]. Even after moving this long, five other countries[21] have to be dropped for lack of capital accumulation (investment) data decreasing the number of countries to 22.

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[19] Particularly, we use gross capital formation, a new terminology for gross investment, of WDI 2006.

[20] The literature sometimes distinguishes between developing and developed countries as to the value of α. Tahari et al. (2004) uses 0.4 as a common measure for developing countries. Accordingly, we also check the robustness of our result using α = 0.4.

[21] The countries are: Botswana, Nigeria, Niger, Nigeria and Swaziland.

3.2.2 Measuring Financial Development

Financial development is a broad concept involving improvements in the quality and quantity of the various financial intermediary services. As such, it is found to be difficult to proxy it by a single measure. We have seen the pros and cons of various measures of financial development in section 2.1.3. Among those measures, we prefer to apply CREDIT as a measure of financial development for this study. It denotes the ratio of domestic credit to the private sector to GDP. This is perhaps the most common proxy of financial development employed in the empirical literature (e.g. King and Levine, 1993a; Benhabib and Spiegel, 2000; Calderon and Lui, 2003). This measure distinguishes between credit to the private sector and credit to the government and state owned enterprises assuming that a financial system which lends its resources to the public sector may not have the will and the power to monitor managers, select profitable investment projects and pool risks in the same degree as financial systems that allocate credit to the private sector. As a result it is argued to be an ideal proxy of financial intermediation that is more closely related to the level and efficiency of investment, and hence economic growth (De Gregorio and Guidotti, 1995).

In addition, CREDIT improves on some varieties of this measure that consider only the ratio of deposit money banks credits to the private sector ignoring other non- financial sectors claim on the private sector (e.g. Levine, 1998; Levine and Zervos, 1998). Concentrating on who receives the credit, CREDIT, nevertheless, encompasses credit issued to the private sector by the central bank. Levine et al. (2000) have tried to overcome this potential problem by taking the ratio of the sum of deposit money banks claim on non- financial private sector (lines 22D of the IFS 2007) and other banking institutions claim on the non- financial private sector (line 42D of IFS) to GDP (line 99B). Unfortunately, the data for this alternative is not fully available for our sample of countries. And when available, the sum of 22D and 42D is either equal (in 15 countries) or very close to 32D suggesting an insignificant portion of central bank credit to the private sector in SSA. It may not be unexpected to get such a negligible portion of central bank credit to the private sector as many commercial banks and other non- bank financial intermediaries in SSA are owned by the government.

One obvious danger of using CREDIT as an indicator of financial development is its narrowness in that it does not consider the development out side the banking sector. As a result, a development in the equity market may bring about a decline in CREDIT and consequently be misinterpreted as a fall in financial development. Nevertheless, this is shall not a problem in our study as the development in the non-bank sector is in its infant stage in most of SSA countries in our sample.

The problem of deflating financial stocks (measured at the end of the period) by GDP flow (measured over the period) is mitigated by using the arithmetic average of this year's end-of-period financial stock values and the previous year's end-of-period values. Thus, CREDIT in 1974 is the average of line 32D of IFS in 1973 and line 32D in 1974 divided by nominal GDP in 1974. If it were not for the lack of data on CPI, first deflating end-of-year financial stock by end-of-year CPI and then deflating annual GDP by annual CPI, as suggested by Beck et al. (2000), could have been a further improvement.

3.2.3 Other Control Variables

As discussed in section 3.1, our growth equation includes a basic set of controls: initial human capital, initial income level, inflation, a measure of government size, and external trade openness.

The neoclassical growth model predicts that countries relatively close to their steady state per capita out put level will experience a slowdown in growth i.e. conditional convergence (Solow, 1956). There is no convergence in endogenous growth models, however. Hence, growth regressions need to have some mechanism to capture this highly debated view of convergence. The effect is commonly captured by the log of initial per capita GDP in cross-sectional analyses (see for example, Mankiw et al., 1992) or log of real per capita GDP in the first year of the respective time period (see for example Beck et al., 2000 and Caselli et al., 1996) in panel data studies. A significant negative coefficient is consistent with the prediction of the neoclassical growth model. However, using the per capita GDP of every first year may lead us to modelling business cycle fluctuations, the very reason for averaging data. As a result, in our analysis, we use lagged GDP per capita, the average value of the previous 5-years period.

The initial human capital is proxied by the level of literacy[22] at the beginning of each 5-years period. As compared to other human capital measures like the average years of schooling or secondary school enrolment rate, it is obvious that literacy is a weaker proxy for human capital. Unfortunately, the data is very poor for SSA countries for those alternatives. Even then, it can be argued that literacy rate is a good predictor of human capital in SSA, where a big proportion of the population is illiterate.

The debated role of the government in the economy is proxied by the ratio of government consumption expenditure to GDP (Landau, 1983; Levine and Renelt, 1992) from WDI 2006. According to Landau (1983), its role is controversial since from an income accounting perspective, higher government consumption could come at the expense of either investment in conventional capital or private consumption. A higher ratio of government consumption to GDP could come at the expense of investment that would tend to diminish the growth rate of per capita out put. However, a great portion of government consumption expenditure like in education, health and infrastructure is in fact investment in the real sense that doesn't necessarily reduce capital formation even if it is at the expense of conventional investment. The implications are also not clear when government consumption is at the expense of private consumption because private consumption may be an incentive to labor supply and savings that increases economic growth on the one hand and government investment in basic health and education could be more important than the incentive effects of spending on say luxury goods, on the other hand. However, this ratio is found to have a significant and negative impact on economic growth in most of the empirical studies (see for e.g. Landau, 1983; Levine and Renelt, 1992; Calderon and Lui, 2003). These negative results seem to lead some economists like, Calderon and Liu (2003) to use this ratio as an indicator of macroeconomic stability (see for e.g. Calderon and Liu, 2003) assuming that a rising proportion of government spending signals lack of macroeconomic stability and hence retard economic growth.

The expected positive impact of international trade on economic growth is captured by a measure called openness, the ratio of the sum of total exports and total imports to GDP taken

[22] Specifically, literacy refers to the ratio of 'literate' people, according to UNESCO's definition that might sometimes vary from country to country, in the age group 15-25years to the population in the same age group. The survey was undertaken every second year of our five-year periods. It is downloaded from www.uis.unesco.org/en/stats/statistics/literacy2000.htm.

from Penn World 6.1, while the expected negative impact of inflation on economic growth is also to be represented by inflation measured by GDP deflator from WDI 2006. For lack of data, inflation measured by CPI is not considered. As the study attempts to analyse determinants of the general economic growth, inflation measured by GDP deflator can be justified as a better measure of inflation.

3.3 Estimation Methodology

3.3.1 Estimation Problems in Growth Regressions

Thanks to the coming of Summers and Heston's (1988,1991) data set of aggregate series for many countries, several empirical studies on determinants of growth have been undertaken in the 1990s(e.g., Barro, 1991; Mankiw et al., 1992; Sala-i-Martin, 1994). However, a classic paper by Caselli et al. (1996) questioned the very basis of the methodology those studies had been following, particularly the way they treated country specific effects (which led to omitted variable bias) and endogenous right hand side variables.

Consider the general specification often used in most cross-country studies of growth:

$$y_{it} - y_{it-1} = \alpha y_{it-1} + \beta X_{it} + \eta_i + \varepsilon_{it} \qquad (4)$$

, where y is the logarithm of real per capita GDP, X is the set of explanatory variables (other than lagged GDP), η is unobserved country specific effect, ε is the error term. Clearly, for cross-section regressions in particular, consistency of OLS estimates requires that the individual country effect is uncorrelated with the explanatory variables. However, Caselli et al. (1996) clearly show that this is not the case if one looks at equation (5) below:

$$E[\eta_i(y_{it-1})] = E[\eta_i(\alpha y_{it-2} + \beta X_{it-1} + \eta_i + \varepsilon_{it-1})] \neq 0, \qquad (5)$$

since $E[\eta_i^2] \neq 0$. Secondly, there is a possibility of endogeneity of a sub-set of X_i (Caselli et al. (1996) wonder whether the very notion of exogenous variables in a growth frame work is useful) such that treating them as exogenous, only introduces endogeneity bias into the results.

Caselli et al. (1996) also criticized the then panel data studies, such as Barro and Lee (1994), Barro and Sala-i-Martin (1995), Loayza (1994), and Islam (1995) as trying to control only one but not both of the two problems (endogeneity and omitted variable bias) at a time and concluded that "*.... almost all existing cross-country regressions, either based on cross-section or panel-data techniques, have been estimated inconsistently*".

3.3.2 Systems GMM Estimator

This paper capitalizes on the recommendation put forward by Caselli et al. (1996) and follow Levine et al. (2000) and Beck et al. (2000) to apply it on the finance-growth debate. Caselli et al. (1996) proposed consistent estimator based on the Generalized Method of Moments (GMM) approach (Arellano and Bond, 1991), which is able to address both issues of omitted variable bias and endogeneity. To see how it works, we follow Levine et al.'s (2000) specification and begin by re-writing the growth model (equation 4) to a per capita out put equation.

$$y_{it} = \hat{\alpha}\, y_{it-1} + \beta X_{it} + \eta_i + \varepsilon_{it}, \qquad \text{where } \hat{\alpha} = 1+\alpha \tag{6}$$

Where, y is the logarithm of real per capita GDP; X is the set of explanatory variables (other than lagged GDP); η is unobserved country specific effect; ε is the error term; and the sub-scripts i and t represent country and time period, respectively.[23]

Now, to avoid the country specific effect, we take the first differences of equation (6).

$$y_{it} - y_{it-1} = \hat{\alpha}\,(y_{it-1} - y_{it-2}) + \beta'(X_{it} - X_{it-1}) + (\varepsilon_{it} - \varepsilon_{it-1}) \tag{7}$$

Equation (7) allows us to avoid any probabilistic statement concerning the country specific effect (for example, the random effects model assumes that they are randomly distributed). However, OLS cannot be used to estimate the above equation for two reasons. First, endogeneity of the explanatory variables is still unsolved. Second, the lagged dependent

[23] Time dummies are also included to allow for time specific effects.

variable $(y_{it-1} - y_{it-2})$ is now correlated with the new error term, $(\varepsilon_{it} - \varepsilon_{it-1})$ in contemporaneous terms in period $t-1$. Hence, instrumental variables are required.

In pure cross-section regressions, instrumental variable estimation does not control for the possible endogeneity of all explanatory variables. Rather it controls for the endogeneity of one variable say financial development. This approach can lead to inappropriate inferences, as many more variables may also be endogenous. Arellano and Bond (1991) suggest the use of internal instruments, defined as instruments based on past realizations of explanatory variables, so as to consider the potential joint endogeneity of all other regressors as well.

Thus, under the assumption that (a) the error term ε is not serially correlated, and (b) the explanatory variables are weakly exogenous (uncorrelated with future realization of the error term), the GMM dynamic panel estimator by Arellano and Bond (1991) uses the following moment conditions.

$$E\left[y_{it-s} \times (\varepsilon_{it} - \varepsilon_{it-1})\right] = 0 \ldots\ldots\ldots\ldots \text{for } s \geq 2; \quad t = 3 \ldots T \qquad (8)$$

$$E\left[X_{it-s} \times (\varepsilon_{it} - \varepsilon_{it-1})\right] = 0 \ldots\ldots\ldots\ldots \text{for } s \geq 2; \quad t = 3 \ldots T \qquad (9)$$

In this case, the lagged values $y_{it-2}, x_{it-2}, y_{it-3}, x_{it-3}$ and longer lags (when observed) will be valid instruments in the first differenced equations for periods t= 3, 4... T. We make a much stronger assumption that *Literacy* is predetermined and is not contemporaneously correlated with the error term as it is measured in the second year of each of the 5-years period. This allows $Literacy_{t-1}$ being additionally available as a valid instrument in the difference equation for period t.

Using these moment conditions, Arellano and Bond (1991) propose a two-step GMM estimator. In the first step, the error terms are assumed to be both independent and homoskedastic, across countries and over time. In the second step, the residuals obtained in the first step are used to construct a consistent estimate of the variance-covariance matrix, thus relaxing the assumptions of independence and homoskedasticity. This GMM estimator is generally called the *difference GMM* estimator.

However, Blundell and Bond (1998) show that when the lagged dependent and explanatory variables are nearly a random walk, lagged levels of these variables are weak instruments for the regression equation in differences. Instrument weakness influences the asymptotic and small sample performance of the *difference* estimator. In small samples, Monte Carlo experiments show that the weakness of the instruments can produce biased coefficients with poor precision (see Blundell and Bond, 1998). In addition, Beck et al. (2000) note the fact that differencing may decrease the signal-to-noise ratio, thereby exacerbating measurement errors (see Griliches and Hausman, 1986).

Arellano and Bover (1995) describe how, if the original equation in levels is added to the system, additional instruments can be brought to bear to increase efficiency. In this equation, variables in levels are instrumented with suitable lags of their own first differences.

However, additional assumptions are required as the country specific effect appears again in the system through the equation in levels. For the differences to be appropriate instruments, we assume that there is no correlation between the differences of these variables and the country specific effect. This assumption results from the following stationarity property that allows correlation between the levels of the right hand side variables and the country specific effect in equation (6), but requires the correlation to be constant over time.

$$E\left[y_{it+p} \times \eta_i\right] = E\left[y_{it+q} \times \eta_i\right] \text{ and}$$

$$E\left[X_{it+p} \times \eta_i\right] = E\left[X_{it+q} \times \eta_i\right] \quad \text{for all } p \text{ and } q \tag{10}$$

The additional moment conditions for the second part of the system (the regression in levels) are:

$$E\left[\left(y_{it-s} - y_{it-s-1}\right) \times \left(\eta_i + \varepsilon_{it}\right)\right] = 0 \text{ for } s = 1 \tag{11}$$

$$E\left[\left(X_{it-s} - X_{it-s-1}\right) \times \left(\eta_i + \varepsilon_{it}\right)\right] = 0 \text{ for } s = 1 \tag{12}$$

We use the moment conditions in 8, 9, 11 and 12 and employ a two-step GMM procedure to generate consistent and efficient parameter estimates. Given that lagged levels are used as

instruments in the difference regressions, only the most recent difference is used as instrument in the level regressions. Using additional differences would result in redundant moment conditions (see Arellano and Bover, 1995). With the same argument for difference estimator, our model is estimated in a two-step GMM procedure generating consistent and efficient coefficient estimates.

It is clear that consistency of the GMM estimator depends on the validity of the instruments. Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998) suggest two specification tests. The first test, Arellano-Bond test of autocorrelation, examines the hypothesis that the error term ε_{it} is not serially correlated. Here, we test whether the differenced error term is second order serially correlated (by construction, the differenced error term is probably first order serially correlated even if the original error term is not). The second suggested test is the Sargan test of over identifying restrictions, which tests the overall validity of the instruments by analysing the sample analog of the moment conditions used in the estimation process. However, the Sargan statistic, which is the minimized value of the one-step GMM criterion function, is not robust to heteroskedasticity or autocorrelation (see Roodman, 2006). Thus, we use another statistic, the Hansen J statistic, which is the minimized value of the two-step GMM criterion function, and is robust.

One apparent problem facing our analysis is the problem of "too many" instruments (see Roodman, 2006). Our system GMM estimator can generate moment conditions in abundance with the instrument count quadratic in time dimension, T. This can cause several problems for small samples like ours. First, it can weaken the Hansen test to the point where it generates implausibly good p values of 1.000. Second, a large instrument collection can over fit endogenous variables. Unfortunately, there appears to be little guidance from the literature on how many instruments is "too many". Roodman (2006) suggests a rule of thumb that the number of instruments be smaller than the number of individuals in the panel.

To reduce the number of instruments, we follow two suggestions from the literature (see Beck and Levine, 2004; Roodman, 2006). First, we have earlier mentioned that we use only the most recent difference as instrument in the level regressions to avoid redundant moment condition. This is also helpful to reduce the number of instruments. Still, the instruments for the equation in differences are many. As a first option we again reduce the number of lags

used as instruments in the difference equation. Specifically, we use only the first lag of lagged GDP and literacy and the second lags of the remaining explanatory variables. Secondly, we follow an approach first applied by Calderon et al. (2002) and Beck and Levine (2004) and thoroughly discussed by Roodman (2006) to "collapse" instruments. Since in the standard, un-collapsed form each instrumenting variable generates one column for each time period and lag available to that time period, the number of instruments is quadratic in T (see Appendix A.1). By " collapsing", we apply each moment condition to all available periods. Beck and Levine (2004) note that this alternative system estimator reduces the dimensionality of the instruments to avoid the over-fitting problem but still permits the construction of heteroskedasticity consistent standard errors. The shortcoming of this alternative procedure is that we lose a period from the sample.

In both options, we include a limited number of control variables at a time so that the number of instruments remains small.

Finally, the software used for our dynamic panel estimation is Stata 9.2 and Stata command xtabond2 by Roodman (2006) is of special interest to us. The next chapter discusses the results of the study.

4 Discussion of Results

This part of the thesis discusses the main findings of the study with respect to the three hypotheses made in the first chapter. First, it presents descriptive statistics for each variable used and then explains regression results.

4.1 Descriptive Statistics

Table 4.1 presents the descriptive statistics for all the variables used in the study. SSA countries differ considerably in real per capita GDP (labelled GDP). The maximum per capita GDP[24]($3423.81) is registered by the Republic of South Africa in the period 1979-1983 while the minimum ($105.52) is that of Burundi, between 1999 and 2003. However, as we can see from Figure 4.1A, all countries in the sample except Botswana, the Republic of Congo, the Republic of South Africa, and Swaziland, have a per capita GDP of less than $1000, leading to a mean of $551.13.

SSA countries also show a considerable variation in the calculated per capita capital stock (KPC), where Burundi (1974-1978) has the lowest value of $22.04 and South Africa (1984-1989) has the highest of $5977.03. Nevertheless, only the Republic of Congo and South Africa have an average per capita capital of well over $2000 rendering the average value to a low of $1014.247.

Regarding the dependent variables, the logarithmic per capita GDP growth[25], DLGDP, varies from a low of –30% in Chad (1979-1983) to a high of 39% in Botswana (1979-1983). In general, however, the growth rate seems to be symmetrically distributed between 20% and-20% with a mean of 0%(see Appendix B.2). We can also see this from the Skewness-Kurtosis test of normality in Appendix A.3. The test shows that we cannot reject the null

[24] All values of per capita GDP and per capita capital in this paper are real values measured at constant 2000 US $ values.

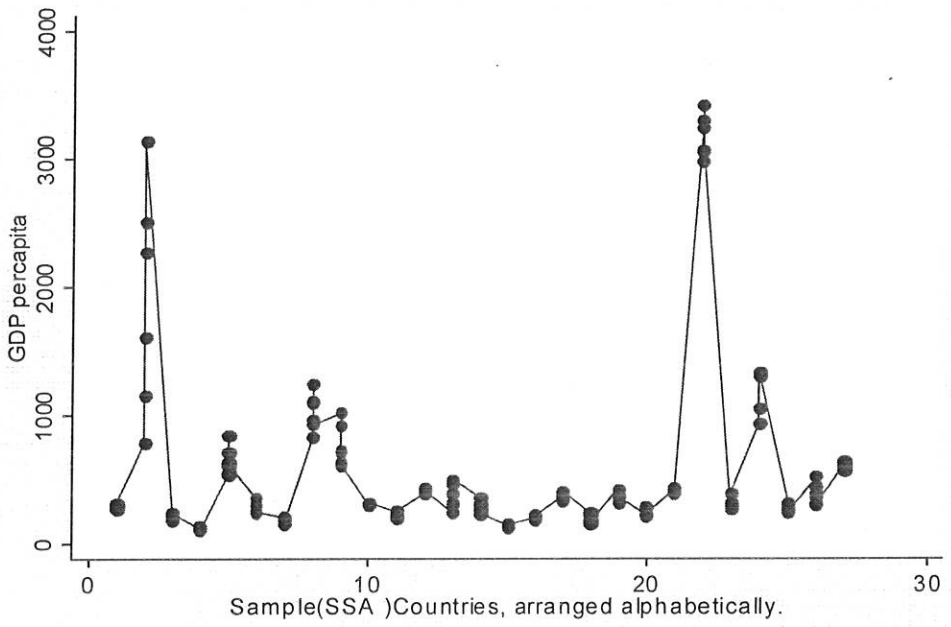
[25] Growth rates should not be interpreted as annual growth rates. Rather, they are growth rates between two periods. They are roughly equivalent to growth rates of per capita GDP (or capital) relative to their value before 5 years.

Table 1: Summary statistics*

Variable	Observ-ation	Mean	Std. Dev	Min	Max	Skewness	Kurtosis
GDP	162	551.1319	662.9481	105.52	3423.81	3.006687	11.78308
DLGDP	135	.0042103	.1223108	-.299011	.3906784	.3663737	3.811073
Literacy	162	.6046773	.2346728	.094896	.974058	-.3063221	1.958115
CREDIT	162	.1486495	.1092764	.0002975	.6414363	1.73577	7.11344
Openness	162	.6776558	.3444836	.10452	1.73656	1.149349	3.853509
Government Size	162	.1544039	.0606999	.059323	.499422	2.082663	10.43537
Inflation	162	.1399453	.1727506	-.026325	1.312328	4.082699	24.1128
KPC	132	1014.247	1221.848	22.04	5977.03	2.549688	9.258074
DLKPC	110	.0678685	.2293524	-.292059	.9436631	.9274835	4.193745
DLA	110	-.022933	.0998048	.0998048	.2468886	-.2687514	3.64063

*Full definitions of the variables and data sources are found in section 3.2. The number of observations, 162, is the product of the cross-sectional dimension, 27, and the time-series length, 6. By calculating growth (and using lagged GDP), one time-series dimension is lost, decreasing the number of observations to 135. Due to data problems, capital per capita (KPC) is calculated only for 22 countries, decreasing the number of observation to 132. Again, in calculating the growth rate of capital per capita, DLKPC, and Total Factor Productivity, DLA, the time-series dimension diminishes to 5 and the number of observations to 110. For the general summary of the variables for the 22 countries models, see Appendix A1.

Figure 4.1 A: Real GDP per capita in 27 SSA countries



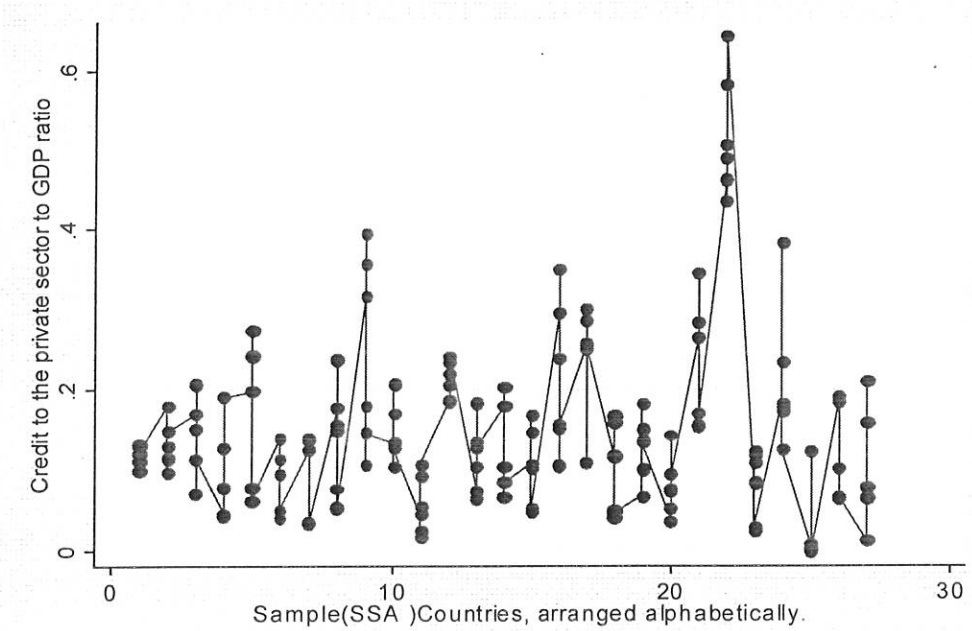
*The first dot is a cluster of 6 observations for Benin that had a minimum of $276.64 and a maximum of $319. When the value shows a noticeable variation the dots are scattered and if the change is steady they form a continuous line, like Botswana (the second country).

hypothesis that DLGDP is normally distributed at 4% level of significance. The level of significance should obviously have increased, if we had not had those few extreme values. This reflects the so-called 'tragedy' that SSA has not only the lowest income level but also the lowest growth rate (Easterly and Levine, 1997).

On the other hand, the logarithmic per capita capital growth, DLKPC, ranges from –29% in Cote d'Ivoire (1989-1993) to 94% in Gambia (1979-1983) whereas Chad has both the lowest (–30% in 1979-1983) and the highest (24% in 1984-1989) Total Factor Productivity, DLA.

Though generally low, there is also a significant variation in CREDIT (credit to the private sector as a percentage of GDP) across countries ranging from a low of 0.02% in Togo in the period 1999-2003 to a high of 64% in South Africa between 1979 and 1983. As we can see from Figure 4.1B below, no country has a ratio of more than 40% except South Africa and the mean is a very low value of 15%.

Figure 4.1B: Credit to the private sector to GDP ratio in 27 SSA countries.



Notwithstanding the fact that it shows a fairly sustained increase in almost all countries (see Appendix B.3), literacy rate is still very low with a mean rate of 60%. Countries also differ in their degree of openness to international trade with Swaziland (1989-1993) and Ghana (1979-1983) taking the highest (173%) and the lowest (10.5%) levels, respectively. Government size is quite smaller in our sample of countries as the mean share of government expenditure to GDP is 15% with a low of about 6%(Sudan, 1994-1998) and a high of 50%(Mauritania, 1974-1978). Finally, the average inflation rate is about 14% where both a negative (-2.6% in the Republic of Congo, 1984-1988) and a very high (131% in Zimbabwe, 1999-2003) rate have been observed.

As is the case for most macro economic data, our variables (except DLGDP and DLA) are not normally distributed (see Appendix A.3). One common way of accounting for the problem of extreme values and non-normality is transforming the levels into logarithms. The transformation improved the distribution of GDP, KPC, government size and openness while the distribution of inflation and CREDIT remained asymmetrical (see Appendix A.4). However, since literacy rate was a bit normal in levels, taking the logarithmic value worsens

the distribution. Hence, in the ensuing regressions, we use the logarithmic values of all explanatory variables, except literacy.[26]Because some of the variables are not still normally distributed, conclusions from this paper should be seen in some sense of caveats, however.

Systems GMM estimator accounts for the problems of endogeneity and omitted variable bias. It also produces heteroskedasticity robust coefficients. The remaining diagnostic test we shall have is that of multicollinearity among explanatory variables. Fortunately, the correlation, as shown in Appendix A.5, of all explanatory variables (except that between government size and openness, which is 0.5408) is below 0.5, telling us that there should be no threat of multicollinearity in the coming regressions.

4.2 Financial Development and Economic Growth in SSA

We begin our analysis from the per capita growth equation for 27 countries with a time-series length of 6, each of which is a five-years average. One time-series dimension is lost owing to the lagged GDP. In order to account for the problem of too many instruments discussed in section 3.3.2, six different specifications are attempted and presented in Table 4.2. We prefer specification 3 because it includes all of our explanatory variables and restricting the lag length of instruments is a standard continuation of the systems GMM estimation than collapsing the instrument matrix (Roodman, 2006). However, the other specifications are very important in giving us a consistency check as the Hansen test gives an implausibly high p-value of 1.00.

Our model passes both of the required tests for systems GMM: Arellano and Bond test of autocorrelation and the Hansen test of over identification. However, care has to be taken in interpreting the Hansen test, since it gets weaker as the number of instruments becomes large. We have used lag length of only 1 so as to minimize the number of instruments. But, even then, there are 54 instruments, which can be considered as quite large against 27, the number

[26] Inflation is transformed into log (1+inflation), as there are some negative values in the untransformed data.

Table 4.2 Financial development and economic growth in SSA♣

	Using only the first appropriate lag			*Using every lag but collapsing the instrument matrix*		
Specification	**1**	**2**	**3**	**4**	**5**	**6**
Lagged GDP per capita	.0445289 (0.200)	-.1231574 (0.051)*	.0068667 (0.765)	-.02690 (0.193)	.0232 (0.246)	.063526 (0.115)
Literacy	.1425537 (0.214)	.4368813 (0.010)***	.1968968 (0.045)**	.5444 (0.000)***	.5218171 (0.000)***	.5855165 (0.000)***
Credit	-.0114346 (0.071)*	.0200323 (0.080)*	.0051739 (0.448)	-.0389 (0.007)***	-.0008923 (0.949)	.0061056 (0.656)
Openness	.0885238 (0.014)**	.0675218 (0.014)**	.075279 (0.020)**	.1390 (0.000)***	.1619782 (0.000)***	.1399091 (0.002)***
Government Size		-.0474038 (0.322)	-.1548711 (0.016)**		-.1554898 (0.010)***	-.1681485 (0.004)***
Inflation			-.1590127 (0.051)*			-.4519556 (0.000)***
Arellano-Bond test	Pr > z = 0.145	Pr > z = 0.158	Pr > z = 0.273	Pr >z = 0.188	Pr > z = 0.262	Pr > z = 0.095
Hansen test	Pr > chi2= 0.727	Pr > chi2 = 1.000	Pr > chi2 = 1.000	Pr>chi2 = 0.318	Pr>chi2 = 0.669	Pr > chi2 = 0.797
Observations	135	135	135	135	135	135
Instruments	38	46	54	26	31	36
Countries	27	27	27	27	27	27

♣The dependent variable is the logarithmic growth rate of real per capita GDP (dLGDP). Lagged GDP is the first lag of the log of per capita GDP. CREDIT is the log of the ratio of credit to the private sector to GDP, whereas Government size is the log of the ratio of general government consumption to GDP. Literacy equals the ratio of 'literate' people in the age group 15-24 to the total population in the same age group, according to UNESCO's definition. Inflation is the log of one plus the inflation rate, while openness is the log of the ratio of imports plus exports to GDP.

In all the regressions, time dummies are included. The null hypothesis of the Arellano-Bond test is that the errors in the first difference regression exhibit no second order serial correlation while the null hypothesis of the Hansen test is that the instruments are jointly valid. Failing to reject both hypotheses supports our model. Specification 1 includes only lagged GDP, literacy, credit and openness as explanatory variables while specifications 2 and 3 add government expenditure and inflation to the previous specification, respectively. Specification 4,5 and 6, are copies of 1, 2, and 3 respectively. The two groups differ in their instrument matrix.

P values are in parenthesis and ***, ** and * denote significance levels of 1%, 5% and 10% respectively.

of groups. The fact that all specifications are robust to Hansen test is a sign that the higher p value of specification 3 is not only the result of the large number of instruments.

From specification 3 of Table 4.2, we see that CREDIT (which measures credit to the private sector as a ratio of GDP) does not appear to significantly explain economic growth in SSA while, as expected, literacy[27] and openness are found to positively affect economic growth at 5% level of significance and government expenditure and inflation have a negative effect respectively at 5% and 10% levels of significance. Yet, lagged GDP is insignificant.

Failing to support our first hypothesis, credit to the private sector is not found to positively and significantly affect the growth rate in real per capita GDP. Referring to the other specifications, CREDIT carries a significant (at 10% level of significance) coefficient in 3 of the six observations. However, they cannot invalidate the conclusion made from specification 3 (i.e. credit to the private sector is not found to positively and significantly affect the growth rate in real per capita GDP) as two of them, which are negative coefficients, are obtained when only 4 variables are included in the model and they change to a positive value when government expenditure is added to the first appropriate lag specification and become insignificant in the collapse option. In both options, CREDIT is insignificant when inflation is added. Other explanatory variables are fairly robust to different specification reinforcing the result from specification 3 that CREDIT carries a negligible role on economic growth of SSA, if other growth determinants are sufficiently controlled for and estimation problems like endogeneity are solved.

As our model controls for endogeneity, the result creates caveats, at least for SSA and lower income countries, on the view that the exogenous part of financial development (the deliberate creation and development of financial systems and associated services) is crucial for economic growth. This says nothing, however, on the possibility that economic growth may or may not promote financial development. It simply refutes the position that exogenous finance is important for economic development. The result is against the view both theoretical predictions and empirical studies seem to generally agree i.e. financial development promotes economic growth (see Chapter 2 of this paper and Levine, 2005 for a good survey of the literature). On the contrary, it is in line with the skeptical views (see

[27] Literacy becomes insignificant for the 22 countries growth model as shown in Appendix A.6.

Section 2.1.4 for the survey of the sceptical views) that exogenous creation of financial development does not affect the real sector.

However, the insignificant result may not be interpreted as a support for the doubtful views on the role of financial development. As the motivation for this study, views applicable for the general world should not necessarily apply for SSA countries and vice versa. Rather, this result may contribute for the theoretical and empirical ambiguity on the finance-level of development linkage. The result strengthens Deidda's (2006) argument that economies should reach some threshold level of development before financial development is to be endogenously created and help to bring about a boost in the real sector. Still, the second justification for our study seems to explain this insignificant correlation: Africa may have different growth factors (Masanjala and Papageorgiou, 2003). Though other growth determinants have shown the signs expected in the standard growth literature, unusually negative relationship between financial development and economic growth have also been identified by earlier studies. In a time-series study, Xu (2000) observes that 9 of the 14 countries with negative (27 showed positive) long-term effects of financial development on economic growth are concentrated in Africa. However, it should not be forgotten that there are other time-series studies like that of Ghirmay (2004) which demonstrate a positive impact of finance on economic growth. Since time series studies select a smaller and different set of sample of countries, these mixed results are not unexpected. With a broader data set, our study could tell about Africa at large.

With a broader data set and a better methodology that is able to account for a number of growth determinants and country specific growth factors in addition to solving the problem of endogeneity, this study is unable to reject the hypothesis that exogenous finance is not a determining factor for the economic growth of SSA countries. Or at least, finance is not as important a growth-affecting factor as literacy, openness, inflation and government size.

Now, let us briefly explain the impact of other control variables on the economic growth of SSA. From specification 3, lagged per capita GDP is insignificant implying a lack of 'conditional convergence'[28] (see Islam, 2003 and Casseli et al., 1996 for a detailed discussion

[28] This is against the prediction of neo-classical growth model that countries relatively close to their steady-state output level should experience a slowdown in growth-'conditional convergence' (Caselli et al., 1996).

of convergence) among the countries in the study. This means that other explanatory variables are measuring differences in steady-state growth rates.

Literacy carries the sign predicted by the 'augmented' Solow model of Lucas (1988) that human capital promotes economic growth. According to specification 3 of Table 4.2, increasing the literacy rate by 0.1 brings a 0.019 increase in growth rate, other things constant.

Openness to international trade positively affects economic growth in SSA with approximately a 100% increment in the ratio of imports and exports to GDP leading to 7.5% increase in the rate of economic growth, stressing the importance of international trade to economic growth. This confirms the result by Savvides (1995) that openness to international trade is important for growth in SSA.

On the contrary, SSA economies are retarded by the increase in the share of government consumption in GDP. Although economic theory is inconclusive (see Landau, 1983 for a detailed discussion of the controversy), this result corroborates the empirical results by most growth studies (see for e.g. Landau, 1983; Levine and Renelt; Calderon and Lui, 2003). Although the expenditure on basic infrastructure, education and health may have a positive effect on economic growth, the negative coefficient appears to be the result of excessive taxation that hampers private investment. In addition it may proxy macroeconomic instability (Calderon and Lui, 2003), which is harmful for a healthy economic activity.

Inflation is expected to create uncertainty (Barro, 1989) that complicates information gathering from relative prices, thus leading to inefficient resource allocation, and hence lower growth. Our result corroborates this argument.

4.3 Financial Development and Capital Accumulation in SSA

Our cross-sectional width decreases further to 22 as five more countries are left out for lack of investment data over the period under study. Accordingly, the analysis on the role of financial development in affecting capital growth and productivity is based on 22 SSA countries. We have estimated the six growth specifications for the 22 countries (see

Table 4.3: Financial development and physical capital growth♣

	Using only the first appropriate lag			*Using every lag but collapsing the instrument matrix*		
Specification	**1**	**2**	**3**	**4**	**5**	**6**
Lagged Capital	-.21020 (0.000)***	-.20625 (0.001)***	-.26317 (0.000)***	-.27927 (0.000)***	-.24519 (0.001)***	-.20886 (0.024)***
Literacy	.27582 (0.173)	.29289 (0.207)	-.28485 (0.411)	.26350 (0.399)	.05159 (0.829)	-.24645 (0.592)
Credit	.05015 (0.000)***	.0527065 (0.000)***	.05405 (0.000)***	.10454 (0.019)**	.09944 (0.009)***	.08241 (0.013)**
Openness	.19522 (0.012)**	.18156 (0.000)***	.13229 (0.066)*	.16120 (0.032)**	.10230 (0.072)*	.08744 (0.390)
Government		-.03380 (0.572)	.13239 (0.163)		.15839 (0.121)	.26454 (0.047)**
Inflation			.0354421 (0.824)			-.0447084 (0.811)
Arellano-Bond test	Pr > z = 0.773	Pr > z = 0.823	Pr > z = 0.602	Pr > z = 0.708	Pr > z = 0.566	Pr > z = 0.528
Hansen test	Pr > chi2 = 0.947	Pr > chi2 = 0.999	Pr > chi2 = 1.000	Pr > chi2 = 0.625	Pr > chi2 = 0.872	Pr > chi2 = 0.944
Observations	110	110	110	110	110	110
Instruments	38	46	54	26	31	36
Countries	22	22	22	22	22	22

♣The dependent variable is the logarithmic growth rate of real per capita capital stock. Lagged per capita capital stock is the first lag of the log of per capita capital. CREDIT is the log of the ratio of credit to the private sector to GDP, whereas Government size is the log of the ratio of general government consumption to GDP. Literacy equals the ratio of 'literate' people in the age group 15-24 to the total population in the same age group, according to UNESCO's definition. Inflation is the log of one plus the inflation rate, while openness is the log of the ratio of imports plus exports to GDP.

In all the regressions, time dummies are included. The null hypothesis of the Arellano-Bond test is that the errors in the first difference regression exhibit no second order serial correlation while the null hypothesis of the Hansen test is that the instruments are jointly valid. Failing to reject both hypotheses supports our model. Specification 1 includes only lagged GDP, literacy, credit and openness as explanatory variables while specifications 2 and 3 add government expenditure and inflation to the previous specification, respectively. Specification 4,5 and 6, are copies of 1, 2, and 3 respectively. The two groups differ in their instrument matrix.

P values are in parenthesis and ***, ** and * denote significance levels of 1%, 5% and 10% respectively.

Appendix A.4) and found an insignificant coefficient for CREDIT in all the specifications. Though this may seem to be another sort of support for the conclusion we made in section 4.2, there is also a possibility that this might be the result of the loss of degrees of freedom as the number of observations is reduced from 135 to 110. This possibility looks plausible, as literacy has also turned to be insignificant in 4 of the six regressions. Hence, in the ensuing analyses, care has to be taken in interpreting insignificant values.

Taking this point into consideration, we continue, in the following two sub-sections, examining the relevant channels of transmission (either improvement in physical capital accumulation or total factor productivity or both) for the impact financial development may have on economic growth. Even though our result in the earlier section suggests a negligible role of financial development on the real economic growth, there is a possibility that it still affects the economy through one of the channels and that effect is not strong enough to let finance come out as one of the determinants of growth.

In this sub-section, we discuss the results of the systems GMM estimation of the physical capital growth equation on the same explanatory variables as the economic growth model, except that the convergence effect is to be captured by lagged per capita capital instead of lagged GDP[29]. Again, for the same reason as the growth model, specification 3 is our preferred model.

Like the economic growth model, this model also passes both Arellano and Bond test of autocorrelation and the Hansen test of over identification. The warning on the Hansen test is the same as section 4.2.

From Table 4.3, we see that CREDIT and openness to international trade positively and significantly affect physical capital growth while lagged physical capital is negatively and significantly related to it. Literacy, government expenditure and inflation appear to have an insignificant effect on the growth rate of capital accumulation. Here, our hypothesis that financial development promotes capital accumulation is supported. Even then, one needs to know the possible measurement errors in calculating capital accumulation.

[29] Beck et al. (2000) used lagged GDP and we present the results of this specification in Appendix A.6. The results are much similar to the result we are discussing and hence confirm our finding that financial development matters for capital accumulation.

There is a vast literature arguing that financial development, through mobilization of savings, is indispensable for investment, and thereby capital accumulation (e.g., Schumpeter, 1912; Goldsmith, 1969;World Bank, 1989). However, mainly due to lack of capital data, a little has been tried to prove this proposition. And even then, most of them accredit the efficiency promoting effect than the capital accumulating role of financial development for economic growth (De Gregorio and Guidotti, 1995; Benhabib and Speigel, 2000; Beck et.al, 2000). Regarding SSA, no attempt is made to see the relative strengths of the channels of transmission. A somewhat closer attempt is that of Ndikumana (2000) which shows a significant and positive effect of financial development on the rate of investment in SSA[30]. And our result corroborates this.

One basic qualification can be raised on this conclusion. The proxy, CREDIT, is by construction related to investment. Lenders naturally want to guarantee that their loans are certainly to be repaid. And to this effect, most of the credit given to the private sector is mainly supposed to be invested. As a result an increase in the ratio of credit to the private sector to GDP should bring an increase both in the level and growth rate of investment, and hence capital accumulation. The result by Beck et al. (2000) that only CREDIT among the four measures of financial development is found to significantly promote capital accumulation appears to be one proof of this argument. Nevertheless, we should note that this argument does invalidate neither the hypothesis that finance matters for capital accumulation nor the appropriateness of CREDIT as a measure of financial development. What it implies is that one can expect financial development to have a significant capital accumulating role if the increase in CREDIT is believed to be the result (and indicator) of financial development. And we lack a sound reason not to believe that.

4.4 Financial Development and Total Factor Productivity Growth in SSA

The other possible way through which financial development is argued to promote economic growth is improvement in the efficiency through which resources are allocated.

[30] Note that his dependent variable is the ratio of investment to GDP and his control variables are standard determinants of investment like interest rate, not factors of growth.

Table 4.4: Financial Development and Total Factor Productivity♣

	Using only the first appropriate lag			*Using every lag but collapsing the instrument matrix*		
Specification	**1**	**2**	**3**	**4**	**5**	**6**
Lagged GDP per capita	-.01971 (0.732)	-.07520 (0.021)**	-.07230 (0.066)*	-.11640 (0.103)	-.27414 (0.029)**	-.12253 (0.376)
Literacy	-.02946 (0.882)	.45440 (0.002)***	.44438 (0.011)**	.15237 (0.389)	.65924 (0.015)**	.44522 (0.017)**
Credit	-.00506 (0.547)	.01059 (0.125)	.01171 (0.125)	.00830 (0.488)	.00320 (0.861)	.02844 (0.169)
Openness	-.01497 (0.760)	.12203 (0.004)***	.11625 (0.025)**	.06790 (0.026)**	.12036 (0.025)**	-.01480 (0.851)
Government Size		-.20358 (0.001)***	-.20806 (0.001)***		-.18150 (0.001)***	-.143100 (0.036)**
Inflation			-.0253891 (0.758)			-.1761754 (0.145)
Arellano-Bond test	Pr > z = 0.786	Pr > z = 0.943	Pr > z = 0.945	Pr > z = 0.789	Pr > z = 0.789	Pr > z = 0.854
Hansen test	Pr >chi2 = 0.984	Pr > chi2 = 1.000	Pr > chi2 = 1.000	Pr > chi2 = 0.644	Pr > chi2 = 0.644	Pr > chi2 = 0.925
Observations	110	110	110	110	110	110
Instruments	38	46	54	26	31	36
Countries	22	22	22	22	22	22

♣The dependent variable is Total Factor Productivity. Lagged GDP is the first lag of the log of per capita GDP. Credit is the log of the ratio of credit to the private sector to GDP, whereas Government size is the log of the ratio of general government consumption to GDP. Literacy equals the ratio of 'literate' people in the age group 15-24 to the total population in the same age group, according to UNESCO's definition. Inflation is the log of one plus the inflation rate, while openness is the log of the ratio of imports plus exports to GDP.

In all the regressions, time dummies are included. The null hypothesis of the Arellano-Bond test is that the errors in the first difference regression exhibit no second order serial correlation while the null hypothesis of the Hansen test is that the instruments are jointly valid. Failing to reject both hypotheses supports our model. Specification 1 includes only lagged GDP, literacy, credit and openness as explanatory variables while specifications 2 and 3 add government expenditure and inflation to the previous specification, respectively. Specification 4,5 and 6, are copies of 1, 2, and 3 respectively. The two groups differ in their instrument matrix.

P values are in parenthesis and ***, ** and * denote significance levels of 1%, 5% and 10% respectively.

Unfortunately, macroeconomic efficiency is a difficult concept to measure. Following the empirical literature (King and Levine, 1993a; Beck et al., 2000 and Calderon and Lui, 2003), we use the so-called 'Solow Residual' or 'Total Factor Productivity' or 'Something else'-all the sources of growth after the role of the growth in physical capital is accounted for- as our preferred measure of efficiency. Despite its being 'a stylized' fact that this 'Something else' rather than factor accumulation accounts for most of the growth differences across economies, 'Something else' is conceived differently by different theories (Easterly and Levine, 2001). Some model it as changes in technology (Romer, 1990; Aghion and Howitt, 1998), others focus on externalities (Romer, 1986;Lucas, 1988) or cost reductions (Harberger, 1998). Our analysis is based on the assumption that 'technology' (the 'instructions' for producing goods and services) best explains the 'Residual' and financial development may affect the 'technology' (Pagano, 1993).

Like the growth model, specification 3 passes both the Arellano and Bond test of autocorrelation and the Hansen test of over identification. The warning on the Hansen test is the same as section 4.2.

As shown in specification 3 of Table 4.4 below, CREDIT has an insignificant effect on Total Factor Productivity, even at 10% level of significance. And this insignificant relationship is robust to different specifications. Government consumption shows the expected negative and significant impact while literacy and openness carry the expected positive sign. Lagged GDP carries a negative sign while inflation is insignificant in both options.

The insignificant effect of CREDIT on Total Factor Productivity is in opposition to our hypothesis that exogenous creation of financial markets and services induce growth in the real sector. In addition, it is in sharp contrast to earlier empirical studies (De Gregorio and Guidotti, 1995; Benhabib and Speigel, 2000; Beck et al., 2000), although they cover a large number of developing and developed countries and SSA is not well represented. A few explanations can be suggested. On the one hand, repressive financial policies that were common in SSA for a long time may be one reason that hampered the efficiency-promoting role of financial development. On the other hand, the smallness of the financial sector could probably have made it play an insignificant role on the overall macroeconomic efficiency.

Finally, it may simply be supporting the view that the economy has to reach some threshold level before financial development is to enhance macroeconomic efficiency (Deidda, 2006).

Our result that financial development has a negligible impact on Total Factor Productivity is unchanged when we use the alternative value of 0.4 for the capital out put ratio (see Appendix A.8).

The insignificant role of financial development in promoting macroeconomic efficiency explains why financial development is not an important growth determinant: despite its ability to promote physical capital accumulation, its insignificant effect on the residual renders financial development an insignificant role in the overall economic growth.

5 CONCLUSION AND RECOMMENDATION

The impact of financial development on economic growth is highly debated. Some economists argue that financial development promotes economic growth through better mobilization of savings, evaluation of projects, managing risks, monitoring managers, and facilitating transactions that increase both the level of investment and the allocative efficiency of investment. On the contrary, there are other economists who contend that finance does not bring economic growth. Rather, it simply responds to the demand for particular types of financial services generated by economic development.

The empirical evidence is mixed i.e. there are findings that support both views. The inconclusiveness of the results is attributed to the use of different data set and different econometric methodology. Moreover, there are opposing theoretical predictions and empirical findings whether an economy benefits from financial development at its early stage or at a later stage. This is one reason why the finance-growth nexus needs to be separately examined for SSA countries. Secondly, the disagreement among economists on the issue of whether Africa has its own growth determinants different from the rest of the world necessitates separately testing each growth theory on Africa. Though there are a few attempts on the issue that focused on SSA, they employed either pure cross-country analysis, which has severe econometric shortcomings of omitted variable bias and endogeneity, or individual country time-series testing, which covers only few countries that could not be generalized for SSA as a whole.

In this paper, we have tried to see the issue from another econometric angle: dynamic panel data approach. Using a panel data set of 27 countries for the period 1974-2003, where the data is averaged over each of 6 non-overlapping 5-year averages, 3 different growth models are estimated by the systems GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998) that is found to be effective in solving the problems of endogeneity and omitted variable bias, which are common in pure cross-country regressions.

In the first growth model, financial development, measured as a ratio of credit to the private sector to GDP, is not found to significantly affect economic growth in SSA. Once we have accounted for the problems of endogeneity and omitted variable bias and fairly controlled for

other variables explaining economic growth, the result that finance do not affect economic growth questions the argument by many theoretical models and empirical findings that the deliberate creation of financial markets and institutions enhances economic growth.

In the second growth model, nevertheless, financial development is found to positively and significantly affect the growth in physical capital accumulation, which is in line with most theoretical models and empirical findings. Yet, the result should not be unexpected as the proxy, credit to the private sector, is very much related to investment by definition.

The third model appears to solve the seemingly contrasting outcomes of the above two models. Financial development does not have a significantly positive impact on macroeconomic efficiency in SSA. Because any policy measure could affect economic growth either through factor accumulation or productivity growth, the negligible impact of financial development on economic growth is explained by its inability to affect Total Factor Productivity. Its positive role on physical capital accumulation is not strong enough to let financial development come out as a significant growth factor. This may in turn be attributed to the argument that it is not factor accumulation rather it is Total Factor Productivity that greatly matters for economic growth (Easterly and Levine, 2001).

The findings from this study imply that policies to develop the financial sector should focus on enhancing the efficiency-promoting role of financial development if financial development is to bring the demanded economic growth. To achieve this, policies that promote the efficiency of the financial system will be of paramount significance. Guaranteeing free and healthy competition in the financial system bolsters the role of financial intermediaries in evaluation of projects, managing risks and monitoring managers that in general improves macroeconomic efficiency, and hence economic growth.

Finally, the following research areas could be considered as potential areas of investigation in the finance-growth nexus in SSA:

1) Trying other ways of measuring macroeconomic efficiency, esp. Stochastic Frontier Analysis.
2) Broadening the data set to include Northern African countries.
3) Examining the link between financial development and liberalization.

4) Looking for and applying new developments in the dynamic panel data analysis.
5) What determines financial development in SSA?

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Appendix A

Appendix A.1: Uncollapsed and Collapsed to Instrument Matrix.

Uncollapsed

$$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \dots \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \dots \\ y_{i1} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \dots \\ 0 & y_{i2} & y_{i1} & 0 & 0 & 0 & 0 & 0 & \dots \\ 0 & 0 & 0 & y_{i3} & y_{i2} & y_{i2} & 0 & 0 & \dots \\ \dots & \dots & \dots & \dots & \dots & \dots & \dots & \dots & \dots \\ \dots & \dots & \dots & \dots & \dots & \dots & \dots & \dots & \dots \end{bmatrix}$$

collapsed to

Collapsed

$$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \dots \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \dots \\ y_{i1} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \dots \\ y_{i2} & y_{i1} & 0 & 0 & 0 & 0 & 0 & 0 & \dots \\ y_{i3} & y_{i2} & y_{i1} & 0 & 0 & 0 & 0 & 0 & \dots \\ \dots & \dots & \dots & \dots & \dots & \dots & \dots & \dots & \dots \\ \dots & \dots & \dots & \dots & \dots & \dots & \dots & \dots & \dots \end{bmatrix}$$

Appendix A.2: Descriptive statistics for the 22 SSA countries model

Variable	*Observation*	*Mean*	*Std. Dev*	*Min*	*Max*	*Skewness*	*Kurtosis*
GDP	132	499.2972	627.8589	105.5161	3423.811	3.598515	15.67178
DLGDP	110	-.002573	.1099728	-.299005	.2867732	-.0299488	3.443277
Literacy	132	.6081767	.2277959	.1459498	.9740575	-.1859338	1.859667
Credit	132	.1527406	.1162961	.0002975	.6414363	1.633649	6.430165
Openness	132	.6446576	.3013192	.10452	1.57156	1.028917	3.775757
Government Size	132	.1493201	.0608289	.0593226	.4994217	2.462768	12.78415
Inflation	132	.1457204	.1871208	-.026325	1.312328	3.847484	21.02773
KPC	132	1014.247	1221.848	22.04	5977.03	2.549688	9.258074
DLKPC	110	.0678685	.2293524	-.292059	.9436631	.9274835	4.193745
DLA	110	-.022933	.0998048	.0998048	.2468886	-.2687514	3.64063

Appendix A.3: Skewness/Kurtosis tests for Normality: Variables in Levels.

Variable	*Pr (Skewness)*	*Pr (Kurtosis)*	------- *Joint* ------	
			Adj chi2 (2)	*Prob>chi2*
GDP	0.000	0.000	.	0.000
DLGDP	0.076	0.069	6.16	0.0460
Literacy	0.104	0.000	26.55	0.000
Credit	0.000	0.000	50.23	0.000
Openness	0.000	0.047	23.83	0.000
Government Size	0.000	0.000	66.36	0.000
Inflation	0.000	0.000	.	0.000
KPC	0.000	0.000	62.23	0.000
DLKPC	0.000	0.029	14.86	0.0006
DLA	0.230	0.139	3.73	0.1551

Appendix A.4: Skewness/Kurtosis tests for Normality: Variables in Logarithms.

Variable	*Pr (Skewness)*	*Pr (Kurtosis)*	----- *Joint* ------	
			Adj chi2 (2)	*Prob>chi2*
Ln (GDP)	0.000	0.028	23.45	0.000
Ln (Literacy)	0.000	0.048	23.66	0.000
Ln (Credit)	0.000	0.000	73.47	0.000
Ln (Openness)	0.468	0.312	1.57	0.4554
Ln (Government Size)	0.018	0.082	7.89	0.0194
Ln (1+Inflation)	0.000	0.000	.	0.000
Ln (KPC)	0.639	0.059	3.85	0.1459

Appendix A.5: Correlation between explanatory variables

Variable	Ln(GDP)	Literacy	Ln(CRE)	Ln(Open)	Ln (Gov)	Ln(1+Inf)
Ln (GDP)	1.0000					
Literacy	0.4235	1.0000				
Ln(CREDIT)	0.3443	-0.0485	1.0000			
Ln(Openness)	0.2138	0.1772	0.1509	1.0000		
Ln(Govern-ment)	0.3591	0.1287	0.2594	0.5408	1.0000	
Ln(1+Inflation)	-0.0497	0.2671	-0.0708	-0.2271	-0.0733	1.0000

Appendix A.6: Financial development and economic growth in 22 SSA countries.

	Using only the first appropriate lag			**Collapsing the instrument matrix**		
Specification	1	2	3	4	5	6
Lagged GDP per capita	.00543 (0.899)	-.04499 (0.256)	-.038743 (0.390)	-.07627 (0.226)	-.04616 (0.639)	.01553 (0.878)
Literacy	.10689 (0.440)	.39010 (0.010)***	.33424 (0.041)**	.28039 (0.113)	.18294 (0.450)	.22630 (0.402)
Credit	-.00188 (0.816)	.00474 (0.484)	.00781 (0.527)	-.00130 (0.855)	.02607 (0.150)	.01882 (0.255)
Openness	-.00170 (0.967)	.09647 (0.019)**	.06111 (0.201)	.11845 (0.005)***	.21005 (0.001)***	.10329 (0.027)**
Government Size		-.11888 (0.025)**	-.12497 (0.074)*		-.12673 (0.024)**	-.11359 (0.038)**
Inflation			-.10816 (0.532)			-.31800 (0.016)**
Arellano-Bond test	Pr > z = 0.232	Pr > z = 0.295	Pr > z = 0.277	Pr > z = 0.191	Pr > z = 0.207	Pr > z = 0.151
Hansen test	Pr > chi2 = 0.996	Pr > chi2 = 1.000	Pr > chi2 = 1.000	Pr > chi2 = 0.513	Pr > chi2 = 0.765	Pr > chi2 = 0.977
Observations	110	110	110	110	110	110
Instruments	38	46	54	26	31	36
Countries	22	22	22	22	22	22

Appendix A.7: Physical capital growth model with lagged GDP instead of lagged capital per capita

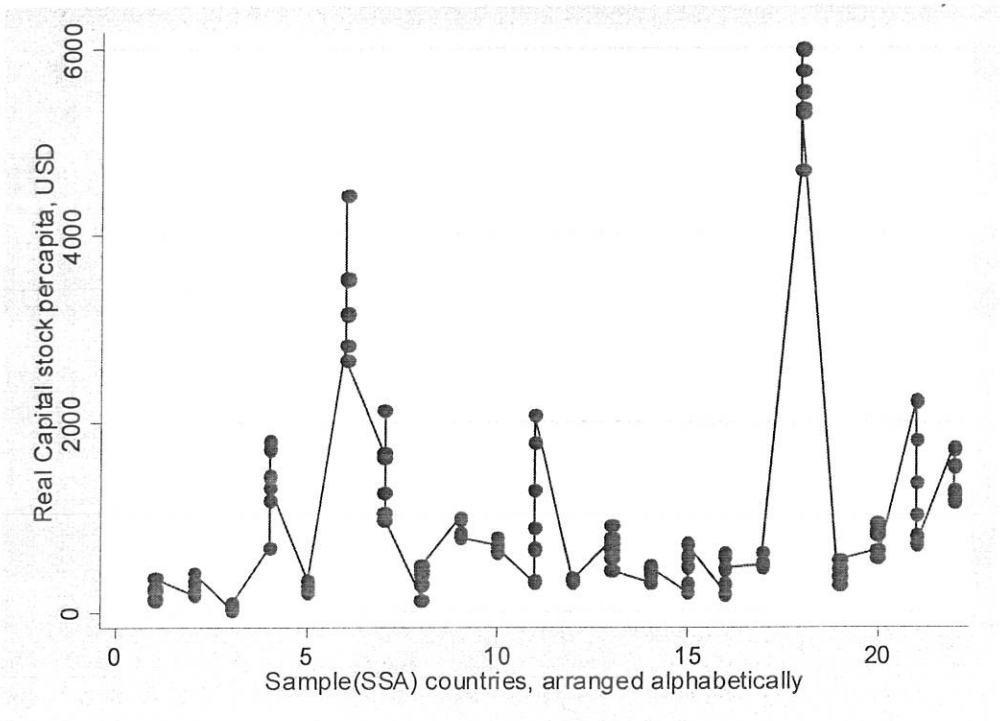
	Using only the first appropriate lag			**Collapsing the instrument matrix**		
Specification	1	2	3	4	5	6
Lagged GDP Per capita	-.1895102 (0.001)***	-.192554 (0.005)***	-.1690508 (0.004)***	.0971135 (0.437)	.0715168 (0.622)	.1950988 (0.257)
Literacy	.0912102 (0.459)	.0243764 (0.891)	.2612099 (0.206)	-.0165774 (0.950)	.114056 (0.749)	-.1041669 (0.831)
Credit	.0276821 (0.000)***	.0313135 (0.003)***	.0352991 (0.003)***	.0144376 (0.392)	.0170097 (0.393)	.0570471 (0.142)
Openness	.2728832 (0.057)*	.2741636 (0.004)***	.2351124 (0.025)**	.2812116 (0.000)***	.4142076 (0.001)***	.3895311 (0.011)**
Government		-.007249 (0.936)	-.0747179 (0.498)		.0099623 (0.932)	-.0299863 (0.788)
Inflation			.0555168 (0.742)			.1111399 (0.733)
Arellano-Bond test	Pr > z = 0.577	Pr > z = 0.601	Pr > z = 0.637	Pr > z = 0.589	Pr > z = 0.733	Pr > z = 0.679
Hansen test	Pr > chi2 = 1.000	Pr> chi2 = 1.000	Pr > chi2 = 1.000	Pr > chi2 = 0.702	Pr > chi2 = 0.962	Pr > chi2 = 0.999
Observations	110	110	110	110	110	110
Instruments	38	46	54	26	31	36
Countries	22	22	22	22	22	22

Appendix A.8: Financial Development and Total Factor Productivity, assuming a capital-output ratio of 0.4.

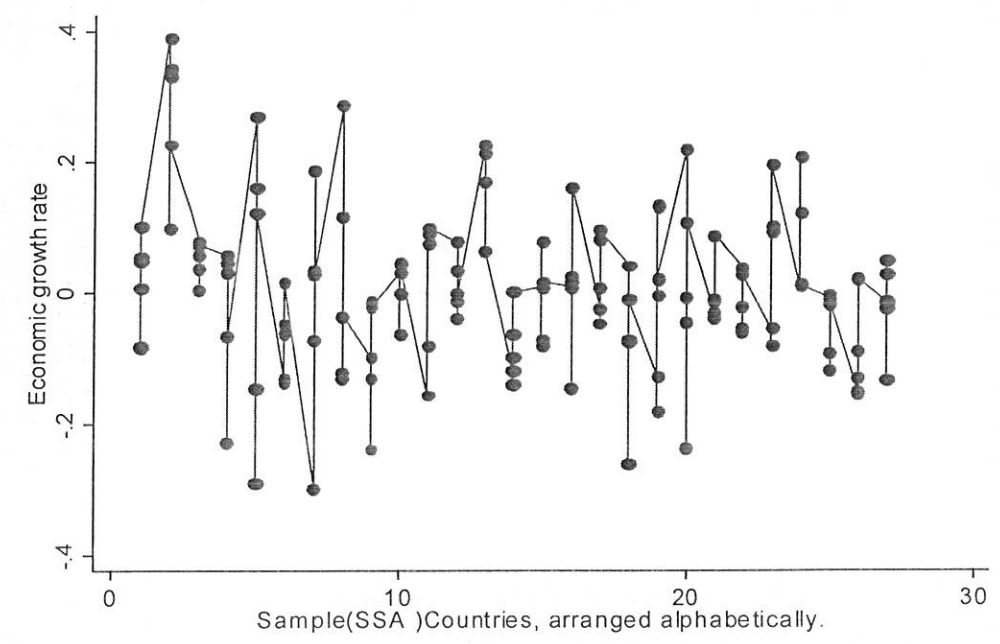
	Using only the first appropriate lag			*Using every lag but collapsing the instrument matrix*		
Specification	1	2	3	4	5	6
Lagged GDP per capita	0.00001 (1.000)	-.06460 (0.187)	-.07600 (0.118)	-.14145 (0.056)*	-.33007 (0.019)**	-.33287 (0.036)
Literacy	.044662 (0.700)	-.27268 (0.210)	-.54189 (0.032)**	.12940 (0.408)	.65268 (0.006)***	.82454 (0.001)***
Credit	-.01437 (0.007)***	.00463 (0.624)	.00630 (0.459)	.01104 (0.367)	.00428 (0.811)	-.01157 (0.600)
Openness	-.00663 (0.901)	.16346 (0.008)***	.21342 (0.002)***	.01428 (0.634)	.05629 (0.243)	.00445 (0.945)
Government Size		-.10552 (0.100)	-.10975 (0.097)*		-.15057 (0.015)**	-.11594 (0.099)**
Inflation			-.06220 (0.553)			-.22764 (0.229)
Arellano-Bond test	Pr>z = 0.962	Pr>z = 0.786	Pr > z = 0.780	Pr> z = 0.872	Pr > z = 0.478	Pr > z = 0.556
Hansen test	Pr>chi2= 0.9	Pr>chi2= 1.(	Pr>chi2 = 1.000	Pr>chi2= 0.729	Pr>chi2= 0.999	Pr>chi2 = 1.000
Observations	110	110	110	110	110	110
Instruments	38	46	54	26	31	36
Countries	22	22	22	22	22	22

Appendix B

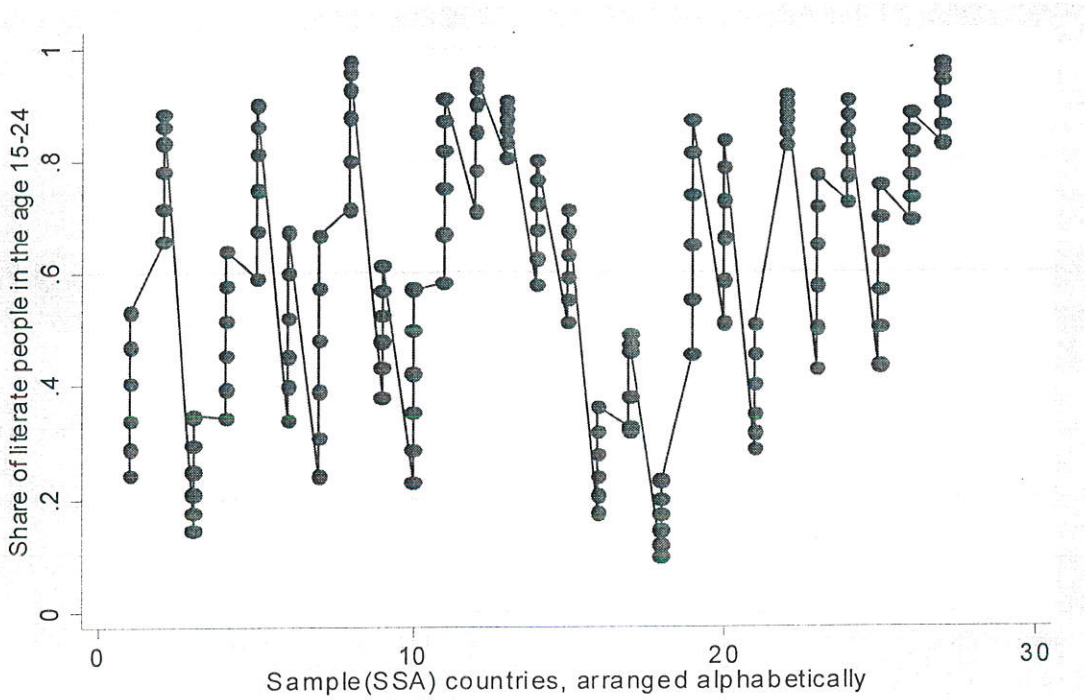
Appendix B.1: Real capital per capita in 22 SSA countries



Appendix B.2: Economic growth rate in 27 SSA countries



Appendix B.3 Literacy rate in 27 SSA countries



Declaration

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in any other university, and that all source of materials used for the thesis have been duly acknowledged.

Declared by:

Name: Yabibal Mulualem

Signature: [signature]

Date: 22nd October, 2007

Confirmed by Advisor:

Name: Gebrehiwot Ageba

Signature: [signature]

Date: Oct. 22, 2007

Place and date of submission: Addis Ababa, 22nd Oct. 2007.