Communication links, Productivity, knowledge transfers, growth and income distribution

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Declaration

I, AYINE RICHARD SIMON NIGO do at this moment declare that the work presented in this Research, is my work and has never been presented before either in part or whole to any institution of higher learning for an academic award.

Signed_____ Date: _____

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(STUDENT)

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I dedicate this page to my beloved family.

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Abstract

In this study, we show that banking development, communication links, productivity and income distribution exert a statistically and economically significant positive impact on local economic growth. This effect becomes more pronounced when the financial sector is more liberalized and deregulated. Preceded by the global changes that occurred since the mid-1980s and 1990s, the world has seen continued economic liberalization, increasing privatization and gradual loosening of credit/capital controls by states. The lifting of state controls in the banking sector in the 1980s and 1990s, created a more integrated and competitive financial industry ensuring efficient allocation of bank credits to productive areas.

The economic thinking behind all this is that the financial entities, functioning under liberalized monetary regimes operate at higher levels of efficiency and productivity. Productivity improvements may result from different sources, yet the notion that the private sector's intention to maximize profit leads to productivity improvement is one of the fundamental ones. Put it differently; a deregulated financial system is viewed as an appealing society to invest.

Using data from 14 Sub Saharan African Countries (SSA), we examined the growth effects of banking development, communication links, productivity and income distribution over the period 1990 – 2013. We find evidence of significant growth effects of banking development in SSA on industrial components of GDP. Growth in agricultural GDP is positive but not significant.

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Chapter one

Introduction and context of the principal thesis.

1.1. Introduction

Sub-Saharan Africa (SSA) is a region in transition following years of economic decline. The nature of Sub-Saharan Africa has changed, and the people have had the extraordinary opportunity to reconstruct their political, social and economic systems afresh after decades of political strive. Most of this countries, over the years, have reformed their financial sectors to enable their economies to integrate with the other economic system. The reforms date back to the late 1980s and early 1990s to improve efficiency and the potency of the banking organization. These reforms include, among other things, Structural Adjustment programs (SAP), privatization, Information, and Communication Technology (ICT) and more recently mobile banking access. Some of the financial sectors regulated and improved on internal controls and performance monitoring mechanisms, all targeted at fostering the growth of the various financial institutions especially the banking sector. As a result of these changes, the evidence from World Bank, (2015) indicates that most of Sub Saharan African financial environment is now more liberalized, and African economies have started expanding their regional presence especially the banking sector.

Besides, many SSA economies have seen significant financial innovation. Private sector credit has experienced its median ratio to GDP increased by ten percentage points from 1995 to 2014 World Bank, (2015) and IMF, (2015). For lower-income households and firms, microfinance has enabled financial inclusion. Moreover, mobile banking services, such as M-Shwari and M-Pesa in Kenya, have promoted stronger domestic banking systems, reducing the reliance on informal savings mechanisms. SSA's efforts towards financial inclusion have fallen behind. Only 34% of the population have bank accounts, compared to 94% in high-

income OECD countries. According to Fosu, (2013), the ratio of equity to total assets of the banks in the 1990s was 15% in Southern and West Africa and 16% in North and East Africa. The author suggested that the proportion of loans to total assets is just roughly 48% on average for the region. At a sub-regional level, this ratio is about 45% and 46% in the Southern and West African sub-regions, respectively. Following the reform programs introduced in the 1980s and 1990s, banks in SSA have moved to strengthen their capital infrastructure Mlambo et al., (2012). Equally, the passive role of state-owned banks or, in some cases, their repositioning to commercial lines has contributed to the strengthening of the banking systems. As a result, the incidence of systemic banking crises – a relatively common event in SSA in the 1980s and early 1990s, has declined post-2000s.

Nonetheless, according to the World Bank, (2016), the proportion of the working capital in Sub-Saharan Africa, that was financed by bank loans compared to the rest of the emerging economies such as Latin America and Asia is low. The degree of financial inclusion on average has gone down in all regions following the recent financial crisis in 2008, for obvious reasons. However, the magnitude of financial access in Sub-Saharan Africa has taken on a lot more quickly compared to their counterparts in the Euro area. The World Bank report further claims that most of the banking institution in SSA is foreign owned and as a result, lending is a mainly short term. The short-term borrowing in SSA is evident in the high cost of financing in the region IMF, (2017). Our results indicate that the percentage of the number of foreign-owned banks to the number of the total banks in SSA is relatively high (See graph 3.2b: panel 2, chapter three). Therefore, foreign banks play a central role in SSA banking systems having recovered market share as banks were restructured and state banks privatized under reform programs in the 1980s and 1990s. Still, the percentage of the unbanked

population is large, with Small and Medium Enterprise (SMEs) typically tightly constrained in their reach to any credit or loans.

Another facet of this study is Sub-Saharan Africa's policies on transport. Over the last decade, the transport infrastructure such as roads, railways, sea, river, and airports has seen a significant rise in foreign investment, especially from China. The increase in foreign investments has enabled African governments to reform the transport sector to accommodate the complexities in negotiations and contracts. Most rural areas in Sub Saharan Africa have modified their transport policies to let market-determined decisions, enterprise autonomy, and individual participation in the ownership and management of the transport line. Most regimes have also piloted various forms of public-private partnerships in large projects such as airports, seaports, and railway projects. According to Jerome, (2008), the number of private contractors in Africa is replacing aid account in the rehabilitation and maintenance of roads and transport infrastructure. Also, public enterprises are given considerable autonomy, and regulation has substituted arbitrary rule through consensual performance contracts. In that, respect is also a visible rise in the number of independent road agencies and dedicated road funds in the transport sector and has begun to show positive results in some rural areas.

Furthermore, evidence from the International Telecommunication Union (ITU), report in 2017 suggests that most investments in Sub-Saharan Africa, over the last decade, are geared towards telecommunications. The evidence indicates that most countries are undergoing sectoral reform and foreign investment is now actively promoted across the continent as privatization and liberalization are progressively getting root. Statistics from the ITU, (2017), show that more than one-third of all state telecommunications companies in Sub Saharan

Africa are already privatized, and several more are ready to undergo privatization soon. Also, Africa is currently among the world's fastest growing market for mobile phones with over 265 million new subscribers in 2015 alone ITU, (2017). These statistics correspond to the number of investments in telecommunication infrastructure in Africa from 1990 to 2015.

1.2. Financial development and growth

The relation between financial development and growth has been long under debate. Although some researchers have argued that finance only reacts to the expectation of growth, there has been overwhelming evidence that financial development plays a vital role in promoting the growth of developed economies. See, e.g., Levine, (2003) for a survey. The evidence is somewhat mixed within developing countries. While finance seems to promote growth in some Latin American nations, Levine, (2002), researchers disagree on the role played by formal and informal finance in Sub Saharan Africa, Farhadi, (2015), and Kumari and Sharma, (2017). Therefore, understanding the finance and growth issue in Sub Saharan Africa is of particular importance. The case of SSA is not unique, as most countries in SSA, suffer from relatively weak legal and financial systems. Also, with the increasing globalization of trade and international capital flows, the sustainability of growth in SSA and the stability of its financial system matter not only for the country itself but also for the rest of the world.

Recent debates on finance and growth boil down to the question of how financial development affects growth. One strand of the literature following from the seminal paper by King and Levine, (1993a, 1993b) consistent with Schumpeter's view theorize that the financial system can promote economic growth. Their study firmly linked several measures of the level of financial development with real per capita GDP growth, the rate of physical capital

accumulation, and improvements in the efficiency with which economies employ physical capital. King and Levine, (1993a) further maintained that the predetermined component of financial development robustly correlates with future rates of economic growth, physical capital accumulation, and economic efficiency improvements.

On the other hand, Demirguc-Kunt and Levine, (1996) in a separate study found that there is a link between stock markets and the growth of financial intermediaries. The research further suggests that, for the business organization to develop there should be different amounts of stock market size, market liquidity, market concentration, market volatility, institutional development, and integration with world capital markets. In their study, the authors analyzed the relationship between the stock market and growth of financial intermediaries using a sample of 44 developing and industrialized economies from 1986-1993. The results of their study show that stock market growth and intermediary economic development are positively correlated.

Another remarkable contribution to the literature on financial development and growth comes from Rajan and Zingeles, (1998). Their study suggests that better-developed financial intermediaries and financial markets help reduce market frictions. Reduction of the effects of market friction provides lower prices of external finance to facilitate firms' expansion and encourage the new firm formation. The authors used industry-level data for a large sample of countries over the 1980s and confirmed that those firms that are more reliant on external finance prosper more in countries with better-developed financial intermediaries and financial markets. The outcomes propose that financial development may play a good role in firms' growth and the rise of young firms by facilitating the flow of external finance. The influential

work of Rajan and Zingeles, (1998) has prompted much research interest in using micro-level data to gain more insight into the connections between financial development and economic growth beyond country-level.

These propositions by King and Levine, (1993a, 1993b), Demirguc-Kunt and Levine, (1996), Rajan and Zingeles, (1998) among others examined different aspects of financial liberalization and bank deregulation on various fronts, including growth, productivity, interests rates, Foreign Direct Investments (FDI), bank efficiency, and capital allocation among others. However, their research interest was mainly focused on the OECD countries, the emerging economies such as China, the Asian Tigers, and India. There was no study done on Sub Saharan Africa (SSA), hence our motivation. During the 1990s, SSA was undergoing Structural Adjustment Programs, liberalization, and telecommunication boom. Therefore, in view of the above discussion, we examined six main macroeconomic indicators, i.e. Gross capital formation (constant 2000 US$), Industry, value added (% of GDP), Agriculture, value added (annual % growth), Communications, telephone (mainlines and mobile phone) subscribers (per 1,000 people), Bank (deposits, credits, and M2) to GDP, as crucial emphasizes of things to consider in answering the following three research questions;

i. How does banking development effect growth in Sub-Saharan Africa?
ii. If the economy has a Balance Growth Path (BGP), how does communication in the informal sector impact economic growth?
iii. How does development in communication effect growth in Sub-Saharan Africa?

1.3. Statement of the Problem and Purpose of the study

Many studies have examined growth effects of financial development in different settings, including those related to human capital externalities such as Abdouli and Hammami, (2017), Abubakar, et al., (2015) and Acquaah, (2015), macroeconomic stability, Acaravci, et al., (2009), Acemoglu, (2008), quality of institutions, Acikgoz, et al., (2012), Ackah and Asiamah, (2016), geography and trade openness Acs, (2008), Aghion and De Aghion, (2006), Aghion, et al., (2005), and Agu and Chukwu, (2008). Increasingly, economic experts are exploring the ways that public and civic institutions, social interactions and norms of behavior, and social networks influence economic activity. Such analysis recognizes that economic development goes beyond factor accumulation and is related to social interactions, Kompas and Owen, (2007). Therefore, the objectives of this thesis are as follows:

i. To examine the growth effects of banking development in Sub-Saharan Africa.
ii. To examine the effects of communication links, knowledge transfers, and social interaction on growth within individuals, families, community, and institutions in SSA.
iii. To examine the growth effects of banking, communication, and infrastructural development in Sub-Saharan Africa.

One conflicting issues on financial development and growth discussed in chapter four concerns, Total Factor Productivity (TFP). Our central thesis in this chapter, argues that some fundamental questions remain unanswered. For example, the debates on intermediation as a primary function of the most financial institution in the literature is vague. We say, its's vague because, if mediation is about technological improvements in the sense of Total Factor

Productivity (TFP) as claimed by most of the studies in our review, is the improvement in intermediation supposed to be around technology? The literature in our opinion did not consider transition or even potentially, poverty traps. Therefore this is where our thesis will make significant contributions. It is a common knowledge that most SSA economies are in transition and potentially poor as well, hence our claim makes much sense. Similarly, on savings, there are no specific relationships between savings and growth in rural areas, another area where this thesis adds value especially chapter three and five.

We contend that the image of the credit markets as a perfectly efficient intermediary is misleading and therefore unrealistic. This same idea is also supported by Knowles and Owen , (1995), who reasoned that the intermediation process in the formal and informal credit markets significantly influences the results of the portfolio allocation effects generated through higher bank deposit rates. Using a general equilibrium utility model, we maintained that, if the economy has a balanced growth path, how does communication in the informal sector affect economic growth. We used a disutility parameter in our model to represent an economy where the social barriers to communication such as a lack of a common language according to Kompas and Owen, (2007), make it expensive to establish knowledge links. We discussed that barriers to communications and the effort in forming knowledge connections, and networking hinders communication links and as a result affects growth. One of the composite statics in the model asserts that a decrease in the effort to form communications and knowledge links makes it easier for agents to interact and as a result, lowers the 'utility-cost' of building connections and hence spurs growth. Such an argument is where chapter four contributes significantly to the current study.

Besides, our review underscored that the debates on financial development and growth provide different predictions concerning the relationship between financial development and growth. Some theories claim that intermediation in financial development will cause a disproportionately beneficial impact on the poor, Lucas, (1988), while other models posit a non-linear relationship between finance and growth Greenwood and Jovanovic, (1990). Without conflicting the status quo, the distinction between levels versus growth rates did not come out clearly. One doubts whether such studies examine steadily improving financial growth on one or several of these ratios. For example, if an individual pushes his level of income up, does an expanding and improved financial sector over time cause growth in that individual ever-increasing levels? Alternatively, is the literature suggesting that an improvement to the financial system, i.e., making it give way from low to a higher level without changes in individual income has implications for sustained growth? We find that these propositions in our opinion do not agree with the central thesis of the finance and growth arguments.

The issues of Levels, Steady State Transitions were never captured by the studies reviewed in chapter two. Another issue is that, yes, intermediation matters, but this begs the question of whether growth happens as levels of intermediation systems change gradually or fixed level today can influence rates of increase in the future. Chapter three and five of this study provides evidence on these progenies. In a related study by K. Matthews and Zhang, (2010), the authors examined the productivity growth of the nationwide banks of China and a sample of city commercial banks from 1997 to 2007. Their study used a bootstrap method for the Malmquist index, to construct estimates of total factor productivity growth. They examined, modeled and treated as bad output five different inputs and outputs variants of both

Intermediation/Production approaches and non-performing loans wittingly to arrive at a robust measure.

Also, their study compared the productivity growth of the state-owned commercial banks (SOCBs), the joint-stock banks (JSCBs) and city commercial banks (CCBs). The results from their study indicate that average TFP growth has been neutral over the period for the SOCBs and JSCBs but positive for the CCBs in the second part of the period. The authors claimed that efficiency gains were obtained through cost reduction and technical innovation was associated with greater diversification of revenue away from interest earnings. Therefore, the opening up of the banking market according to K. Matthews and Zhang, (2010), has not led to a visible improvement in bank productivity growth. A similar study by Cheng and Degryse, (2010) reasoned that banking development plays a substantial role in Chinese economic development. Their work shifts the balance of evidence away from the view that formal finance played little role in financing Chinese economic growth. The results from their studies indicate that an apparent conflict exists between the shock of the financial development of banks and non-bank financial institutions on development. While having drawn out most of their loans to the large and medium-sized firms, depository financial institutions, according to the authors contributed significantly to local development. As a comparison, non-bank financial institutions, while ceding most of their loans to smaller homes in China, seem to be not significant for local growth. Such effects are robust across different specifications controlling for omitted variables or reverse causality.

Cheng and Degryse, (2010), qualify this difference to the fact that banks, relative to non-bank financial institutions, have benefited much more from the Chinese ongoing financial

reforms. In especial, the reforms include commercialization of state-owned banks, market entry deregulation, and liberalization of interest rates. Their results indicate that, despite the relatively weak Chinese financial sector, banks played an indispensable part in the allocation of funds, and in turn spurred growth. Therefore, Motivated by the literature, and following from Cheng and Degryse, (2010), we contribute to the debate on financial development and growth as follow; First, no studies have evaluated the effects of banking development in SSA empirically, and we are the first to do so. Second, no equilibrium model has been used to study the effects of communication links on banking development in SSA.

In the chapters that follow, we review the literature in chapter two. In chapter three, we analyze the relationship between banking development and the local economic growth in 14 Sub-Saharan African countries over the period 1990 to 2013. We examine the connection between growth rates in real per capita Gross Domestic Product (GDP) to banking development and then further analyze the relationship between growth in both industrial and agricultural components of GDP. We find evidence of growth effects of banking development in SSA on industrial components of GDP. The growth rate in agricultural GDP is positive but not significant. In chapter four, we examine growth effects of communication links, knowledge transfers and social interaction within individuals, families, community, and institutions using an optimal multi-sector endogenous growth model in a monetary economy with households, firms, and banks. We argue that the effort in forming connections and barriers to communication impedes knowledge transfers and as a result affects growth. In chapter five, we extend our model in chapter three to probe the effects of banking development, communication, and infrastructural development in Sub Saharan Africa. Our primary objective is to examine how banking and access to information can explain the growth

effects in chapter three using both agricultural and industrial portions of GDP. We use an annual panel data of 14 Sub Saharan Africa countries over the period 1990 – 2013. We examine the link between growth in real per capita GDP, infrastructure and social well-being, and further study the relationship between growth in both industrial and agricultural components of GDP. We run the model in our previous study by controlling for infrastructure, health, and communication to capture the point of interaction using telephone (mainlines and mobile phone) subscribers (per 1,000 people). We find evidence of the growth effects of communication on development. We contend that growth in Sub-Saharan Africa can improve if there are better information and communication infrastructure, long and healthy lifestyles and better ways to save. In chapter six, we provide a general conclusion for the thesis. Chapter six, in particular, provides a summary of findings for each chapter, policy implications, and directions for future research.

1.4. Conclusion

In this chapter, we discussed the main subject of the research, the motivation, and the significance of the study. Chapter one mainly discusses the aims, objectives, and contributions of the study, including an outline of each chapter. We also provided a summary of the structure and a statement of the findings.

Chapter two

Literature review

2.1. Introduction.

The foundation of the financial development and growth dates back as far as 1893 when Walter Bagehot first described how the financial marketplace leads to economic growth in his celebrated essay. Bagehot, (1893), highlights that the significant parts of the financial system in promoting economic growth is through the mobilization of productive financial capital. To date, most of the literature and the discussion on financial development and growth follow from Schumpeter, (1911). Schumpeter, (1911), argues that investors require credit to finance a new commercial enterprise and it is, therefore, the roles of a bank to fund and facilitate this process. The author further suggests that the financial services are more critical when it comes to information sharing with the development of the economic system. The study identifies that a well-functioning financial system should be able to offer multiple servings. This service includes but not restricted to; mobilizing savings, evaluating projects, managing risks, monitoring managers and facilitating transactions and encouraging technological innovations, all of which result in economic growth.

Additionally, the study highlights the importance of financial intermediaries in granting credits to entrepreneurs as a critical point in accelerating economic development, since it can set forth to stimulate other commercial activities and innovations that eventually encourage economic circulations. Similar arguments were later advance by Gurley and Shaw, (1955) and Hicks, (1969). They argued that the development of the financial system is essential in stimulating economic growth, whereas a weak financial system retards economic growth. Goldsmith, (1969) contends that the flow of funds is integral to the financial development since they ease the success of technology transfer and

entrepreneurship towards accelerating economic growth. The author further claims that the country's degree of financial development is positively tied to economic development. The operations of the financial system, according to Goldsmith, (1969) provide credits to firms to expand, borrow and invest. The findings shed some significant policy implications as well, i.e., the expansion of the various components of the financial system and the provision of commercial products might lead to the question of what the structure of the financial system should be. Our study extends part of this argument in chapter two, by contemplating the growth effects of banking development in Sub-Saharan Africa.

However, this position contradicts the Keynesian models that were mainly repressions and includes restrictions on several measures imposed on the financial system, including interest rate controls, higher reserve requirements, and directed credit program. According to Keynes, (1936), stock markets bring out too many speculative activities, and these do not contribute to the stability of an economic system. Proponents of the Keynesian theory such as Modigliani and Miller, (1958), argued that real economic decisions are independent of the financial structure and their model assumes an environment of perfect markets with information asymmetry and no cost. Fame, (1980) developed Modigliani and Miller, (1958) model further and expressed that if a competitive banking sector with equal access to capital markets is interrupted by lending decisions, the lending decisions by the bank will not affect the price. The Keynesian policies are prevalent in developing rural areas as ways to finance fiscal deficits without increasing taxation or inflation. The disadvantages are that it weakens the incentives to hold money and other financial assets. This policy was later challenged by McKinnon (1973) and Shaw (1973), contributing to the McKinnon and Shaw models.

McKinnon (1973) and Shaw (1973), stresses the role of the financial system in boosting economic growth by advocating for financial liberalization as a path to stray from the repressive monetary policies believed to slow the economic development. They reasoned out that investments in developing economic systems are self-financed. Therefore, the business of this nature cannot materialize unless investors accumulate sufficient funds through savings. McKinnon, (1973), and Shaw, (1973) proposed a monetary system based on extensive bank lending to draw on savings. Such a method according to McKinnon, (1973) increases the real size of the monetary policy, as well as ease financial repression. McKinnon, (1973) portrays the spectacle of financial repression where banks seem to lack efficiency because of regulated interest and collateral requirements as a burden. Such an idea, according to McKinnon, (1973), leads to the incapability of banks to earn high equilibrium rates of return from borrowers to depositors and the promotion of economic growth.

On the other hand, Shaw, (1973) developed a corresponding hypothesis known as "debt-intermediation." The process of debt-intermediation requires that borrowers in the financial system should be able to appeal directly to savers for debt capital through the securities markets without using a financial institution as an intermediary. Their work indicated that intermediaries promote investment and steady output growth through borrowing and lending. Hence, most of the work by McKinnon, (1973), and Shaw, (1973) challenged the Keynesian distortions of the monetary system. Followers of the study of the McKinnon and Shaw models include Mathieson, (1980), and Pagano, (1993).

Nevertheless, several critical assumptions of the McKinnon Shaw models were also severely criticized by the new neo-structuralist economists Wijnbergen, (1983), Taylor,

(1983) and Buffie, (1984). They introduced the concept of competitive and efficient "curb markets" or non-institutionalized credit markets. They hypothesized that, since commercial banks take a reserve requirement, the "curb markets" will function better in that, their constituent segment (Gold, Bank deposits, and Curb loans) can substitute each other and offset the effect of bank loans. The ideas of the neo-structuralist were later challenged by Knowles and Owen, (1995). Their work indicated that the picture of the credit markets as a perfectly efficient intermediary is misleading and thus unrealistic. They reasoned that the intermediation process in the formal and informal credit markets significantly influences the results of the portfolio allocation generated through higher bank deposit rates. This same idea is also supported and examined by our current study in chapter four.

Communication across social groups according to Roger, (1995) increases the pace of growth, adoption of fresh ideas, and innovation by members of the societal system and in turn, may influence the innovation's rate of adoption. Their study indicates that mass media channels, such as agricultural magazines, were acceptable for less complicated innovations, but interpersonal contact with extension change agents was more critical for innovations that were perceived by farmers as more complicated. If an inappropriate communication channel was used, such as mass media channels for complex new ideas, a slower rate of adoption resulted. This analysis suggests that the nature of the societal system, such as the norms of the institution and the degree to which the communication network is structured is highly interconnected, and can significantly affect the growth of that institution. In this context, it is perhaps suitable to think of institutional quality as, in part, the effects of social capital, rather than as part of social capital.

In chapter four, we showed that individual networks of trust and contacts are substitutes for a disconnected market governed by regulations or the rule of law. It seems readable that a legal system with defined and enforceable rules is more necessary for the absence of personal ties. Any legal system is simpler and more comfortable to enforce if it merely codifies accepted norms of behavior in the society. Having that trust is likely to cut the monetary values and dangers of both economic and non-economic activities. Rivera-Batiz and Romer, (1991), suggested that flows of ideas deserve attention comparable to that devoted to flows of goods, as such; public policy can influence international communications and information flow to the same extent that it changes goods flows. For example, tax policies directly affect the incentive to station company employees in foreign lands, while immigration and visa policies directly limit the movement of the masses. Likewise, some governments restrict direct foreign investment in their telecommunication networks, which is presumably important in the international transmission of thoughts. Although these are the few examples considered, it should be clear that flows of goods and streams of ideas are not the only factors in economic integration. Under some assumptions about nominal variables and the functioning of the financial sector, economic integration will also depend on money and institutional arrangements. Such relations between income, social capital, and subjective well-being have been studied across and within a nation, over time, for aggregates, and across countries.

According to Helliwell and Putnam, (1995), a society that attaches values to abstract knowledge, the details of practice have come to be nonessential, unimportant, and quickly developed once the relevant abstractions get halted. Thus, education, training, and technology design focus on abstract representations to the detriment, if not on the exclusion

of actual use. We, by contrast, argue that practice is central to understanding work. Abstractions detached from practice distort or obscure details of that design. Without a clear understanding of those intricacies and the role they play, impedes realizing such practice faster. Learning according to Brown and Duguid, (2000), is a practice that first, narrates these divisions as an individual contributes to the construction and development of his or her own identity and equally to the building and development of the institutions in which he or she works.

Similarly, in communicating ideas, an individual becomes a member. Simultaneously and interdependently, the members are contributing to the building and development of the institution that they are bringing together. Thus, it is through the continual evolution of these communities that the shared meaning of interpreting complex activity get formed, transformed, and communicated. Shared community values can play a role in influencing aspirations, and values and expectations can run over long distances. Helliwell and Putnam, (1995) indicated that the interaction between personality, local and community values, and life experiences help to explain the variety of responses to what appears superficially in many institutions.

The evolution of more complex types of models of the 1980s and 1990 changed the literature entirely on financial development and growth. For example, Greenwood and Jovanovich, (1990), Pagano, (1993), and finally, King and Levine, (1993a, 1993b) developed endogenous models used to determined financial development and growth). They reasoned that economic development reduces information asymmetry and thus improves resource allocation. The role of the endogenous theorist was primarily to act upon policy intentions of governments in developing economies to abolish restrictions and thus foster

real sector growth in developing economic systems. Greenwood and Jovanovich, (1990) also find that, in theory, the relationship between financial development and economic growth relates to the association between income distribution and economic growth. Increases in income equality in the early phase of economic development where growth is sluggish results in depressed growth. However, as the economy evolves into a mature stage, the financial sector becomes more developed, and the income inequality gap eventually becomes little due to better communication and infrastructural development in addition to deregulated markets.

Further extensions to the endogenous models by some modern economist focus mainly on the comparative importance of either a Bank-established financial system or a Market-established financial organization. For example, Allen and Gale, (2000) suggest that bank-base models operate well in a relatively less developed financial market system, and at the same time, the bank acts as depository financial institutions compared to financial markets. Stiglitz, (1995), for instance, argues that well-developed markets quickly and publicly reveal information, which reduces the incentives for individual investors to find information. Banks, however, mitigate this problem since they form long-run relationships with firms and do not reveal information immediately in public marketplaces. Thus, harmonizing with the bank-based judgment, more significant market development may hinder corporate control and economic evolution. Consequently, the financial structure is not referred to the probability of having a considerable banking crisis or to output growth volatility.

On the other hand, the market based financial system runs in a highly developed financial system and this regard, long-term finances are usually provided by financial

markets. Merton and Bodie, (2005) on the other hand, argue that what matters is the overall economic development and not which type of financial structure provides the necessary financial services to fuel growth. Given their diverse purposes, it is possible for financial intermediaries and financial markets to have mutually reinforcing roles in the overall development of financial strategies and economic growth. Therefore, distinguishing between bank-based and market-based financial systems in our opinion is not particularly useful for understanding long-run growth, but the economic relationship between overall financial sector development and long-run growth is economically relevant.

2.2. Banking development and Growth

In contrast with Schumpeter, (1911), several authors argue that if a link exists between financial development and economic growth, it is the reverse direction, i.e., financial intermediation occurs as a reaction to economic growth Robinson, (1952). However, the advance of endogenous growth models in the 1980s provided a theoretical account of the effects of financial development on capital accumulation and economic development in the long run. A more recent study by Cavenaile, et al., (2014) indicates that there exists a single long-run relationship between financial events and economic growth, and they tested for the joint homogeneity of these cointegration vectors in their samples. They rejected the homogeneity restriction for all the three combinations of economic growth, banking system and financial market development for which the rank of matrix almost equal to one. Cavenaile, et al., (2014) conclude that the recent financial crisis, which has affected the financial system and the real economy, highlights the need to determine whether financial development and innovation, promote growth in the long run or not. While

at the same time, the crisis has shown that misusing instruments intended to diversify better risk could lead to destabilization of the actual economic system.

Law and Singh, (2014) on the other hand, examined the relationship between finance and economic growth using an advanced, dynamic panel threshold technique. Their sample consists of 87 developed and developing countries. The empirical results indicate that there is a threshold effect on the finance-growth relationship. They find that the level of financial development is beneficial to growth only up to a certain point, any expansion beyond the threshold level tends to affect development adversely. They argued that finance delivers a robust positive influence on productivity growth in more developed economic systems. In low-income economies, the effect of finance on output growth occurs through capital accumulation.

On the other hand, finance starts having a negative result on output growth when credit to the private sector reaches 100% of GDP. The results are consistent with the diminishing roles of finance on growth. These findings reveal that more finance is not necessarily good for economic growth and highlight that an ideal level of financial development is more important in facilitating development. Law and Singh, (2014) further argued that domestic credit not only includes credit to the private sector but also state-owned enterprises. The development process tends to deteriorate if state-owned enterprises channel the credit to unproductive investment and destructive activities. Nevertheless, the monetization can increase without financial development occurring and it is not an entirely satisfactory indicator of financial development.

Beck, (2003) advanced similar arguments on enterprise and households' credit. Their study indicates that enterprise and household credit play a vital function in determining the

relationship between finance and growth. They find that the growth effect of financial development comes through enterprise rather than household credit to drive the positive impact. Their finding supports the view that financial systems foster economic development by alleviating firms' financing constraints and this explains the lack of a significant finance growth link in high-income countries. Therefore, finance and growth might be that financial development helps countries to seize up to the productivity frontier but has defined or no growth effect in rural areas that are close to or at the edge. In a similar study, Beck, (2012) examined the financial system following the recent crisis and concluded that the measures of financial depth and intermediation in the literature have been applying what might be crude to capture quality improvements at high levels of financial development. In other words, the financial sector has gradually expanded its reach beyond the traditional activity of intermediation toward financial activities.

Therefore, the usual measures of mediation of services have become less and less congruent with the reality of modern financial systems. Also, the conclusion that the non-linearity of the finance-growth relationship might help the financial development to reach the productivity frontier is misleading. With such an estimate, we would therefore not expect any growth effect from further financial deepening in high-income countries. Another reason for non-linearity might lie in the beneficiary of the credit as argued by Beck, (2012). The author examined the differential growth effects of enterprise and household credit. Consistent with the theory the study find that the growth effect of financial deepening comes through enterprise rather than household credit. Most of the financial deepening in high-income countries have come through additional household lending, which thus might explain the difference in growth relationship across high-income nations.

According to Čihák et al., (2012), for markets to functions, there are costs involved. These costs are either direct cost such as writing contracts, interpreting and implementing contracts, costs associated with transacting goods, services or even for information operations. Indirect costs are mainly associated with uncertainties or risks and mitigated through insurance. The bearing on this cost, according to Levine, (2005), produces information about possible investments and individuals then allocate capital or create incentives for those involved in the process of intermediation. Boosted by the profits, financial establishments, then improve on these services for a fee. The fees charged can be on government services, legal fees or accounting fees to mention but a few. This process evolves to produce what we call 'financial transaction.' While Levine, (2005) has argued candidly about the topics raised above, the distinction between levels versus growth rates did not come out apparently. The issues of Levels, Steady State Transitions were never held by their work. Thus, their contention is that intermediation matters, but this begs the question of whether growth happens as levels of intermediation systems change gradually or fixed level today can influence rates of increase in the future.

James, (2008) further argued that the issue of the financial market intermediaries is a direct effect due to information and transaction prices. The presence of agents and entrepreneurs in the economy requires investors with a shortage of money to borrow. The funds borrowed need to be monitored because lenders may have limited information about the borrowers resulting in agency monitoring costs. A well-functioning financial system can run off this layer of agency cost through the reduction of market friction, i.e., better asymmetry of information. However, Savings rates are not monotone drone with increases in return or improved risk bearing; it can work the other direction. The theory provides

different predictions concerning the relationship between financial development and growth. Some methods claim that intermediary financial development will have an excessively valuable influence on the poor Aghion, et al., (2005). Other models posit a non-linear relationship between finance and income distribution Greenwood and Jovanovich, (1990).

K. Matthews et al., (2007), assessed the competitive conditions among the major British banks from 1980 – 2004, during a period of significant structural change. Their study examined 12 British banks and explicitly reported the estimates of the Rosse–Panzar H-statistic. They tested for the robustness of the Rosse–Panzar methodology by estimating the ratio of Lerner indices obtained from the interest rate. Their results indicate that competition in British banking is consistent with the theoretical model of monopolistic competition. The study by K. Matthews et al., (2007), provides evidence that the intensity of competition in the core market for bank lending remained approximately unchanged throughout the 1980s and 1990s. However, competition appears to have become less intense in the non-core (off-balance sheet) business of British banks.

According to James, (2008) two factors in the financial system influence growth. First through the accumulation of capital. Households in this channel mobilize savings, and the savings are utilized by the productive sector of the economy to generate wealth. This process according to Gurley and Shaw, (1955) is called the "debt accumulation." Secondly, through the Total Factor Productivity (TFP), also recognized as the qualitative channel. The qualitative channel looks at the functions of innovative financial technologies and how they influence growth. According to King and Levine, (1993b), this technology brings down the financial asymmetry that hinders the efficient allocation of financial resources and thus encourages development. Evidence from the growth accounting literature is that long-run

growth requires more technology improvement, but this leaves out transitions, which could be a significant or even poverty trap that in our opinion is silent in the growth literature. A more recent study by Levine, (2010a, 2010b), following the financial crisis in 2008 supplemented some of these ideas that, finance promotes economic development in the first place by improving the efficiency of capital allocation, not by increasing investment. Still, the question persists, does finance cause growth, reduced inequality, or lower poverty?

Lorenzo and Grechyna, (2015), examined the interdependence between financial development and real sector output and their effect on economic growth. The survey utilized a panel data for 101 developed and developing rural areas over the period 1970 to 2010. Their study includes an interaction term between the measure of financial development and the divergence between the growth of the financial and real sectors of the economic system. Along with the standard of financial development included as a variable, the interaction term provides a possible channel through which financial development may have a nonlinear effect on growth. The impact of financial development on economic growth might be weakened or could be even harmful if there is unbalanced growth in the financial and real sectors. They show that the effect of financial development on economic growth depends on the expansion of private credit relative to the actual output growth. The findings also suggest that the impact of financial development on growth becomes contrary if there is a rapid growth in private credit not accompanied by an increase in real output. Their findings provide empirical evidence that confirms the theories that suggest the existence of an optimal level of financial development given by the characteristics of an economic system. The authors further argued that, if financial-deepening increases systemic risk because of excess financing allocated to risky investments, technological progress in the

productive sector could achieve out the economy's production capacity and release the demand for funds from more efficient firms.

Such a process would stabilize the economy, take down the prospect of systemic crises, and so increases the fair economic growth rates. Likewise, if financial innovations reduce savings due to, for example, dampening interest rates, technological progress in the real sector has the opposite effect, i.e., increases the requirement for funds with a resultant boost in interest rates. Therefore, balanced growth of financial sector technologies and real sector technologies might be necessary for financial development to have an unambiguously positive effect on economic growth.

Luintel et al., (2016), examined if financial development (FD) and financial structure (FS) would affect financial and economic stability. Their study concentrates on economic stability only because they believe acute financial instability, which exacerbates economic uncertainty, is of more concern. They substituted economic instability by growth volatility and computed five yearly moving standard deviation of real per capita GDP growth, ARCH (1) volatility of real per capita GDP growth, and finally, the square of the residuals from their example as a measure of the conditional volatility of real GDP per capita. Hence, they estimated fixed effects (OLS) models for each measure of growth volatility on FD and FS across all nine specifications. Their results reveal that both converts are insignificant across all specifications. Thus, they conclude that there is no evidence that financial development and structure explains growth volatility.

Despite these recent debates and their appeal to theory, there are however some underlying questions that remain unanswered. For example, is the improvement in intermediation supposed to be around technology? This question in our opinion did not

again consider the transition in the events that the financial system goes wrong just like during the recent crisis in 2008. Similarly, on savings, there are no specific relationships between savings and risk allocations. We argue that, if the financial system is sufficient, with improved distribution of risk-bearing, then an individual does not need to save as a buffer because, savings may go down and not upward, because of improving one part of the financial system. Our thesis in chapter two and three discusses further details of the growth components of GDP as a result of banking development and the implications of savings (deposits), credits and money supply in regional development.

2.3. Conclusion

In this chapter, we reviewed the literature on financial development and growth. In our approach, we identify contextualized studies on financial development, and effects on growth, to generate interpretive explanations of why we believe the current debates on financial development is confined. One of the topics we identified in the literature is the debates on total factor productivity, and despite the arguments examined in the previous sections, we argue that some fundamental questions remain unanswered. For example, the discussion on intermediation as a primary function of the most financial institution in the literature is vague. The problem is, is intermediation about technological improvements in the sense of Total Factor Productivity (TFP)? Alternatively, is the improvement in intermediation supposed to be around technology? This question in our opinion did not consider transition or even potentially, poverty traps in the effects that the financial system goes wrong just like during the recent crisis in 2008. Similarly, on savings, there are no specific relationships between savings and improved allocation of risk. We argue that, if the financial system is sufficient, with improved distribution of risk-bearing, then an individual

does not need to save as a buffer because, savings may go down and not upward, because of improving one part of the financial system. Our thesis in chapter three and four discusses further some details of the growth effects of banking development as well as their effects on GDP components.

Moreover, following Knowles and Owen, (1995), we argue that the image of the credit markets as a perfectly efficient intermediary is misleading and therefore unrealistic. The authors reasoned that the intermediation process in the formal and informal credit markets significantly influences the results of the portfolio allocation effects generated through higher bank deposit rates. This same idea is what we examine in chapter four. In chapter four, we argue that, if the economy has a balanced growth path, how does communication in the informal sector effect economic growth. Further, the debates on financial development and growth provide different predictions concerning the relationship between financial development and growth. Some theories claim that intermediary financial development will cause a disproportionately beneficial impact on the poor Lucas, (1988). While other models posit a non-linear relationship between finance and growth such as in Greenwood and Jovanovich, (1990).

Without contradicting the status quo, the distinction between levels versus growth rates did not come out distinctly. One doubts whether such studies examine steadily improving financial growth on one or several of these ratios. For example, if an individual pushes his level of income up, does an expanding and improved financial sector over time is cause growth in that individual ever-increasing levels? Alternatively, is the literature suggesting that an improvement to the financial system, i.e., making it give way from low to a higher level without changes in individual income has implications for sustained growth?

We find that these propositions in our opinion do not agree with the central thesis of the finance and growth arguments.

The issues of Levels, Steady State Transitions were never captured by the studies reviewed in the previous sections. Another aspect is that, yes, intermediation matters, but this begs the issue of whether growth happens as levels of intermediation systems change gradually or fixed level today can influence rates of increase in the future. Still, the question persists, does finance cause growth, reduced inequality, or lower poverty? Level differences in GDP per capita in this study refer to one country's position relative to another but holding the growth rate constant. Growth rates, apply to the massive divergence in GDP per capita. In this study, we focus our discussion on growth rates in SSA and not level differences. Transitional growth means an individual hopped ahead of the growth frontier. Interim growth and level differences go hand in hand. Interim growth is how an individual change level differences Aggarwal, et al., (2005).

Chapter Three

Growth effects of banking development in Sub - Saharan Africa (SSA).

3.1. Introduction

In this chapter, we analyze the relationship between banking development and the local economic growth in 14 Sub-Saharan African (SSA) countries. We examine the connection between growths in real per capita Gross Domestic Product (GDP) to banking development and then further analyze the relationship between growth in both industrial and agricultural components of GDP. Our primary aim is to examine the growth effects of banking development on growth and its components in SSA countries. Many Sub-Saharan African countries, over the years, have reformed their financial sectors to enable their economies to integrate with the other financial system. These reforms date back to the late 1980s and early 1990s as an effort to improve the efficiency and the potency of the banking organization. These reforms included, among other things, Structural Adjustment programs (SAP), privatization, Information, and Communication Technology (ICT) and more recently mobile banking access. Some of the financial sectors regulated and improved on internal controls and performance monitoring mechanisms, all targeted at fostering the growth of the various financial institutions especially the banking sector. As a result of these changes, the evidence from World Bank, (2015) indicates that most of Sub Saharan African financial environment is now more liberalized, and African economies have started expanding their regional presence. Financial markets have begun to grow and develop as well, particularly in regional capital cities like Johannesburg, Nairobi, and Lagos.

According to Fosu, (2013), substantial government ownership of some African banks has caused domestic credit to the private sector to average at almost 32% of GDP because of bad performance of loans. Moreover, the deregulations of the financial industry allowed foreign entrants into the banking industry in Africa. This act as suggested by Kasekende, (2010) resulted into further deregulations of the interest rates and exchange rates, removing credit ceilings,

restructuring and privatizing banks, and boosting the capital markets, but above all increase in the number of banks and a visible improvement in cross-border banking. The presence of these banks across the regional capitals in Africa leads us to the motivation of this chapter; how does banking development; contribute to growth in sub-Saharan Africa?

Čihák et al., (2012), suggests that, for markets to functions, there are costs involved. These costs are either direct cost such as writing contracts, interpreting and implementing contracts, costs associated with the transaction of goods, services or even for information operations. Indirect costs include costs that are chiefly related to uncertainties, or risks, mitigated through insurance. The presence of these costs, according to Čihák et al., (2012), creates incentives for those involved in the process of intermediation. Encouraged by the profits, financial institutions, and then improve on these services for a fee. The fees charged can be on government services, legal fees or accounting fees to mention only a few. The complicated process develops to produce what we call financial transaction. One thing to notice is that some states have successfully created a sound economic organization. For instance, the United States (U.S.A) and the United Kingdom (UK), while others are yet to do so which could positively influence their economic systems.

Consequently, financial development occurs when financial institutions successfully reduce the monetary value of the transaction and mitigate the effects of market imperfections World Bank, (2016). Recent works on economic developments such as Levine, (2005), categorized and provided a more encompassing understanding of the financial system and its functions. This classification includes; information processing, monitoring, and allocation of capital, risk management and trade, mobilization of savings and finally, the ease of transaction

cost for both goods and services. According to Levine, (2005), commercial banks take a starring part in these aspects for two reasons;

i. They supply funds to firms for investments through credit extensions to productive enterprise. These firms in their part invest and create development opportunities through employment.
ii. Banks mobilize savings from firms and households by taking deposits to invest. At the same time, banks measure and supervise all the monetary resources and projects deployed through their support. This element of banks monitoring boost efficiency and reduce risk. Also, it encourages investments in significant projects that would have otherwise got neglected.
iii. Banks can further reduce cost and spread through technology and investments that is a common tendency in high street banks today. This process facilitates better trade and results in economic development and growth Smith, (1776).

However, in the events that the financial institutions fail, they can affect economic development, as most of the functions and roles discussed above are reversed. For example, misallocation of household savings and bank deposits to inefficient firms will result in credit defaults. On the corporate levels, executives might promote projects that only will increase their bonuses such as selling debt to third parties; all these shortcomings can distort economic prosperity. Despite the empirical grounds to hold the link between banking development and growth Levine, (2005), the effects on the development of rural population are absent in the literature. Also, the roles of banking development and its impact on growth in real per capita GDP are insufficient in the literature both on the theoretical and empirical approaches to the debates in the finance and economic development discourse. In this chapter, therefore, we

examine the effects of financial development on growth with a focus on the banking system by studying the growth effects of banking development on per capita GDP growth and the GDP components for agriculture and industry in Sub-Saharan Africa. Also, we examine the relationship between growth in Bank deposits, credits, money supply (M2) and growth rates using both fixed effects panel model following King and Levine (1993a, 1993b) and Instrumental Variables (IV), Two Stage Least Square (2SLS) estimation techniques.

While there is a substantial presence of formal banks in Sub-Saharan Africa, the level of financial intermediation has remained constant compared to the previous decades in the 90's Kasekende, (2010), yet, the banking system accounts for the bulk of the financial sector assets and activities in the region? Similarly, the expansion of the Pan Africa banks to the rest of the region remains an attractive factor in this domain. Besides, Sub-Saharan Africa banking system has significant excess liquidity World Bank, (2016). The excess liquidity reflects the absence of some expectations that we aspire to examine in this chapter using a panel data from 14 Sub-Saharan African countries to estimate three sets of growth specifications under two different approaches.

i. Under approach one; we analyze the effects of banking sector development on growth in real per capita GDP (constant USD), growth in real per capita agricultural GDP and growth in real per capita industrial GDP using fixed effects panel estimation technique. Besides, we use the growth in per capita capital stock as one of the regressors, the lagged value of per capita GDP, per capita agriculture GDP (AGDP), and per capita industrial GDP (IGDP). Likewise, our model includes the lagged values of the financial development proxy (i.e., Deposit to GDP ratio, Credit to GDP ratio and Money supply to GDP ratio) and their combinations as regressors for models all specifications. We

conduct formal diagnostic tests to verify the significance of the fixed effects, the growth effect of deposits and the growth effect for credits for all three models.

ii. Under approach two, we use 2SLS (FE-IV) estimation to capture the possible endogeneity of the regressors of the growth equations. The 2SLS procedure replaces the endogenous variables with predicted values of this endogenous variable when regressed on instruments. In the setup, we first estimate the first stage (reduced form) equation with only exogenous regressors, i.e., $Y2 = X1'Y1 + X2'Y2 + \varepsilon$. Secondly, we calculate the predicted values $\widehat{Y2}$ and substitute them in the structural equation model in equation (3.4). I.e. $Y1 = \widehat{Y2}'\beta1 + X1'\beta2 + u$. Equation (3.4) according to Anderson and Hsiao, (1981) will correct the problems of endogeneity. Therefore, we examined the effects of banking developments on growth ($Y1$), given the endogenous regressors of deposits, credits and money supply ($Y2$), the exogenous regressors of capital stock, roads in km, and roads square, telephone communication, and life expectancy ($X1$). Instruments are the lagged dependent variables as regressors ($X2$)

Our results indicate that the lagged per capita GDP has a significant negative effect on the growth of per capita real GDP. The negative effect shows that there is evidence of convergence in our sample and, a low-income country tends to grow faster than a rich one so that the poor state catches up with the rich one regarding the level of per capita income or product Barro and Sala-I-Martin, (1995, 1997). For all specifications, we discover that the marginal effect of per capita capital stock growth on per capita GDP growth is insignificant. The results may be due to the difference in capital share among the 14 Sub-Saharan African nations. Similarly, we find that lagged bank deposits to GDP have a significant negative effect on per capita GDP growth for all

the three models. Overall, per capita growth in GDP in Sub-Saharan Africa can improve by increasing savings (i.e., bank deposits) through bank expansion.

The rest of this chapter is organized as follows; Section 2 describes the background and indicators of the macroeconomic development in Sub-Saharan Africa and the banking systems, comparing the financial institutions in SSA and the rest of the world. Section 3 reviews the related literature and section 4 presents our empirical framework as well as the data. Section 5 presents and discusses the outcomes of the fixed effects panel estimation and the results from the 2SLS estimate. The last Section 6 concludes.

3.2. Background of Sub-Saharan Economy.

Kasekende, (2010) claims that the financial sector remains underdeveloped in SSA, yet the banking sector accounts for most financial sector assets. Referable to the banking crisis of the early 70's and 80's in Africa, there was a demand to fix the financial sector. The reforms mainly target the banking sector and other micro-financial institutions initiated in the early 90's Kasekende, (2010). These reforms focused on the banking sector, on the state-owned commercial and foreign banks. In this section, therefore, we discuss the context and the background of the financial institutions in SSA and how they compare to the rest of the world and the Euro area. We offer to work how the banking system in SSA influences growth and development using four institutional characteristics and benchmarks suggested by Čihák et al., (2012). Our discussion on context will include an emphasis on; the size of financial institutions (financial depth), Access to financial services, the efficiency of fiscal intermediaries in facilitating financial transactions and finally stability of financial institutions. The background to the study will also include the relevant macroeconomic circumstance such as GDP growth, liquidity, and risk.

It is evident that, over the last two decades, a significant number of countries in SSA have registered a full degree of sustainable economic growth (see Figure 3.1a: panel a-d infra). Growth during this time was primarily during the 1990's and continued still after the slowdown throughout the 2008 financial crises. Evidence from table 3.1 indicates that SSA registered a growth rate of 6.04 percent compared with barely 0.8 in Western Europe and 1.06 percent in the European Union during this period. Countries like Malawi and Uganda recorded the highest growth rates of 7.42 and 8.26 respectively. Nevertheless, some countries like DR. Congo with high inflation rates remained exposed to food and fuel price shocks. Performance in the agriculture sector (figure3.1a: panel c) in the last two decades has been remarkably unsteady despite the resilience shown during the financial crisis of 2008. Therefore, the data suggest some vital consideration of whether there are some identifiable regional performance problems. Also, (figure 3.1a: panels' b and c) seems to imply some issues with long-run equilibrium values, for example, GDP growth in most of the sample did not show a constant growth trend. According to Jones, (2002), differences in cyclical adjustments to shocks, i.e., short-run equilibrium values of demand and supply issues should adjust in the long run, and such a proposition is not evident in Sub-Saharan Africa. The increase in the growth rates due to falling consumer price inflation is not consistent with the macroeconomic factors such as capital-output ratio, the ratio of physical capital to GDP and investment in physical capital stock in panel b.

Nevertheless, the policy implications on the growth of the 90s suggested by Fosu, (2013) compared with the previous decades is not surprising, but an indication of improved living standards and macroeconomic stability. Unlike in the 80's when Sub-Saharan Africa fell behind the rest of the world (Table 3.1) enhanced macroeconomic policies such as consolidation of financial positions and targeting of inflation controls spurred growth. The region also liberalized

its exchange regimes and unification of exchange rates, including the construction of foreign reserves through investments. The International Monetary Fund (IMF), a report in 2017 attributes several of these critical elements linked to growth due to mainly Trade and regulatory reforms. Governments in Sub-Saharan Africa during this period reduced their direct state participation in economic activity but instead encouraged the private sector through reforms, trade liberalization and regulatory reforms. This policy increased domestic competition and cut inefficiencies.

Figure 3.1a: Charts of Sample Means

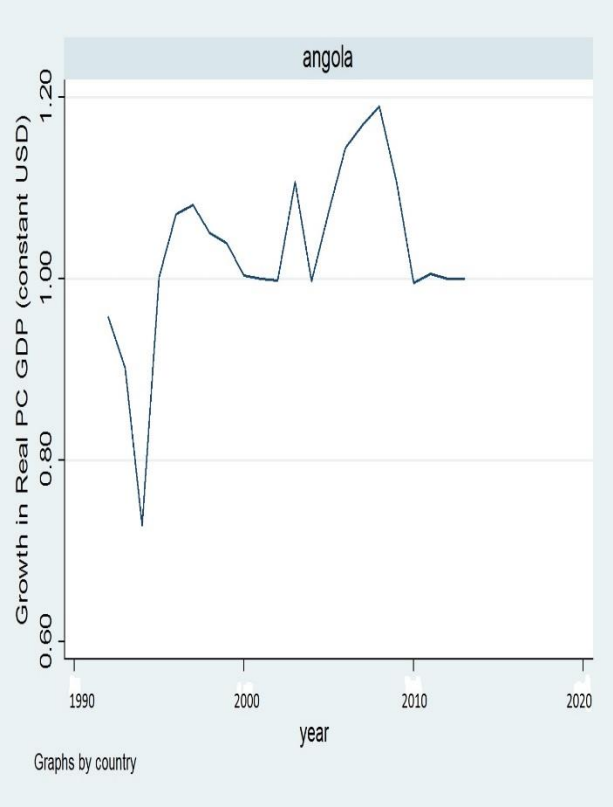
Likewise, discoveries of new natural resources such as oil, gas, and better commodity price trends provided a strong motivator for development in many mineral-rich economies. On the other hand, some non-petroleum producing states have experienced tremendous advances in their economies benefiting from the surging oil prices; this includes Malawi, Rwanda, and Uganda. Sub-Saharan Africa has also experienced a significant financial deepening in most states over this period. The prevalence of banking crises in the late 80's and early 90's according to the World Bank, (2017) came to an end at the remainder of the 1990s and to the present time. Therefore, in examining growth patterns in Sub-Saharan Africa, it is of the essence that we pay some attention to the diversity of the region. Sub Saharan Africa, according to the World Bank, (2017) vary markedly regarding population size, income levels, resource endowments, access to international transportation corridors, and the extent of societal-political stability because such conditions adversely affect growth.

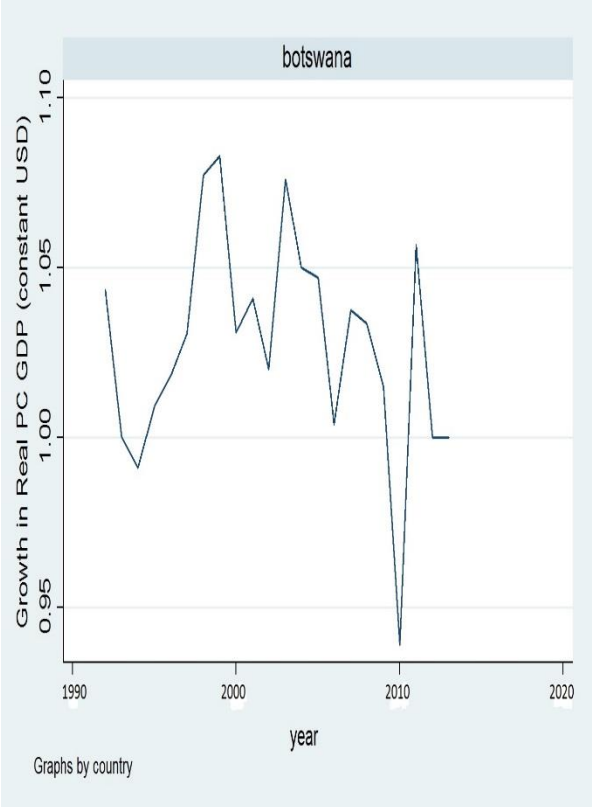
Table 3.1 further, shows that growth prospects in sub-Saharan Africa remain fragile. In 2016, growth slowed in about two-thirds of the states in the region, accounting for 83 percent of regional GDP, the worst performance in more than two decades. The recovery was determined in 2017 driven by regaining in petroleum yield in oil-producing countries, higher public spending as a result of elections in most states, and the fading of drought effects combined, with small advances in their terms of trade. Federal Reserve Bank of St. Louis, (2017). Even so, the underlying regional momentum remains weak, and, at this pace, sub-Saharan Africa growth will continue to fall considerably short of past movements and barely exceed population growth.

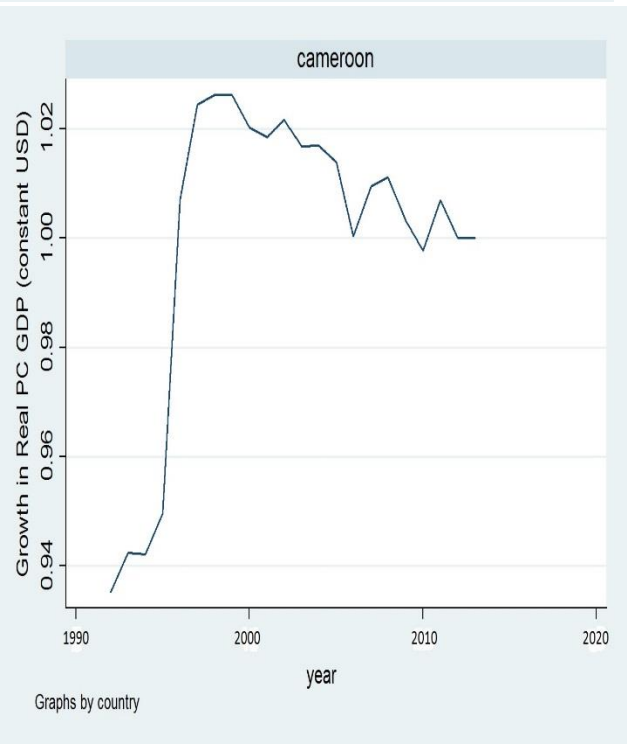
Table 3.1: Sub Saharan Africa - Macroeconomic Data Compared to the Rest of the World

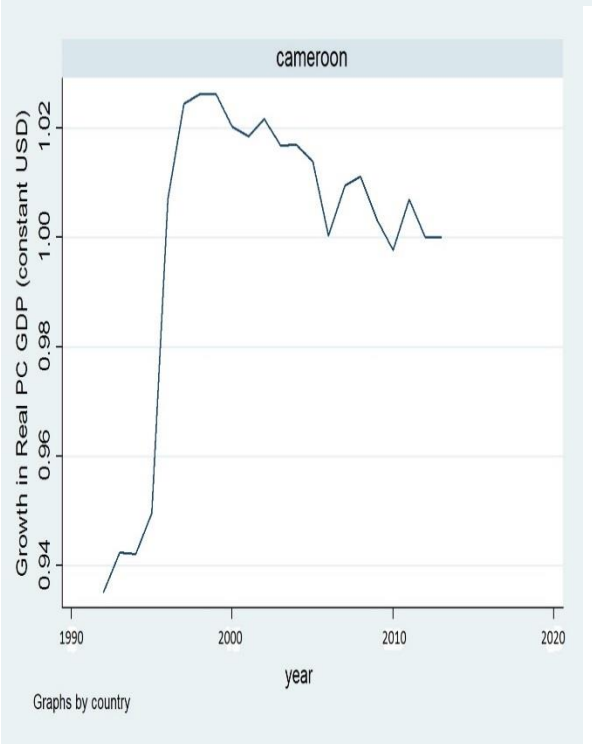
Year	1986-90	1991-95	1996-00	2001-05	2006-10	2011-15	2016	2017
Botswana	**12.08**	**3.24**	**5.24**	**3.66**	**4.76**	**4.84**	**2.9**	**4.1**
Cameroon	-2.26	-1.86	4.68	3.7	2.92	5.2	4.4	3.7
Chad	4.46	3.08	2.64	15.36	4.94	4.68	-6.4	0.3
Congo, Dem. Rep. of the	1.78	-7.14	-5.1	3.84	5.56	7.78	2.4	2.8
Ghana	4.8	4.14	4.44	5.08	6.46	7.7	4	5.8
Kenya	5.52	1.38	2	3.54	4.94	5.46	6	5.3
Malawi	2.32	2.92	4.4	2.42	7.42	4.12	2.3	4.5
Namibia	0	4.02	3.52	4.78	3.28	5.54	0.1	3.5
Rwanda	0.04	-5.1	9.3	8.16	8.32	7.56	5.9	6.1
South Africa	**1.68**	**0.88**	**2.8**	**3.84**	**3.14**	**2.2**	**0.3**	**0.8**
Sudan	4.1	3.42	6.88	5.78	5.52	1.5	3	3.7
Tanzania	5.54	1.82	4.28	6.6	6.12	6.86	6.6	6.8
Togo	4.18	2.7	-0.18	1.2	3.2	5.5	5	5
Uganda	5.22	6.26	5.84	7.58	8.26	4.72	4.7	5
Africa (Region)	**0**	**1.38**	**3.98**	**5.38**	**5.46**	**4.12**	**2.2**	**3.5**
Europe	3.14	-0.2	2.76	2.7	1.52	1.14	1.6	1.9
Western Europe	3.42	1.66	2.92	1.76	0.82	0.98	1.8	1.7
European Union	3.18	1.52	2.94	2.06	1.06	1.14	2	2
Middle East and North Africa	3.36	3.86	3.82	5.98	4.54	3.46	3.8	2.3
Sub-Saharan Africa	**0**	**1**	**3.42**	**6.02**	**6.04**	**4.62**	**1.4**	**2.6**
World	**3.9**	**2.72**	**3.76**	**4.02**	**3.88**	**3.6**	**3.1**	**3.5**

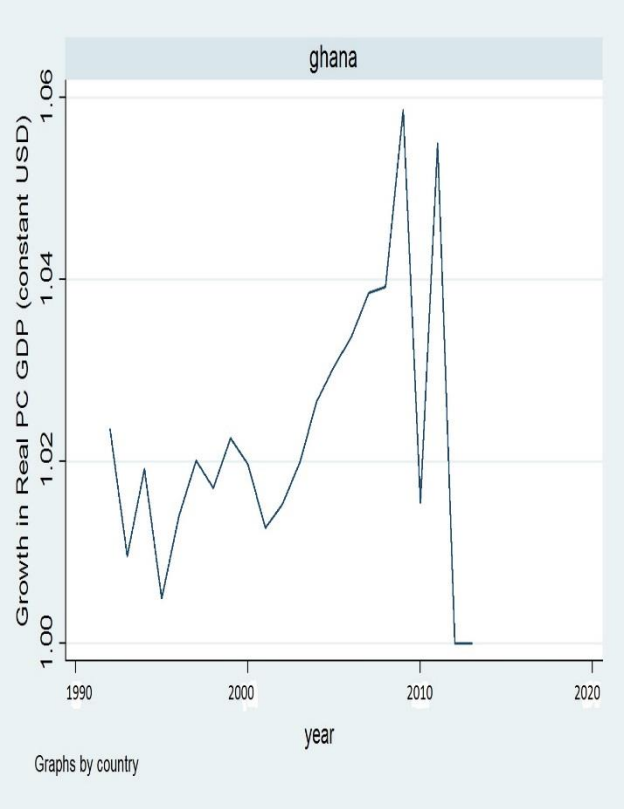
Source: Authors work. The Figures in table 2.1 shows growth in real per capita GDP at constant U$D.

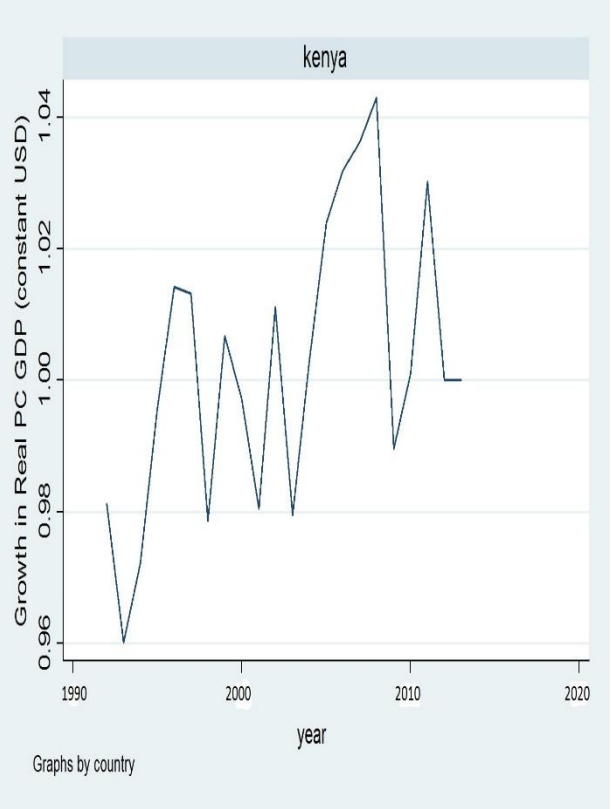

angola
Growth in Real PC GDP (constant USD)
0.60
0.80
1.00
1.20
1990
2000
2010
2020
year
Graphs by country

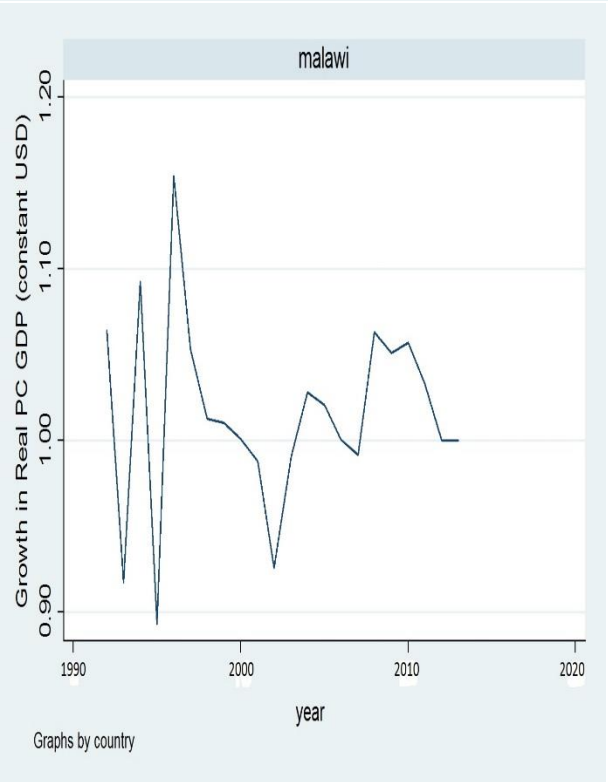

botswana
Growth in Real PC GDP (constant USD)
0.95
1.00
1.05
1.10
1990
2000
2010
2020
year
Graphs by country

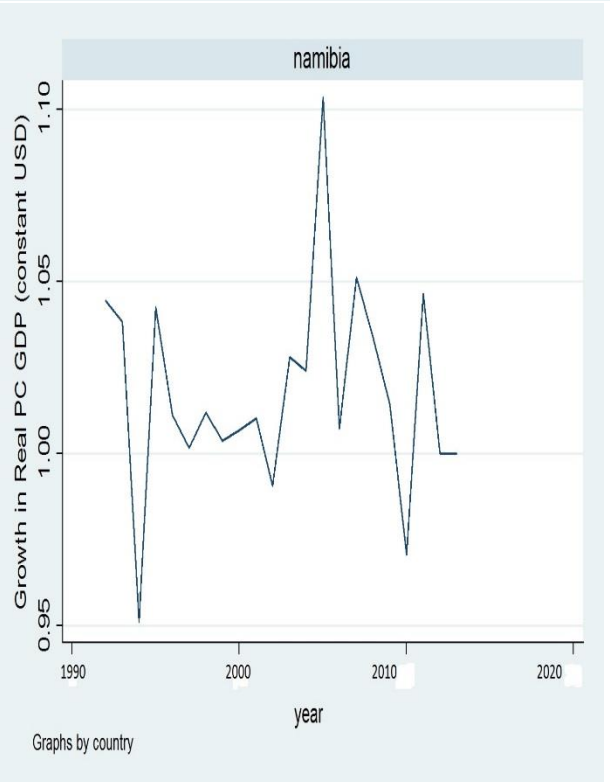

cameroon
Growth in Real PC GDP (constant USD)
0.94
0.96
0.98
1.00
1.02
1990
2000
2010
2020
year
Graphs by country

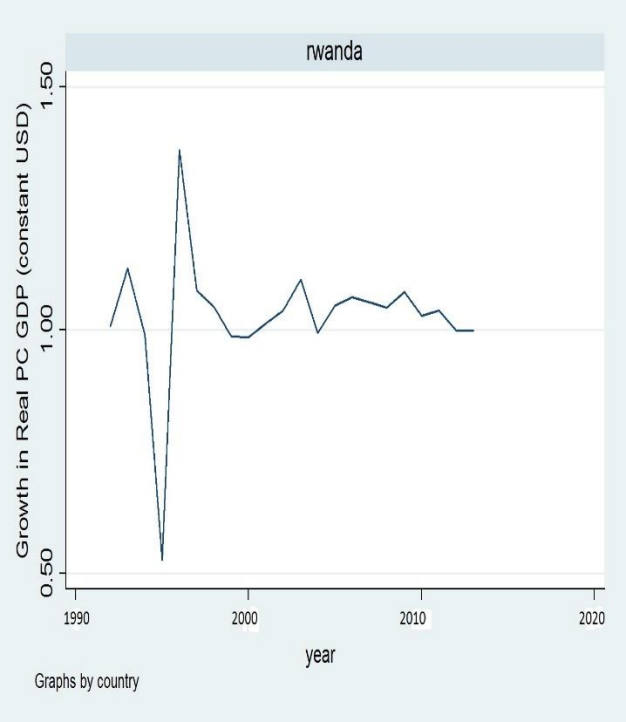

cameroon
Growth in Real PC GDP (constant USD)
0.94
0.96
0.98
1.00
1.02
1990
2000
2010
2020
year
Graphs by country

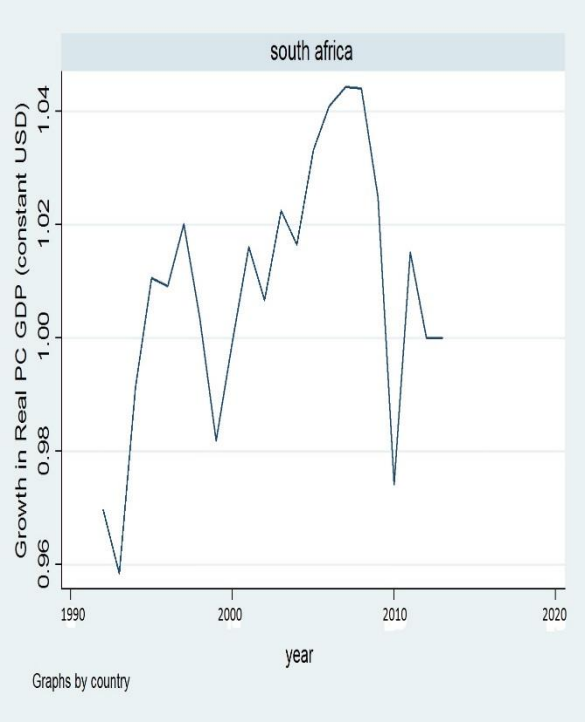

ghana
Growth in Real PC GDP (constant USD)
1.00
1.02
1.04
1.06
1990
2000
2010
2020
year
Graphs by country

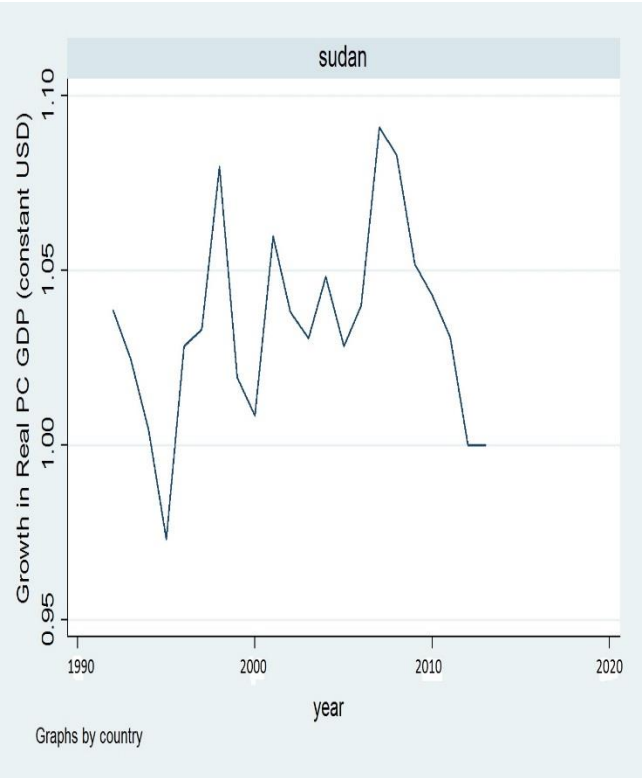

kenya
Growth in Real PC GDP (constant USD)
0.96
0.98
1.00
1.02
1.04
1990
2000
2010
2020
year
Graphs by country

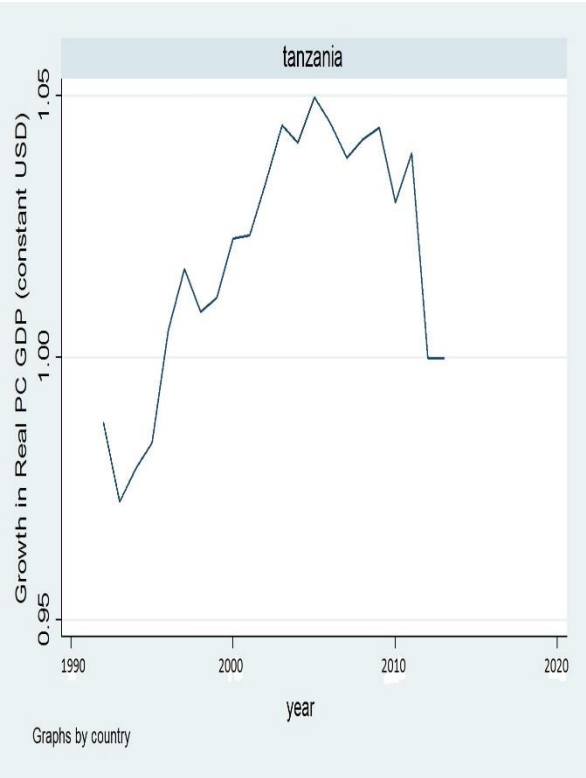

malawi
Growth in Real PC GDP (constant USD)
0.90
1.00
1.10
1.20
1990
2000
2010
2020
year
Graphs by country

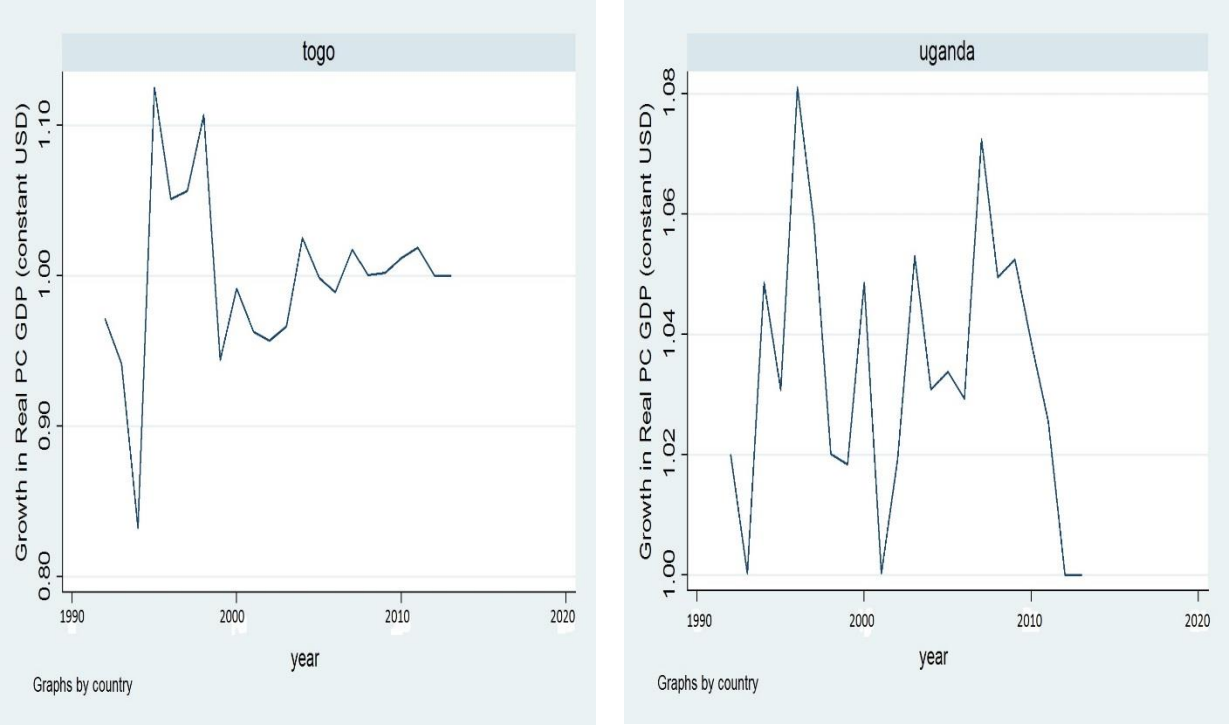

namibia
Growth in Real PC GDP (constant USD)
0.95
1.00
1.05
1.10
1990
2000
2010
2020
year
Graphs by country


rwanda
Growth in Real PC GDP (constant USD)
0.50
1.00
1.50
1990
2000
2010
2020
year
Graphs by country


south africa
Growth in Real PC GDP (constant USD)
0.96
0.98
1.00
1.02
1.04
1990
2000
2010
2020
year
Graphs by country


sudan
Growth in Real PC GDP (constant USD)
0.95
1.00
1.05
1.10
1990
2000
2010
2020
year
Graphs by country


tanzania
Growth in Real PC GDP (constant USD)
0.95
1.00
1.05
1990
2000
2010
2020
year
Graphs by country



Graph 3.1: Growth in real pc GDP (constant USD) by country

Source: Authors work. Data is from the World Bank, African Development Indicators (ADI) Database

3.2.1. Summary Statistics for all Counties from 1990 to 2013.

African Development Indicators (ADI) 2004 depicts a diverse picture of development in Africa, with several countries making remarkable progress and others lagging seriously behind. ADI, (2004) presents data for the 14 SSA in our sample summarized in table 3.2 below. Sudan, Congo, DR, Rwanda, Uganda and Angola show their economy averaged 1% growth for the period 1995-2002. This is mainly as a result of severe civil conflict and adverse weather conditions. The region's economic growth slowed in 2002 to 2.8 percent, slightly down from 2.9 percent in 2001. Net foreign direct investment flows continued on a rising trend and reached $8.9 billion in 2002, ADI, (2004). These continued to be heavily concentrated in oil exporting countries (mainly Sudan and Angola) and South Africa.

The increase in official aid to the region fell far below the levels required to put a significant dent on poverty or achieve the MDGs. According to the World Bank, (2017), debt relief is playing a more significant role in Africa's resource picture, as total debt service relief reached $43 billion in the fiscal year 2013. Gross enrollment in primary schools recovered to 87 percent, up from 80 percent in 1980, mainly for Uganda, Malawi, and Tanzania. The increase contributed to a drop in illiteracy rates from 47 percent in 1997 to 37 percent from 2000 to 2015. Tracking the HIV/AIDS pandemic, the ADI, (2015) reveals that almost 30 million Africans are infected, and eleven million children have been orphaned. In 2001 alone, 2.2 million AIDS-related deaths were recorded on the continent. Civil wars, the rapid spread of HIV/AIDS, anemic aid, persistent low growth rates and weak commodity prices, threaten gains of the recent years in overall poverty alleviation and have jeopardized Africa's chances of attaining some of the Millennium Development Goals (MDGs) in 2015.

Table 3.2: Summary Statistics for all countries

VARIABLES – Angola.	N	mean	Sd.	min	max
GDP per capita (constant USD)	23	3.952	1.425	2.347	6.232
Growth in Real PC GDP (constant USD)	22	1.028	0.0969	0.729	1.190
Real PC Capital Stock (constant USD)	23	37.45	7.599	27.78	51.29
Growth in Real PC Capital Stock	22	0.973	0.00919	0.966	1.000
Industry value added Per Capita (Real USD)	23	2.430	0.947	1.191	4.202
Growth in Real PC Industry GDP	22	1.086	0.181	0.725	1.486
Agriculture value added per capita (Real USD)	23	26.43	12.78	10.50	51.11
Growth in Real PC Agriculture GDP	22	1.040	0.160	0.517	1.242
Real Bank Deposit to GDP Ratio	23	0.130	0.0786	0.0548	0.295
Real Bank Credit to GDP ratio	23	0.0691	0.0799	0.00451	0.292
Real Money Supply (M2) to GDP Ratio	23	0.139	0.102	0.00313	0.385

VARIABLES – Ghana.	N	mean	Sd.	min	max
GDP per capita (constant USD)	23	2.786	0.469	2.211	3.603
Growth in Real PC GDP (constant USD)	22	1.023	0.0153	1.000	1.059
Real PC Capital Stock (constant USD)	23	61.98	10.12	49.03	80.83
Growth in Real PC Capital Stock	22	0.978	0.00744	0.972	1.000
Industry value added Per Capita (Real USD)	23	0.608	0.0981	0.371	0.740
Growth in Real PC Industry GDP	22	1.054	0.112	0.839	1.498
Agriculture value added per capita (Real USD)	23	91.09	14.87	72.05	118.8
Growth in Real PC Agriculture GDP	22	0.978	0.00744	0.972	1.000
Real Bank Deposit to GDP Ratio	23	0.159	0.0393	0.0850	0.225
Real Bank Credit to GDP ratio	23	0.265	0.0692	0.164	0.398
Real Money Supply (M2) to GDP Ratio	23	0.233	0.0617	0.141	0.341

VARIABLES – Kenya.	N	mean	Sd.	min	max
GDP per capita (constant USD)	23	4.310	0.237	4.026	4.706
Growth in Real PC GDP (constant USD)	22	1.002	0.0221	0.960	1.043
Real PC Capital Stock (constant USD)	23	75.34	22.52	44.15	112.0
Growth in Real PC Capital Stock	22	1.033	0.108	0.776	1.193
Industry value added Per Capita (Real USD)	23	0.684	0.0687	0.565	0.795
Growth in Real PC Industry GDP	22	1.029	0.0723	0.910	1.259
Agriculture value added per capita (Real USD)	23	119.0	5.917	110.1	133.8
Growth in Real PC Agriculture GDP	22	0.995	0.0442	0.933	1.088
Real Bank Deposit to GDP Ratio	23	0.320	0.0524	0.228	0.430
Real Bank Credit to GDP ratio	23	0.396	0.0667	0.291	0.603
Real Money Supply (M2) to GDP Ratio	23	0.360	0.0584	0.228	0.441

VARIABLES – Malawi.	N	mean	Sd.	min	max
GDP per capita (constant USD)	23	1.528	0.156	1.262	1.809
Growth in Real PC GDP (constant USD)	22	1.016	0.0579	0.893	1.154
Real PC Capital Stock (constant USD)	23	20.51	3.256	15.87	25.21
Growth in Real PC Capital Stock	22	0.979	0.0105	0.969	1.000
Industry value added Per Capita (Real USD)	23	0.182	0.0409	0.125	0.260
Growth in Real PC Industry GDP	22	1.044	0.232	0.607	1.615
Agriculture value added per capita (Real USD)	23	47.22	9.252	26.31	58.29
Growth in Real PC Agriculture GDP	22	1.041	0.176	0.707	1.524
Real Bank Deposit to GDP Ratio	23	0.126	0.0380	0.0759	0.215
Real Bank Credit to GDP ratio	23	0.177	0.105	0.0625	0.430
Real Money Supply (M2) to GDP Ratio	23	0.176	0.0378	0.121	0.257

VARIABLES – Namibia.	N	mean	Sd.	min	max
GDP per capita (constant USD)	23	22.23	2.984	18.31	26.78
Growth in Real PC GDP (constant USD)	22	1.018	0.0311	0.951	1.103
Real PC Capital Stock (constant USD)	23	429.0	125.6	210.9	639.7
Growth in Real PC Capital Stock	22	1.040	0.172	0.644	1.347
Industry value added Per Capita (Real USD)	23	6.302	1.266	4.833	9.267
Growth in Real PC Industry GDP	22	1.034	0.102	0.830	1.281
Agriculture value added per capita (Real USD)	23	201.5	20.24	163.3	230.7
Growth in Real PC Agriculture GDP	22	0.998	0.0738	0.841	1.122
Real Bank Deposit to GDP Ratio	23	0.384	0.0956	0.232	0.594
Real Bank Credit to GDP ratio	23	0.466	0.0963	0.195	0.585
Real Money Supply (M2) to GDP Ratio	23	0.370	0.0620	0.243	0.463

VARIABLES – Rwanda.	N	mean	Sd.	min	max
GDP per capita (constant USD)	23	2.594	0.577	1.395	3.525
Growth in Real PC GDP (constant USD)	22	1.030	0.138	0.527	1.371
Real PC Capital Stock (constant USD)	23	38.27	20.75	6.646	73.46
Growth in Real PC Capital Stock	22	1.127	0.400	0.193	2.594
Industry value added Per Capita (Real USD)	23	0.415	0.0902	0.291	0.578
Growth in Real PC Industry GDP	22	1.027	0.151	0.574	1.277
Agriculture value added per capita (Real USD)	23	86.57	13.36	54.80	108.6
Growth in Real PC Agriculture GDP	22	1.027	0.108	0.728	1.312
Real Bank Deposit to GDP Ratio	23	0.119	0.0176	0.0884	0.135
Real Bank Credit to GDP ratio	23	0.110	0.0595	0.0303	0.285
Real Money Supply (M2) to GDP Ratio	23	0.144	0.0411	0.0661	0.224

VARIABLES – South Africa.	N	mean	Sd.	min	max
GDP per capita (constant USD)	23	32.58	3.309	29.03	37.96
Growth in Real PC GDP (constant USD)	22	1.008	0.0233	0.958	1.044
Real PC Capital Stock (constant USD)	23	591.9	169.2	371.1	864.3
Growth in Real PC Capital Stock	22	1.033	0.0777	0.911	1.226
Industry value added Per Capita (Real USD)	23	9.713	0.828	8.425	11.48
Growth in Real PC Industry GDP	22	1.013	0.0403	0.938	1.103
Agriculture value added per capita (Real USD)	23	90.73	7.172	76.46	107.3
Growth in Real PC Agriculture GDP	22	1.001	0.110	0.712	1.214
Real Bank Deposit to GDP Ratio	23	0.520	0.0633	0.429	0.639
Real Bank Credit to GDP ratio	23	0.637	0.380	0.148	1.332
Real Money Supply (M2) to GDP Ratio	23	0.448	0.292	0.143	1.090

VARIABLES- Sudan.	N	mean	Sd.	min	max
GDP per capita (constant USD)	23	4.958	1.325	3.422	7.126
Growth in Real PC GDP (constant USD)	22	1.034	0.0285	0.973	1.091
Real PC Capital Stock (constant USD)	23	106.2	65.86	20.51	186.8
Growth in Real PC Capital Stock	22	1.127	0.280	0.946	2.215
Industry value added Per Capita (Real USD)	23	1.049	0.603	0.356	2.107
Growth in Real PC Industry GDP	22	1.100	0.170	0.759	1.519
Agriculture value added per capita (Real USD)	23	175.2	27.14	123.6	218.5
Growth in Real PC Agriculture GDP	22	1.026	0.0671	0.928	1.197
Real Bank Deposit to GDP Ratio	23	0.0980	0.0369	0.0490	0.144
Real Bank Credit to GDP ratio	23	0.140	0.0814	0.0487	0.357
Real Money Supply (M2) to GDP Ratio	23	0.154	0.0498	0.0858	0.233

VARIABLES – Tanzania.	N	mean	Sd.	min	max
GDP per capita (constant USD)	23	3.388	0.631	2.740	4.453
Growth in Real PC GDP (constant USD)	22	1.019	0.0239	0.973	1.050
Real PC Capital Stock (constant USD)	23	72.43	26.11	42.42	117.9
Growth in Real PC Capital Stock	22	1.031	0.0833	0.828	1.151
Industry value added Per Capita (Real USD)	23	0.639	0.225	0.365	0.996
Growth in Real PC Industry GDP	22	1.065	0.110	0.973	1.494
Agriculture value added per capita (Real USD)	23	97.94	8.164	87.96	112.3
Growth in Real PC Agriculture GDP	22	1.010	0.0139	0.979	1.034
Real Bank Deposit to GDP Ratio	23	0.172	0.0487	0.110	0.265
Real Bank Credit to GDP ratio	23	0.181	0.0887	0.0730	0.346
Real Money Supply (M2) to GDP Ratio	23	0.224	0.0454	0.165	0.311

VARIABLES – Togo.	N	mean	Sd.	min	max
GDP per capita (constant USD)	23	2.628	0.163	2.165	2.995
Growth in Real PC GDP (constant USD)	22	0.999	0.0594	0.833	1.125
Real PC Capital Stock (constant USD)	23	46.03	13.87	17.59	85.30
Growth in Real PC Capital Stock	22	1.027	0.276	0.371	1.831
Industry value added Per Capita (Real USD)	23	0.500	0.0772	0.417	0.695
Growth in Real PC Industry GDP	22	1.011	0.106	0.738	1.180
Agriculture value added per capita (Real USD)	23	92.93	8.980	75.15	107.0
Growth in Real PC Agriculture GDP	22	0.996	0.0829	0.720	1.138
Real Bank Deposit to GDP Ratio	23	0.218	0.0672	0.133	0.341
Real Bank Credit to GDP ratio	23	0.237	0.0619	0.160	0.428
Real Money Supply (M2) to GDP Ratio	23	0.291	0.0572	0.211	0.413

VARIABLES – Uganda.	N	mean	Sd.	min	max
GDP per capita (constant USD)	23	2.767	0.664	1.861	3.800
Growth in Real PC GDP (constant USD)	22	1.033	0.0231	1.00	1.081
Real PC Capital Stock (constant USD)	23	59.89	19.93	33.70	94.48
Growth in Real PC Capital Stock	22	1.044	0.101	0.902	1.376
Industry value added Per Capita (Real USD)	23	0.557	0.258	0.194	0.919
Growth in Real PC Industry GDP	22	1.106	0.0779	0.983	1.239
Agriculture value added per capita (Real USD)	23	71.00	2.724	65.96	76.27
Growth in Real PC Agriculture GDP	22	0.998	0.0278	0.958	1.058
Real Bank Deposit to GDP Ratio	23	0.115	0.0494	0.0410	0.211
Real Bank Credit to GDP ratio	23	0.125	0.0748	0.0438	0.354
Real Money Supply (M2) to GDP Ratio	23	0.156	0.0433	0.0760	0.236

VARIABLES- Cameroon.	N	mean	Sd.	min	max
GDP per capita (constant USD)	23	6.079	0.446	5.247	6.654
Growth in Real PC GDP (constant USD)	22	1.000	0.0290	0.935	1.026
Real PC Capital Stock (constant USD)	23	118.2	26.16	78.50	168.5
Growth in Real PC Capital Stock	22	1.016	0.0993	0.814	1.224
Industry value added Per Capita (Real USD)	23	1.751	0.148	1.472	1.973
Growth in Real PC Industry GDP	22	1.022	0.0815	0.842	1.182
Agriculture value added per capita (Real USD)	23	115.7	14.28	91.64	132.3
Growth in Real PC Agriculture GDP	22	1.011	0.0296	0.933	1.060
Real Bank Deposit to GDP Ratio	23	0.134	0.0278	0.0890	0.177
Real Bank Credit to GDP ratio	23	0.164	0.0726	0.0658	0.375
Real Money Supply (M2) to GDP Ratio	23	0.160	0.0295	0.119	0.216

VARIABLES – Botswana.	N	mean	Sd.	min	max
GDP per capita (constant USD)	23	33.17	7.196	23.36	42.23
Growth in Real PC GDP (constant USD)	22	1.027	0.0330	0.939	1.083
Real PC Capital Stock (constant USD)	23	977.8	251.4	584.3	1,355
Growth in Real PC Capital Stock	22	1.027	0.134	0.711	1.261
Industry value added Per Capita (Real USD)	23	16.16	3.195	11.57	21.44
Growth in Real PC Industry GDP	22	1.036	0.0951	0.718	1.200
Agriculture value added per capita (Real USD)	23	88.37	14.03	67.66	113.4
Growth in Real PC Agriculture GDP	22	0.992	0.0602	0.900	1.138
Real Bank Deposit to GDP Ratio	23	0.272	0.110	0.145	0.523
Real Bank Credit to GDP ratio	23	0.253	0.209	0.00166	0.675
Real Money Supply (M2) to GDP Ratio	23	0.287	0.122	0.0782	0.469

VARIABLES – Congo. DR.	N	mean	Sd.	min	max
GDP per capita (constant USD)	23	1.120	0.324	0.827	2.104
Growth in Real PC GDP (constant USD)	22	0.971	0.0628	0.831	1.047
Real PC Capital Stock (constant USD)	23	4.292	1.769	2.047	6.700
Growth in Real PC Capital Stock	22	1.050	0.154	0.873	1.592
Industry value added Per Capita (Real USD)	23	0.233	0.0918	0.164	0.594
Growth in Real PC Industry GDP	22	1.009	0.249	0.565	1.899
Agriculture value added per capita (Real USD)	23	44.76	7.332	37.45	55.24
Growth in Real PC Agriculture GDP	22	0.985	0.0402	0.862	1.080
Real Bank Deposit to GDP Ratio	23	0.0281	0.0153	0.0116	0.0586
Real Bank Credit to GDP ratio	23	0.546	1.056	0.451	3.658
Real Money Supply (M2) to GDP Ratio	23	0.648	0.896	1.105	3.351

Source: Authors work. Data is from the World Bank, Africa Development Indicators Database.

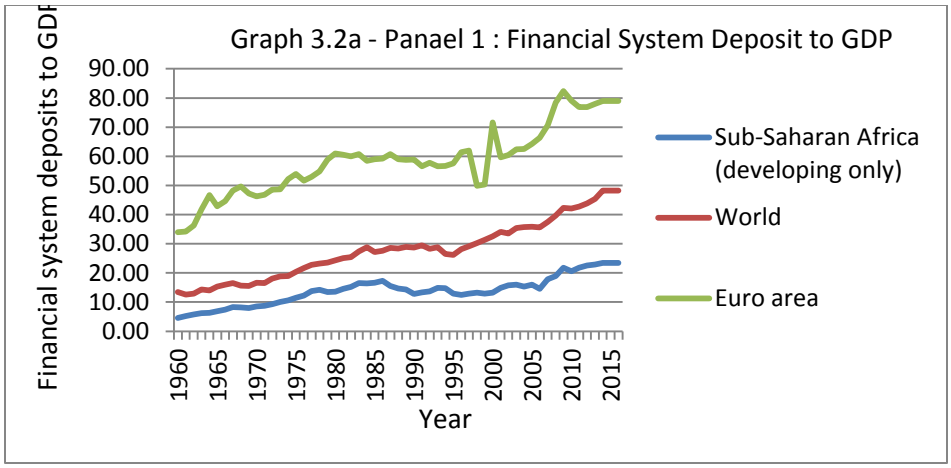
3.2.2. Financial Depth.

Financial depth refers to liquid liabilities to GDP. Adopted from the accounting concept of liquidity (Short term) and Solvency (Long term), liquidity trends across cross-country comparisons are especially useful. It measures the state's ability to repay its short-term financial obligations out of its current assets, and this change significantly between countries (Graph 3.2a – panel 1to 3). Demand, time and saving deposits in deposit money have improved over the past decades in the Euro area compared to SSA (see Panel 1). The increasing need for banking services indicates that most banking systems in SSA are small, characterized by small bank deposits to GDP ratios. Nevertheless, the proportion of central bank assets to GDP (panel 2) in SSA is enormous. Therefore, there is a significant portion of assets taken during government securities and cash in SSA compared to the Euro area.

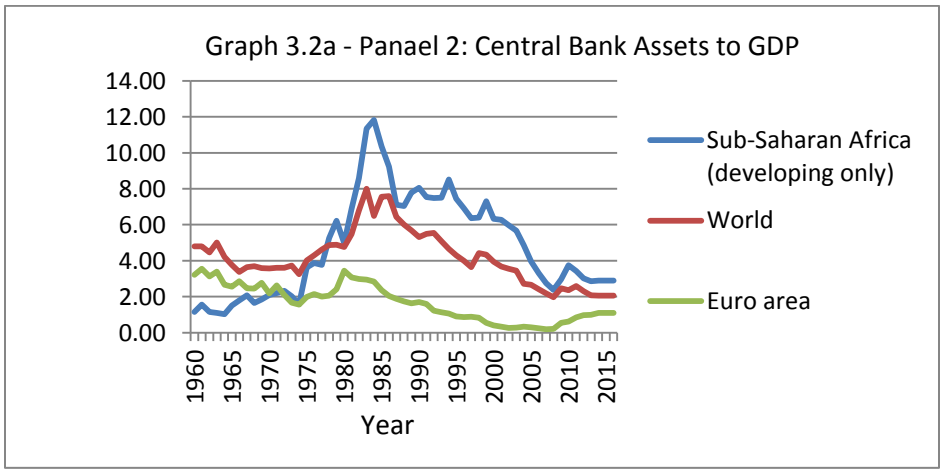
Looking back to the banking sector in SSA in the 1980's, we find that, the increase in the number of low banks with the comparatively smaller capital base, as a by-product of reforms, attracted recapitalization programs, particularly in West Africa to reverse possible risk financial instability. Summary statistics by Fosu, (2013) during the period of their study indicate that a sub-regional average of the ratio of equity to total assets was as eminent as 15% in Southern and West Africa and 16% in North and East Africa. The proportion of loans to total assets is averaged 48% for the region Fosu, (2013). At a sub-regional level, this ratio is about 45% and 46% in the Southern and West African sub-regions, respectively.

Characterized by significant excess liquidity, the banking systems in SSA echoes the inadequacy of what banks are held to be. In such circumstances, policy tools such as reserve requirements become ineffective in influencing lending conditions. Čihák et al., (2012), further

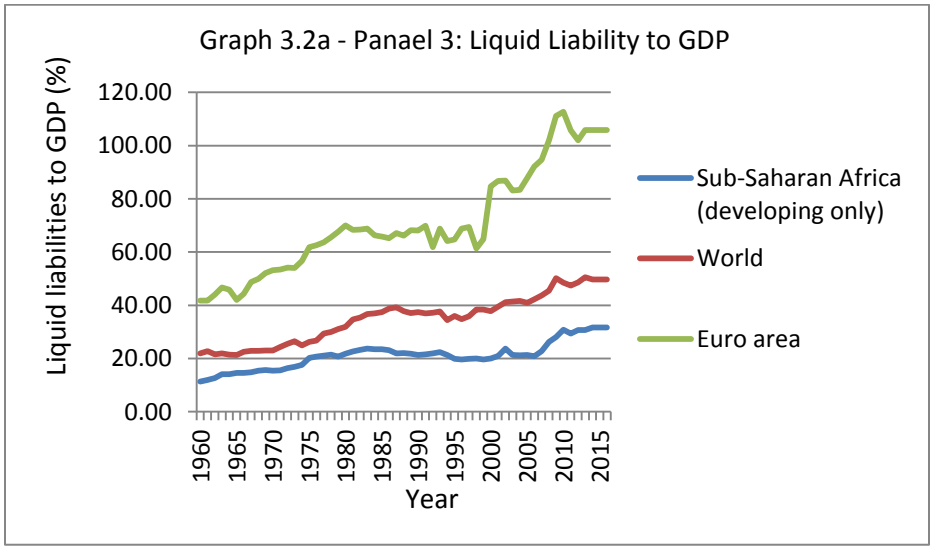
argues that the proportion of liquid liabilities to GDP is also recognized as broad money (M3 in panel 3), is comparatively low in Sub-Saharan Africa but has gradually increased over from the past decades. The variation in graph 3.2a-panel 3 confirms that SSA scores lowest among similar regions in the world regarding financial development and in particular on financial access.



Source: Authors work. Financial system deposit to GDP refers to demand, time and saving deposits in deposit money banks and other financial establishments as a percentage of GDP (World Bank, 2017)



Source: Authors work. Central Bank Assets to GDP refer to the proportion of central bank assets to GDP. These assets are claims on a domestic real nonfinancial sector of the Central Bank (World Bank, 2017).

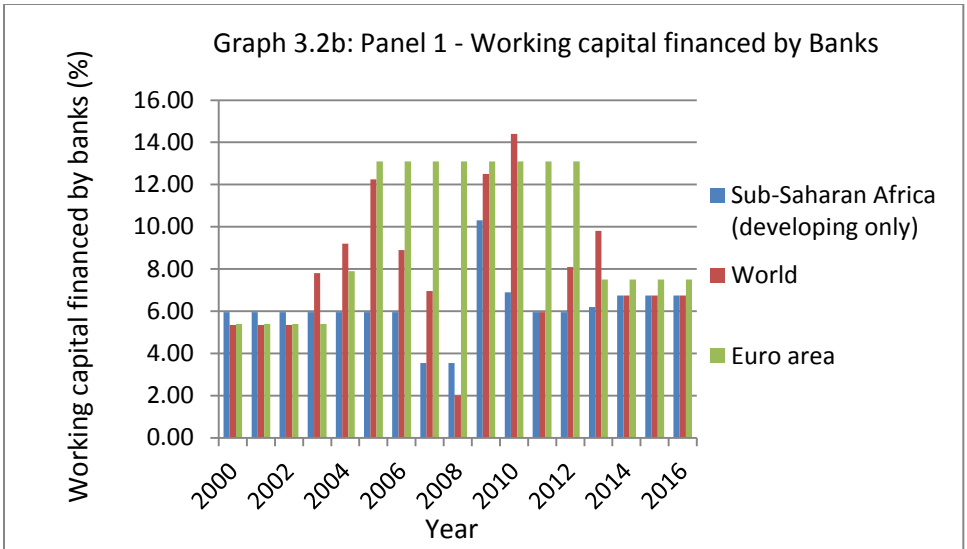


Source: Authors work. Liquid liabilities refer to the entire amount of currency and deposits in the central bank (M3).

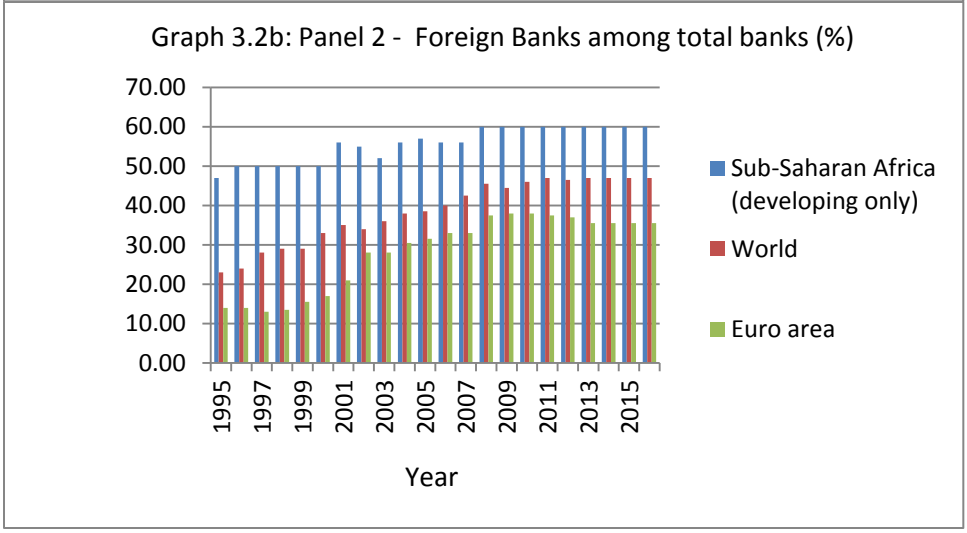
3.2.3. Financial Access.

Financial access refers to the level of financial intermediation received or accessed by the broader population and households. Some common proxies include the number of bank branches per 100,000 persons World Bank, (2016), or the Proportion of the working capital that was financed by bank loans. Graph 3.2b; panel 1 presents the level of financial intermediation in Sub-Saharan Africa compared to the rest of the world. The degree of financial inclusion on average has gone down in all regions following the crisis in 2008, for obvious reasons. However, the magnitude of access in SSA has taken on a lot more quickly compared to their counterparts in the Euro area. Most of the foreign-owned banks in SSA (See graph 3.2b: panel 2), provides short-term lending. We record in graph 3.2a; panel two above the short-term borrowing due to the high share of total assets to GDP in SSA.

Our data further indicate that the percentage of the number of foreign-owned banks to the amount of the total banks in SSA is relatively high. (See graph 3.2b: panel 2). Restructuring of the banking system allowed foreign banks to play a central role in SSA and recovered their market share under reform programs in the 1980s and 1990s. However, the percentage of the unbanked population is enormous, with Small and Medium Enterprise (SMEs) typically tightly constrained in their approach to any credit.



Source: Authors work. Working capital financed by banks – refers to the ratio of the working capital that is funded by bank loans. Data is retrieved and based on World Bank Global Financial Development Database 2016.

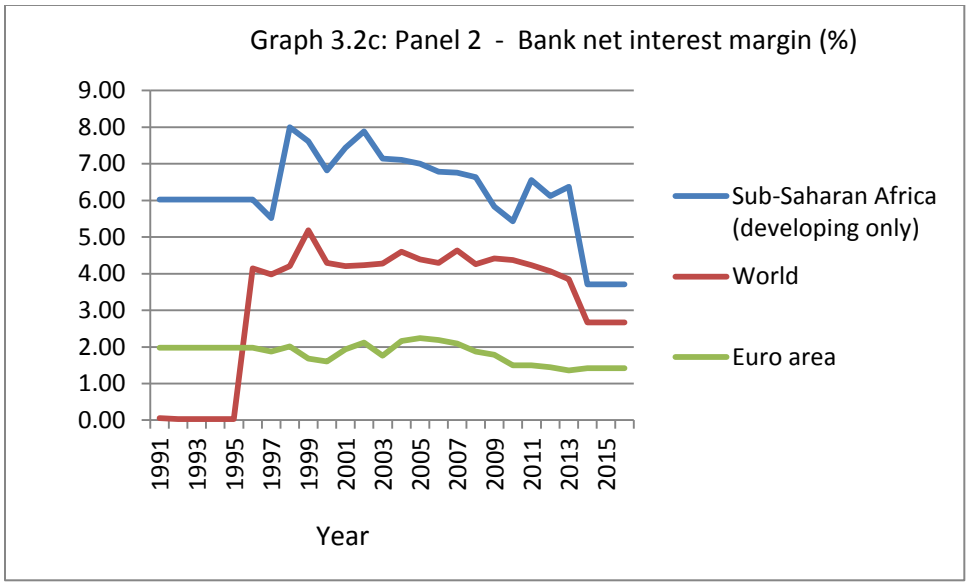


Source: Authors work. A foreign bank is a bank where foreigners own 51 percent or more of its shares. The graph plots the percentage of the number of foreign-owned banks to the figure of the total banks in an Economy.

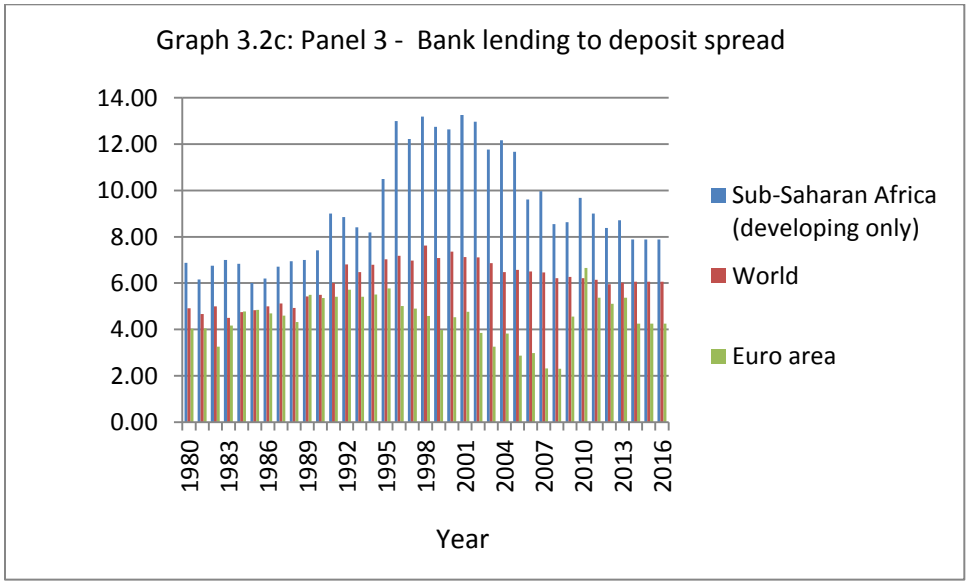
3.2.4. Financial Efficiency.

Financial efficiency measures the cost of intermediating credit and services among banks Čihák et al., (2012). It is likewise the power of banks to turn resources into revenue. These activities include, but not limited to, bank lending to deposit spread and bank net interest margin in percentage (percentage). Bank lending to deposit spread is the difference between the lending rate and deposit rate. Lending rate is the charge per unit charged by banks on loans to the private

sector, and deposit interest rate is the rate offered by commercial banks on three-month deposits Čihák et al., (2012). The cost of banking in SSA is high (Graph 3.2c: panel 2) compared to its counterparts in the Euro region. Similarly, bank operations and branch network mainly concentrate on urban towns and urban cities. Consequently, interest rates spread, and service fees are relatively high. (Graph 3.2c panel 3).



Source: Authors work. The interest margin refers to the accounting value of the bank's net interest revenue as a share of its average interest-bearing (total earning) assets. The Interest margin measured in percentage.



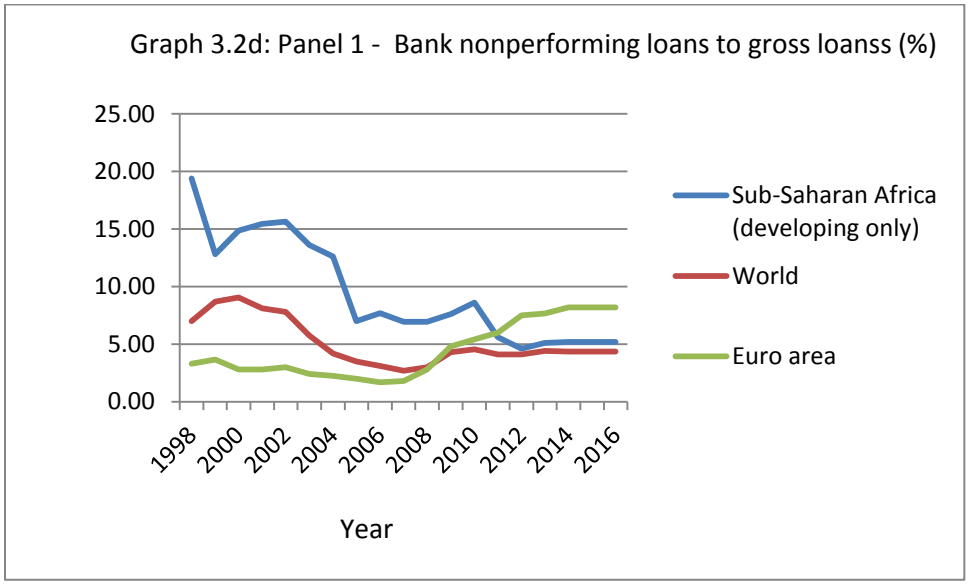
Source: Authors work. Lending rate is the charge per unit charged by banks on loans to the private sector, and deposit interest rate is the rate offered by commercial banks on three-month deposits. We plot the Bank lending-deposit spread Čihák et al., (2012).

3.2.5. Financial Stability

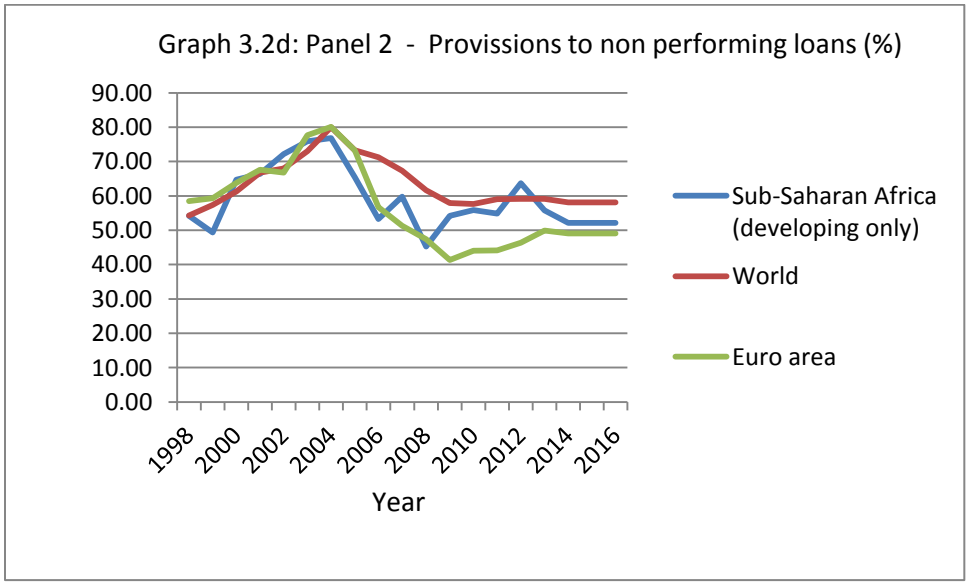
Following the reform programs introduced in the 1980s and 1990s, banks in SSA have moved to strengthen their capital infrastructure and improve risk management Mlambo et al., (2012). Equally, the subdued role of state-owned banks or, in some cases, their repositioning to commercial lines has contributed to the strengthening of the banking systems. As a result, the incidence of systemic banking crises – a relatively common event in SSA in the 1980s and early 1990s – has declined, with only one major crisis recorded since 1995. In this segment, our treatment will be limited to banks nonperforming loans to gross loans and the provisions to nonperforming loans. Banks Nonperforming Loans to Gross Loans is the ratio of defaulting loans to total gross loans. The loan amount recorded as nonperforming according to Mlambo et al., (2012) includes the value of the credit as recorded on the balance sheet, not the amount overdue World Bank, (2017). Provisions for nonperforming loans (NPL) are loans for which the contractual payments default, usually specified as the NPL ratio being overdue for more than a particular routine of days (See Graph 3.2d: panel 1and 2). The part of the NPL in SSA has improved over the years compared to the rest of the world. The advance of the NPL was mainly due to the reforms in the 90's and the improvement in operational efficiency among SSA bank.

The traditional features of SSA banking system reflect a combination of factors, including the small absolute size of banks, limited creditor, and legal rights Andrianaivo and Yartey, (2009). The features of the banking environment in SSA itself are demanding, albeit lower-income levels, the vast informal sectors and the daunting political risk Fosu, (2013). The low points of financial literacy among the broader population risk some defaults and the most experienced in the 1980s' coupled with weak contractual frameworks for banking activities Beck and Levine, (2004). This position is evident in (Graph 3.2d; panel 2) by averagely high

percentage of the provisions of nonperforming loans. Not amazingly, the difference between SSA and the Euro area is low.



Source: Authors work. Nonperforming loans refer to the ratio of defaulting loans to total gross loans. The loan amount recorded as nonperforming includes the rank value of the investment as recorded on the balance sheet, not just the sum of money that is unpaid.



Source: Authors work. Provisions for nonperforming loans, Nonperforming loans are loans for which the contractual payments default, usually defined as an NPL ratio being overdue. (e.g., generally more than 90 days).

3.3. Literature review.

There is increasing evidence, which depicts the importance of banks and other financial institutions on economic growth and development Levine, (2005). Banks get a starring part in these aspects for two reasons; first, they provide funds through credit extensions to productive enterprise. These firms in their part invest and create development opportunities through employment. Second, banks mobilize savings from commercial enterprises and households by taking deposits to invest. At the same time, the banks evaluate and monitor all the funds and projects deployed through their support. These elements of banks advisory boost efficiency and reduce risk. Also, it encourages investments in the main projects that could avoided. Banks can further turn down their cost and spread through technology and investments. This process facilitates better trade and results in economic development and growth Smith, (1776).

However, in the events that the financial institutions fail, they can affect economic development, as most of the functions and roles discussed above will change. For example, misallocation of household savings and bank deposits to inefficient firms will result in credit defaults. On the corporate levels, executives might promote projects that only will increase their bonuses such as selling debt to third parties. All these shortcomings can distort economic prosperity. While in that respect is much empirical evidence confirming the link between banking development and growth Levine, (2005), little is examined about its marginal effects on development to broader or rural population. Too, the roles of banking development and its impact on growth in real per capita GDP are insufficient in the literature both on the theoretical and empirical approaches to the disputations in the finance and economic development literature. In this section, therefore, we attempt to show the relevance of banks /

financial development and their relationship to economic growth in Sub Saharan Africa.

3.3.1. Financial development and growth.

The seminal paper by King and Levine, (1993a, 1993b) consistent with Schumpeter's view theorize that the financial system can promote economic growth, using data in 80 countries over the 1960-1989 period. The study argues that several measures of the level of financial development are firmly linked with real per capita GDP growth, the rate of physical capital accumulation, and improvements in the efficiency with which economies employ physical capital. The authors further argued that the predetermined component of financial development robustly correlates with future rates of economic growth, physical capital accumulation, and economic efficiency improvements. Demirguc-Kunt and Levine, (1996) in a separate study found that there is a link between stock markets and the growth of financial intermediaries World Bank, (2016). The study further suggests that, for the financial organization to develop there should be different amounts of stock market size, market liquidity, market concentration, market volatility, institutional development, and integration with world capital markets. They also further developed some index and analyzed the relationship between the topic of the stock market and the development of financial intermediaries using a sample of 44 developing and industrialized economies from 1986-1993. Their results show that stock market growth and intermediary economic development correlate positively.

Another remarkable contribution to the growth of the financial development comes from Rajan and Zingales, (1998). Their study suggests that better-developed financial intermediaries and financial markets help reduce market frictions. Reduction of the effects of market friction provides lower prices of external finance to facilitate firms' expansion and encourage the new firm formation. The authors demonstrate those firms which are more reliant on external finance

prosper more in countries with better-developed financial intermediaries and financial markets. The outcomes propose that financial development may play a good role in firms' growth and the rise of young firms by facilitating the flow of external finance. The influential work of Rajan and Zingales, (1998) has prompted much research interest in using micro-level data to gain more insight into the connections between financial development and economic growth beyond country-level.

Levine, (2005), further argued that, because firms can allocate resources for investments and productive exercise, it is imperative for them to monitor expenditures and exert corporate governance after providing finance. One thing to watch is that some individual states have successfully built up a sound financial organization, for instance, the United States and the United Kingdom while others are yet to do so which could positively affect their savings. Therefore, it is common knowledge that financial development occurs when financial institutions successfully reduce the monetary value of the transaction costs and mitigate the effects of market imperfections World Bank, (2016). Levine, (2005) Categorized and provided a more comprehensive discernment of the financial system and further indicated that a well-functioning financial system offers information processing, monitoring, and allocation of capital, risk management and trade, mobilization of savings and finally, the ease of transaction cost for both goods and services. Such a classification implies that the financial system in its entirety takes on a substantial role in mobilizing savings and then efficiently allocates these resources for the proper purpose. A well-functioning financial system, therefore, eases the exchange of goods and services. Some of these business functions may influence savings and investment decisions and hence economic growth.

According to James, (2008) two factors in the financial system influence growth. First, through the accumulation of capital. Households in this channel mobilize savings, and the savings are utilized by the productive sector of the economy to generate wealth. This process according to Gurley and Shaw, (1955) is called the "debt accumulation." Secondly, the cognitive operation of Total Factor Productivity (TFP) also recognized as the qualitative channel. The qualitative channel looks at the functions of innovative financial technologies and how they influence growth. According to King and Levine, (1993b), this technology brings down the economic asymmetry that hinders the efficient allocation of financial resources and thus encourages development. Evidence from the growth accounting literature is that long-run growth requires more technology improvement, but this leaves out transitions, which could be significant or even poverty traps.

James, (2008) further argued that the issue of the financial market intermediaries is a direct effect due to information and transaction prices. The presence of agents and entrepreneurs in the economy requires investors with a shortage of money to borrow. The funds borrowed need to be monitored because lenders may have limited information about the borrowers resulting in agency monitoring costs. A well-functioning financial system can run off this layer of agency cost through the reduction of market friction, i.e., better asymmetry of information. However, Savings rates are not monotone with increases in return or improved risk bearing; it can work the other direction. "Theory provides different predictions concerning the relationship between financial development and both income distribution and poverty relief. Some theories claim that intermediary financial development will cause a disproportionately beneficial impact on the poor Aghion, et al., (2005). Other models posit a non-linear relationship between finance and income

distribution. Greenwood and Jovanovic, (1990) show how the interaction of financial and economic development can give rise to non-linear economic growth.

While Levine, (2005) has argued candidly about the topics raised above, the distinction between levels versus growth rates did not come out apparently. One doubts whether the study examines steadily improving financial growth on one or several of these ratios, i.e., pushing levels of income up so that an expanding and improved financial sector over time is causing growth in the sense that an individual has ever-increasing levels. Alternatively, is the study saying, once and for all, improvement to the financial system, i.e., making it give way from low to a higher level without changes has implications for sustained growth? These propositions by Levine, (2005) do not agree with his central thesis. The issues of Levels, Steady State Transitions were never caught by their work. Thus, their contention is that intermediation matters, but this begs the question of whether growth happens as levels of intermediation systems change gradually or fixed level today can influence rates of increase in the future.

A more recent study by Levine, (2010a, 2010b), following the financial crisis in 2008 supplemented the idea that, finance promotes economic development in the first place by improving the efficiency of capital allocation, not by increasing investment. Thus, recognizing the financial system as an input-output system according to Levine, (2010a, 2010b), i.e., credit in and revenues out is deceptive. Instead, the financial system should work like the central nervous system, where choosing to allocate resources matters most. Still, the question persists, does finance cause growth, reduced inequality, or lower poverty?

3.3.2. Bank development and growth in Sub-Saharan Africa.

The empirical dimension of the arguments for financial development among others includes Goldsmith, (1969). This study presented the first connection between financial

development and growth using a model that involved 35-countries. Their results revealed a positive correlation between financial development and economic growth. King and Levine, (1993b) on the other hand used credits and showed that banking development is a significant impetus for economic growth. A more relevant study by Odedokun, (1996) studied the effects of selected policies on economic efficiency in 81 developing countries by pooling cross-country data from 1961 to 1990. Their work used an incremental output-capital ratio as a measure of economic ability. The variables for their study include export orientation, the size of the public sector, directed credit program through development bank lending, financial depth, inflation rate, real interest rate, and real exchange rate distortion.

The results, according to Odedokun, (1998) confirm that Financial Sector Development (FSD) plays a contributing role in economic development. Likewise, FSD has a more consistently positive and statistically significant relationship with economic growth than the other variables in their study. However, the time-series results fail to adjust for autocorrelation and no bi-directional test of causality presented. The first defect of this literature according to Caselli et al., (1996) lies in its treatment of the country-specific effect. The standard cross-section estimator is it OLS, or any random variable that allows for non-spherical disturbances are only coherent if the individual results can be presumed to be uncorrelated with the other right-hand-side variables. Nevertheless, it is comfortable to understand that it is possible to violate such an assumption in the dynamic framework of a growth regression.

Murinde, (2012) considered the dual role of financial liberalization on growth using a bank crisis model and a growth model. Their study used econometric panel techniques on data covering 34 countries in Sub-Saharan Africa over the period 1983–2008. The outcomes suggest that the growth-retarding effects of financial liberalization are dominant over growth-

enhancing effects, which show mixed results. The results as easily indicate that institutional variables, human capital formation, and foreign aid are critical factors in explaining the growth in Sub-Saharan Africa. They, therefore, recommend adoption of a 'managed financial openness' policy and institutional reform measures.

Murinde, (2012) showed that the banking sector instability has damaging effects on an ever-expanding catalog of financial crises, including the recent Global Financial Crisis. Their study suggests that banks should monitor borrowing firms to ensure capital efficiently, whiles banks themselves get supervised to manage the deposits they collect without taking undue risk. On the other hand, Fowowe, (2013) contended that, with increased deposit rates following financial liberalization, the low return on investment in the less efficient sector means that firms would choose to raise their bank deposits by reducing expenditure and this expanded credit flowing into the more productive sector. The higher rate of return on investment in the more efficient sector means that the quality of investment will improve, and this will increase economic growth.

Ahmed, (2016) employed a dynamic system GMM model and panel data of 30 Sub-Saharan African (SSA) countries from 1976 to 2010 to examine the impact of International Financial Integration (IFI) on economic performance. Their work examined the simultaneous openness hypothesis of Rajan and Zingales, examined the joint influence of both capital, and trade openness on financial development in Sub Saharan Africa. The results of their work prove a negative link between financial integration and economic growth rate in SSA countries, adverse to the theoretical expectation. However, their study places a positive and significant association between IFI and financial development, bearing out the long hypothesis view that IFI may positively influence economic growth through enhancing the depth of the

domestic financial system. Ahmed, (2016), claims that SSA countries should put in place and strengthen institutions of governance, including security of property rights, transparency of the legal system and investor-friendly laws.

An early but similar study to the current study is by Cheng and Degryse, (2010). They studied the impact of bank and Non-bank financial development on the local economic development of China. Using a state-level panel dataset over the period 1995–2003, they find that bank credit, dramatically contributes to province growth. They claimed that an increase of bank loans to GDP ratio from the lowest to the highest in their sample increases future annual growth by 8.5 share points. In contrast, in most specifications, the development of non-bank financial institutions is interrelated with growth. The authors attribute this difference to banks that have benefited more from the reform process such as commercialization, entry deregulation and liberalization than nonbank financial institutions. However, their study discussed little regarding how real balances would have a positive effect on economic or growth of actual output. All the same, the study by Cheng and Degryse, (2010), examines Chinese provinces with the same banking and fiscal regulation. Similarly, their work only considers regional growth in per capita state domestic product and not the local growth in the different portions of the state domestic product. Therefore, given the consideration of the banking environment in Sub Saharan Africa, this field is where the current study adds value to this literature.

Parvin, (2011) examined another similar study to the current study. Their study is similar to the current study in some approach and formulation of the structural empirical model following King and Levine, (1993a, 1993b). However, the differences in the current study and Parvin's thesis is that: Their study follow close arguments from Gillman et al.,

(2004) and Gillman and Kejak, (2011), but the current study follows arguments from Kompass and Owen, (2007). Their study examines how financial development cause growth, by examing the effects of human capital allocations both in the informal and formal market. The current study examines the growth effects of communications links and social interaction. Our central argument is that if the economy has a balanced growth path, how does communication links, social interaction, and knowledge transfers in the informal sector impact economic growth?

The empirical analysis in their study and approach used panel data from Indian states and territories. The characteristics of this states are similar regarding their financial systems, the legal and the regulatory framework since Indian is an independent country with one central bank and government. Whereas, this current study looks at 14 different Sub-Saharan African countries, with entirely different systems of government, finance, and the banking system. The 14 countries in our sample have 14 different independent central banks and supervisory regimes. The evidence from our study and the diversity in Sub-Saharan Africa is where this current study makes a valuable contribution.

3.4. Empirical Framework and Data

3.4.1. The Panel OLS Framework.

To estimate the impact of financial development on economic growth, we start from a fixed effects panel model controlling for state and time fixed effects, following the traditional finance-growth literature such as King and Levine, (1993b), and Cheng and Degryse, (2010). We present the structural model for this study in equation (3.1) below.

$$Y_{,it} = \beta_o + \beta_1 InY_{i,t-1} + \beta_2 Y_k + \beta_3 Inbd_{i,t-1} + \theta_i + \varphi_t + \varepsilon_{i,t} \quad (3.1)$$

where Y_{it} is the growth rate of real per capita GDP at time t and in country i, $Y_{i,t-1}$ is the lagged value of real GDP per capita in country i, $Y_{k.i,t}$ is the growth rate of real per capita capital stock in country i, at time t and $bd_{i,t-1}$ is the lagged financial development indicator of either bank deposits, bank credits or money supply (M2) to GDP, θ_i is a set of state dummy variables, φ_t a set of time dummy variables, and ε_{it} are stochastic disturbance terms which are independently and identically distributed with zero mean and constant variance equal to σ, all for country i in period t, $i = 1,2, \ldots \ldots .. N \; and \; t = 1,2, \ldots \ldots T$.

Equation (3.1) is the benchmark empirical model, where β_o which is expected to be negative shows the convergence Sala-i-Martin, (1997). From the theoretical position, this is the estimable equation derived from a generalized Cobb-Douglas production function where banking development is a determinant of production growth. In equation (3.1), β_o shows the convergence. Two full concepts of convergence appear in discussions of economic development across countries. In one position such as that of Barro and Sala-I-Martin, (1992, 1995, 1997), Baumol, (1986), Delong, (1988), Barro, (1991), convergence applies if a weak economy tends to grow faster than a rich one so that the weak economy catches up with the rich one regarding the level of per capita income. The second concept, such as that in Easterlin, (1974), deals with the cross-sectional dispersion. According to this view, convergence occurs if the measured dispersion declines over time. Convergence of the first kind tends to generate a convergence of the second kind, β0 corresponds to the first concept of convergence. We estimate two more growth equations that are like (3.1) using different measures of growth in state-level per capita income to examine the impact of banking

development on agricultural growth and industrial growth of per capita income. For this, we estimate:

$$Y_{agrit} = \beta_o + \beta_1 InY_{agri,t-1} + \beta_2 Y_k + \beta_3 Inbd_{i,t-1} + \theta_i + \varphi_t + \varepsilon_{agrit} \quad (3.2)$$

Where Y_{agrit}, is the growth rate of real per capita agriculture GDP at time t and in country i, $Y_{agri,t-1}$, is the lagged value of per capita agriculture GDP at time t and in country i, ε_{agrit} are independently and identically distributed error terms with zero mean and constant variance equal to σ, all for the country i, in period t . For growth in the industrial sector, we estimate;

$$Y_{ind.i,t} = \beta_o + \beta_1 InY_{ind.i,t-1} + \beta_2 Y_k + \beta_3 Inbd_{i,t-1} + \theta_i + \varphi_t + \varepsilon_{ind.i,t} \quad (3.3)$$

Where $Y_{ind.i,t}$, is the growth rate of real per capita industry GDP for country i at time t. $Y_{ind.i,t-1}$, is the lagged value of real per capita industry GDP for country $i$at time t. And $\varepsilon_{ind.i,t}$, are independently and identically distributed error terms with zero mean and constant variance equal to σ, all for country i in period t. The Bank Deposit equals the ratio of the savings in the banking system to local GDP. Bank deposit measures "financial depth" of the local banking sector. A second indicator is Bank Credit, which equals the credit extended by banks to local enterprises over local GDP. This indicator measures financial access, i.e., the money provided by banks to firms. A third indicator is the money supply (M2) to GDP ratio. M2 includes M1 (physical money supply), plus short-term time deposits in banks and 24-hour money market funds.

3.4.2. The Two-Stage Least Squares (2SLS) estimation procedures

A central issue in the finance-growth literature is potential reserve causality. We directly control for endogeneity between finance and growth by employing the Instrumental variables (IV), 2SLS estimator proposed by Anderson and Hsioa, (1981). We rewrite the model in equation (3.1) as follows. $Y1 = Y2'\beta 2 + X1'\beta 2 + u$. Where $Y1$, is the dependent variable, $Y2'$, is the endogenous variable, $X1'$, are the exogenous variables, and $X2'$, are the instruments (the lagged dependent variables as regressors). Our emphasis is on single equation models with auto regressive dynamics and explanatory variables that are not strictly exogenous Arellano and Bond, (1991), Ahn and Schmidt, (1995). We regress the first-differenced 2SLS (reduced form) equation with only exogenous regressors for the AR (1), and then calculatethe predicted values $\widehat{Y2}$ and substitute them in the structural equation model. Hence, our structural equation model involves a combined set $X = [Y2, X2]$ of both endogenous and exogenous variables. The structural equation for the OLS regression will be: $Y1 = Y2'\beta 1 + X1'\beta 2 + u$. The 2SLS, first-stage equation will be: $Y2 = x1'Y1 + X2'y2 + \varepsilon$. And hence finally Equation (3.4), for the 2SLS, second-stage equation is :

$$Y1 = \widehat{Y2}'\beta 1 + X1'\beta 2 + u. \qquad (3.4)$$

For all the three models, we conduct several tests, th; thest test is Hausthe man test. This test checks if a regressor is exogenous or endogenous. It compares the OLS and IV estimates to check for significant differences. If there are significant differences, then the regressor is endogenous, if there are no significant differences, then the regressor is exogenous. The second test is Durba in-Wu-Hausman test for exogenous regressors. In this

test, we check whether, $E[X|u] = Cov(x', u) \neq 0$. We do this by first estimating the first stage model i.e. $Y2 = x1'Y, 1 + X2'y2 + \varepsilon$. Then we include the residuals $\hat{u}$ from the first-stage regression in the structural equation regression i.e. $Y1 = Y2'\beta1 + X1'\beta2 + \rho\hat{u}, + \varepsilon$. If the coefficient on the residuals from first stage regression ρ is not significantly different from zero, then the regression is exogenous. If the coefficient ρ is significantly different from zero, then the regressors are endogenous. The third test is Test for weak instruments. If an instrument has a low correlation with the endogenous variable, it will undermine the precision of the estimator. The IV estimator is asymptotically consistent but biased towards OLS estimator in finite samples. The size ofthe the bias is positively related to the weakness of the instruments and inversely related with the size of the sample. When several instruments are used for one endogenous variable, the weakness of the instruments can be measured by the partial R^2 and partial F-statistics from the first stage regression. The instrument is weak if the partial F-statistics testing the joint significance of the instruments ($Y2 = 0$) is less than 10.

3.4.3. Data description.

Our dataset contains annual growth rates of real per capita GDP, real per capita capital stock, and lagged financial development indicators for 14 Sub-Saharan Countries. These countries include; Botswana, Tanzania, Kenya, Uganda, Rwanda, Ghana, Togo, Sudan, Malawi, Congo DR, Cameroon, Chad, South Africa and finally Namibia, covering the period 1990–2013. Our data is not average because averaging the data would reduce the degrees of freedom in our sample, a significant departure from Levine et al., (2000). Therefore, the non-overlapping five-year average will significantly scale down the degree of freedom, or result in weak instruments as only one lag is available Cheng and Degryse, (2010). The financial

development indicators in our study are calculated employing the statistics data reported by the World Bank, (2015) and the African Development Indicators ADI, (2015). Availability of data governs the choice, the period, and the number of countries in our sample for all variables. Data for GDP per capita growth rates, inflation, M2/GDP, bank deposit and credit, domestic credit to the private sector, the banking development indicator is from the World Bank: African Development Indicators ADI, (2015) and the unit of measurement is the US Dollar.

The World Bank data set performs better in this respect because it is a broad mixture of sources, which makes it more authentic. Likewise, the number of nations and territories used by alternate sources such Corruption Perception Index (CPI) of Transparency International (TI)) is less than the number available from the World Bank database. However, some of our data contain missing values, especially for DR. Congo and Angola, causing some estimation issues. In such a case, we extrapolate using the previous information as a recorded observation of the missing values. Our original sample included Zambia, Burundi, Eritrea, and Somalia, but we had to drop them out because these counties did not have some of the macroeconomic indicators examined in the series, leaving us with a sample size of 14 countries.

3.4.4. Financial development indicators.

Bank Deposits to GDP. The total value of demand, time and saving deposits at domestic deposit money banks as a share of GDP. Banks deposits comprise commercial banks and other financial institutions that accept transferable deposits, such as demand deposits. Demand, time and saving deposits in deposit money banks as a share of GDP Federal Bank of St. Louse, (2016).

Bank Credit to GDP. Domestic credit to private sector refers to financial resources provided to the private sector, such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable that establish a claim for repayment Federal Bank of St. Louse, (2016). For some countries, these claims include credit to public enterprises. We also use the GDP and the banking data to create some proxies that account for the level of financial development in the 14 Sub Saharan Countries.

Money and quasi money (M2) as a percentage of GDP. Money supply is the total value of monetary assets available in an economy at a specific time. It includes currency in circulation and demand deposits. Changes in M2 according to the World Bank report, (2015 effects the price level, inflation, the exchange rate and the business cycle. According to the World Bank, (2015). M2 comprises the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government. Data is from the World Bank, Africa Development Indicators (ADI), 2015 database.

We also use the GDP and the banking data to create some proxies that account for the level of financial development in the 14 Sub Saharan Countries. These proxies are; Real Deposits (USD), which is the proportion of bank deposits (current U$D) to the Deflator. Real Credit (USD) is the ratio of Net Credit (current U$D) to the Deflator. Real Money Supply is the ratio of M2 (current U$D) to the Deflator. Others in this category include; Credit – GDP ratio is the ratio of real credit to real GDP. The real GDP is the ratio of GDP at current U$D to the GDP Deflator. Deposits – GDP ratio is the ratio of the actual deposits to real GDP and M2 – GDP ratio, which is the ratio of real money supply to real GDP. Growth in per capita GDP measured at constant U$D is calculated as follows, $Y_{i,t} = 1 + g$. Where$g = (Y_{t+1} - Y_t)/Y_t$.

$Y_{i,t}$, is the GDP per Capita (constant U$D) in country i at time t.

Gross capital formation, Yk (constant 2000 US$). Gross capital formation also known as the gross domestic investment, consists of outlays (expenditures) on additions to the fixed assets of the economy plus net changes in the level of inventories. The Fixed assets following World Bank, (2015) include land improvements (fences, ditches, drains); plant, machinery, and equipment purchases; and the building of roads, railroads, including schools, government agencies, hospitals, private residential dwellings, and commercial and industrial constructions. Inventories are stocks of goods held by firms to meet temporary or unexpected fluctuations in production or sales, and "work in progress." Data are in constant 2000 U.S. dollars World Bank, (2015). The growth in per capita capital stock, Y_k, is calculated as follows; $Y_k = 1 + g_k$. Where $g_k = (K_{t+1} - K_t)/K_t$. Y_k is the Per Capita Capital Stock in Constant U$D, in country i at time t. Y_k is calculated as the ratio of Gross Capital Formation in Constant 2000 U$D to the Total population.

Industry, value added (% of GDP). It comprises value added in mining, manufacturing, construction, electricity, water, and gas. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources IMF reports, (2011). The International Standard Industrial Classification (ISIC), and World Bank determine the origin of value added. Per Capita Industry GDP Growth $Y_{ind.i,t.}$, is the ratio of change of industry value added growth in constant U$D in the current year to the previous year calculated as follows: $Y_{ind.i,t.} = 1 + g_{ind}$. Where $g_{ind} = (Y_{ind.t+1} - Y_{ind.t})/Y_{ind.t.}$ $Y_{ind.i,t.}$, is the Industry value added at constant USD in country i at time t.

Agriculture, value added (annual % growth). The annual growth rate for agricultural

value added based on constant local currency. Aggregates based on constant 2000 U.S. dollars. Agriculture includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The International Standard Industrial Classification (ISIC), and World Bank determine the origin of value added.

Per Capita Agriculture GDP Growth, $\boldsymbol{Y_{agr.i,t.}}$, is the ratio of change of agriculture value added per capital in real U$D in the current year to the previous year calculated as follows; $Y_{agr.i,t} = 1 + g_{agr}$. Where $g_{agr} = (Y_{agr.t+1} - Y_{agr.t})/Y_{agr.t.}$ $Y_{agr.i,t}$, is the agriculture value added per capita (real U$D) in country i at time t.

3.4.5. Summary statistics.

Table summary statistics table below highlights some significant variation among individual countries. For instance, the highest average annual real per capita GDP growth rate in SSA is 0.0129 (constant USD), and the range between the lowest and the highest is 0.96 (Constant USD). These statistics confirm the degree of individual difference when dealing with Sub Saharan African nations. A Pearson's product-moment correlation was run to evaluate the relationship between growth and Deposit - GDP ratio in a sample of 308. There was a strong positive correlation between growth and income, r (306) = 0.71, p <.00005. The effects of banking on growth explaining 29% of the variation in income. We present both tables below.

Table 3.3: Summary Statistics of Regression Variables.

VARIABLES	Obs.	mean	Std. Dev.	Min	Max
GDP per capita (constant USD)	322	8.863	11.26	0.827	42.23
Growth in Real PC GDP (constant USD) [LL]	308	1.015	0.0583	0.527	1.371
Real PC Capital Stock (constant USD) [L]	322	188.5	287.3	2.047	1,355
Growth in Real PC Capital Stock[L]	308	1.035	0.177	0.193	2.594
Industry value added Per Capita (Real USD)	322	2.945	4.631	0.125	21.44
Growth in Real PC Industry GDP	308	1.045	0.141	0.565	1.899
Agriculture value added per capita (Real USD)	322	96.32	47.42	10.50	230.7
Growth in Real PC Agriculture GDP [LL]	308	1.007	0.0873	0.517	1.524
Real Bank Deposits (Millions USD)	322	6.697	2.052	0.540	1.171
Real Bank Credit (Millions USD)	322	8.926	3.315	0.345	2.499
Real Bank Deposit to GDP Ratio [LL]	322	0.200	0.140	0.0116	0.639
Real Bank Credit to GDP ratio [LL]	322	0.269	0.350	4.510	3.658
Real Money Supply (M2) to GDP Ratio [LL]	322	0.271	0.290	1.101	3.351
Ratio of Deposit to Agriculture value added per capita	322	0.736	2.266	0.010	1.286
The ratio of Credits to Agriculture value added per capita GDP	322	1.004	3.646	6.253	2.642
The ratio of Deposit to Industry value added Per Capita GDP	322	1.947	2.500	0.352	1.113
Ratio of Credits to Industry value added Per Capita GDP	322	3.533	9.958	0.581	1.123

Source: Authors work.

[L]: Logarithm in regression. [LL]: Logarithm and Lagged value in regression

Table 3.4. A Pearson's product-moment correlation between growth and deposit to GDP ratio

	growth in pc GDP	deposit to GDP ratio	growth in pc GDP	Growth in per capita capital stock
growth in pc GDP[L]	1.000 308			
deposit to GDP ratio[LL]	0.1022 0.733 308	1.0000 322		
growth in pc GDP[LL]	0.0482 0.3988 308	0.7143* 0.00005 308	1.0000 308	
Growth in per capita capital stock[L]	0.5853* 0.00001 308	-0.0341 0.5510 308	0.0045 0.9367 308	1.0000 308

Source: Authors work.

[L]: Logarithm in regression. [LL]: Logarithm and Lagged value in regression. * stands for 5% significance level.

3.5. The growth effects of financial development in Sub Saharan Africa.

In the table below, we summarize the results from fixed effects panel estimation for the nine specifications. We report the estimated coefficient and its associated p-value (in parenthesis).

3.5.1. Results from fixed effects panel estimation.

Table 3.5 reports the three different models for equations (3.1), (3.2) and (3.3), i.e., growth in real per capita income, growth in real per capita agriculture GDP and finally growth in real Per Capita Industrial GDP. In the left-hand panel, we use seven variables, i.e., the lagged values of the dependent variable (growth in per capita GDP, growth in agriculture GDP and growth in industrial GDP), capital stock, bank deposits, bank credits and money supply M2. The right-hand panel represents the models in our estimation, i.e., models with bank deposits in columns (1a, 1b, 1c). Models with bank credits are summarized in columns (2a, 2b, and 2c) and finally models with money supply to GDP ratio are summarized in columns (3a, 3b, and 3c) respectively. We report the estimated coefficient and its associated standard errors (standard errors in parenthesis), and the adjusted R-sq. For each model.

Table 3.5: OLS FE estimation results.

Variables.	Model (1a).	Model (1b).	Model (1c).	Model (2a).	Model (2b).	Model (2c).	Model (3a).	Model (3b).	Model (3c).
Real Pc GDP.^{L}	-0.0559*			-0.0137			-0.0166		
	(0.0279)			(0.0117)			(0.0113)		
Gross real Pc Stock.	0.211**	0.0803	0.215***	0.215**	0.0801	0.217***	0.211**	0.0787	0.213***
	(0.0712)	(0.0621)	(0.0491)	(0.0733)	(0.0625)	(0.0467)	(0.0736)	(0.0627)	(0.0471)
Deposits to GDP ratio^{L}	0.0281**	0.0310	0.0171						
	(0.0107)	(0.0258)	(0.0409)						
Real Pc Agric. GDP^{L}		-0.112**			-0.110*			-0.105*	
		(0.0438)			(0.0553)			(0.0572)	
Real Pc Ind. GDP^{L}			-0.129			-0.117**			-0.121**
			(0.0733)			(0.0515)			(0.0508)
Credits to GDP ratio^{L}				0.00793***	0.00152	0.00648**			
				(0.00103)	(0.00468)	(0.00267)			
Money Supply to GDP ratio^{L}							0.0114***	0.00451	0.0115***
							(0.00259)	(0.00886)	(0.00119)
Constant	0.148**	0.555***	0.0731	0.0467**	0.490*	0.0536***	0.0550***	0.473*	0.0612***
	(0.0587)	(0.174)	(0.0827)	(0.0182)	(0.238)	(0.00846)	(0.0165)	(0.243)	(0.00438)
Observations	308	308	308	308	308	308	308	308	308
R-squared	0.398	0.085	0.175	0.424	0.073	0.180	0.456	0.078	0.190

Robust standard errors in parentheses. Level of significance *** p<0.01, ** p<0.05, * p<0.1. L. Lagged regressors.

For all the three models, our results for the lagged per capita GDP is significant for the model (1a) at the 10% level. The negative sign captures the convergence effect of growth within the Sub-Saharan African countries discussed earlier Cheng and Degryse, (2010). The results show that there is evidence of convergence in these states and, countries with weak economies tends to grow faster than a rich one. Real per capita GDP is significant at 10% level with bank deposits. Not significant fo credits and money supply but negative, (shows convergence). The capital stock also shows statistically significant results at 5% level of significance as well as the results on lagged deposits to GDP ratio at 10% level of significance. In general, our results show evidence of the effects of banking development on growth.

The coefficients for capital stock are significant for all models except for models 1b, 2b, and 3c. The results for the model (2) also show convergence for in agriculture GDP. For model (3), the lagged per capita industry GDP for all specifications is statistically significant but negative. The effects on capital stock on aggregate growth in the industry is statistically significant and positive. The results are an essential indicator of the impact of finance on industrial GDP and growth. The effect on credits is positive but not significant for all the three specifications. The results further indicate that banking development in Sub-Saharan Africa contributes very little to growth in agriculture. The results for deposits to GDP ratio are statistically significant. In general, our results show significant effects of banking development on growth.

3.5.2. Effect of banking development on income and growth.

We analyze the magnitude of the effects of banking development on growth and variance using the $\overline{R}^2$, the F-statistics, the standard deviations and the standard errors to determine how

much variation in income exists from these results. Estimates from, $\overline{R}^2$ i.e., $R^2 = \sum (x_i - \overline{x})^2 / SS = 0.398 \approx 39.8\%.$ indicate that developments in banking explain 39.8 % variation in growth of per capita GDP. Similarly, test using the F-Statistics, are statistically significant (i.e., $F = \frac{Meansquared(MS)}{\text{Re}siduals} = 3.20 \ldots \text{Pr}ob > F = 0.0002$).

The marginal effects of per capita GDP on growth decreases at a rate of 5.58% annually i.e., $\frac{\partial E[y_{it}]}{\partial lnpcGDP_{t-1}} = a_2 = -0.0558.$ Given the results above; we can determine the magnitude of the change. From Table 3.3; the standard deviation of growth in pc GDP is 1.046602. The results suggest that the scale of the change is $1.046602 \times (-0.0558) = -0.0584$. Applying the standard deviation of our dependent variable (Growth in per capita GDP = 0.06299), we can quickly show that, an increase of one standard deviation in per capita GDP causes a decrease of 0.9271, i.e. $\frac{-0.0584}{0.062987} = -0.9271$

We apply the same lines to interpret the solutions for models 1b and 1c, and both effects are significant. In summary, we find that the coefficient of per capita GDP = -0.0559, so that increasing per capita GDP by one-unit affects growth by 5.58% (0.0559), with a magnitude of 0.9271 of a standard deviation in growth. The negative sign shows convergence. We use similar arguments to interpret model 1b and model 1c. We reject the null that the coefficients of both estimates are zero (both at 5% level of significance model 1c).

3.5.3. Effect of banking development on Agriculture.

Using the same arguments and methodology for model 2, we find that, the $\overline{R}^2$ is 8.5 %. The results from the $\overline{R}^2$ is an indication that the developments in banking explain only 8.5% variation in agricultural development. The overall F- statistics is 2.665 with a probability of 0.0016. The marginal effects of per capita agriculture GDP on growth converge at a rate of 1.12 % annually, i.e., $\frac{\partial E[y_{agr}]}{\partial lnpcGDP_{t-1}} = a_2 = -0.112.$ in summary; we find that the coefficient of per capita agriculture GDP = -0.112.

3.5.4. Effect of banking development on Industry.

Using the same arguments and methodology for model 3, we find that, the $\overline{R}^2$ is 19.0%. The results from the $\overline{R}^2$ is an indication that the developments in banking explain about 19.0 % variation in industrial development. The overall F- statistics is 3.23 with a probability of 0.0001.

3.5.5. The Results from 2 SLS.

We follow suggestions from Arellano and Bond, (1991), Arellano and Bover, (1995) and Blundell and Bond, (1998), for two specification tests. Foremost, the Hansen's J test of overidentifying restrictions. Hansen's J test examines the overall validity of the instruments, and the null hypothesis is that all instruments as a group are exogenous. Therefore, higher p-values are insignificant. According to Arellano and Bover, (1995), one should not reject the null hypothesis of both tests. In table 3.6 we report the results from 2SLS estimation for models (1), (2) and (3) with lagged values of the dependent variable as instruments. The left-hand side panel,

of the table, reports the variable used in the regression. There are seven variables altogether, i.e., the lagged value of the dependent variable, per capita GDP, capital stock, and the banking development indicators (bank deposits, bank credits, and money supply respectively). The right-hand panel reports the results from Models (1a) (1b) and (1c) and there specification in regression using bank deposits. Models (2a), (2b) and (2c) reports the specification and regressions using bank credits and finally, for models (3a), (3b) and (3c) reports the specification and regressions using real money supply (M2) to GDP ratio. Results on growth in Per Capita GDP is significantly negative in all specifications, which captures the convergence effect of development among the Sub-Saharan African nations. The capital stock variable when instrumented is statistically significant for all specifications at the 5% level of significance. Growth in per capital agriculture GDP is statistically significant as well. All financial development indicators after instrumentation, including the exogenous part of bank credit and M2, has a statistically positive impact on growth.

The results from 2SLS further indicates that, after instrumentation, those states with access to bank facilities (models 1, 2, and 3), their rate of convergence is 0.46%, 0.12%, and 0.28% faster than the states with unbanked populations in the region. Put it differently, their rate of convergence relative to the unbanked population decreases by 0.46%, 0.12%, and 0.28% annually towards the steady states relative to the unbanked states. Note that the 2SLS coefficient turned out quite different from the OLS FE coefficient, for growth in Agriculture GDP. The estimates are all significant for all the three models (model 1, 2 and 3) at the 5% level of significance. The rate of convergence decreases by 2.47%, for model 2a, and 2.37%, 2.42% for model 2b and 2c respectively. Growth in industrial GDP is positive but not significant, with

0.52%, 0.71% and 0.84% for models 3a, 3b and 3c respectively. Overall, results for the 2SLS estimations are significant and robust.

Table 3.6: 2SLS estimation, over –identified case (4 endogenous variables, 3 instruments).

Variables	Model (1a).	Model (1b).	Model (1c).	Model (2a).	Model (2b).	Model (2c).	Model (3a).	Model (3b).	Model (3c).
Deposits to GDP ratio^{L}	0.0136***	0.0101	0.000368						
	(0.00520)	(0.00703)	(0.0117)						
Gross real Pc Stock.	0.214***	0.0901***	0.241***	0.212***	0.0885***	0.241***	0.209***	0.0870***	0.238***
	(0.0166)	(0.0293)	(0.0419)	(0.0161)	(0.0292)	(0.0416)	(0.0156)	(0.0291)	(0.0414)
Real Pc GDP.^{L}	-0.00464			-0.00119			-0.00277		
	(0.00395)			(0.00277)			(0.00270)		
Real Pc Agric. GDP^{L}		-0.0247**			-0.0237**			-0.0242***	
		(0.00991)			(0.00958)			(0.00928)	
Real Pc Ind. GDP^{L}			-0.00516			-0.00709			-0.00840
			(0.00681)			(0.00541)			(0.00543)
Credits to GDP ratio^{L}				0.00749***	0.00391	0.00747**			
				(0.00141)	(0.00261)	(0.00357)			
Money Supply to GDP ratio^{L}							0.0114***	0.00663**	0.0114***
							(0.00160)	(0.00296)	(0.00419)
Constant	0.0416***	0.130**	0.0318	0.0264***	0.114**	0.0471***	0.0339***	0.121***	0.0522***
	(0.0151)	(0.0511)	(0.0236)	(0.00649)	(0.0449)	(0.0106)	(0.00635)	(0.0431)	(0.0106)
Observations	308	308	308	308	308	308	308	308	308
R-squared	0.359	0.045	0.101	0.401	0.045	0.114	0.439	0.054	0.123

Robust standard errors in parentheses. Level of significance *** p<0.01, ** p<0.05, * p<0.1. L. lagged regressors.

3.5.6. Robustness Tests.

In this subsection, we investigate the robustness of our results from both the fixed effects model and the 2SLS models. We report the results of four additional tests; two of them focus on the fixed effects model, and the other two relates to the 2SLS models. In table 3.7a, we use the Durbin-Wu-Hausman test for endogeneity. In this test, we report the Durbin score which is Chi2(1) statistics and the p-values in parenthesis. Our results for all the three models are significant, and we reject the null hypothesis that the regressors are exogenous. Therefore, all our variables are endogenous regressors, and we need to use an instrumental variables approach. In table 3.7b, we Test for overidentifying restriction. We use a GMM model, to form a test statistic. We are only interested in the Hansen's J Chi2(1) and the associated p-values. The results for all the three models are significant, and we do not reject the null. This means, all our instruments are valid and that, the test statistic is asymptotically distributed as a chi-square variable with (m – k) degrees of freedom. Where m is the number of instruments and k is the is the number of endogenous variables. In addition to the J test, there is a high correlation among instruments and endogenous variable, of about 0.36 - 0.56 in absolute value.

Table 3.7a: Durbin-Wu-Hausman test for endogeneity.

	Model (1)	**Model (2)**	**Model (3)**
Null hypothesis.			
variables are exogenous	108.4. (0.000)	9.29644. (0.0023)	30.2928. (0.0000)

P-values in parenthesis.

Table 3.7b: Test for overidentifying restriction.

	Model (1)	**Model (2)**	**Model (3)**
Null hypothesis.			
Over - identifying restrictions are valid.	3.27958 (0.0701)	1.98273 (0.1591)	4.09027 (0.0431)

P-values in parenthesis.

Table 3.7c, test for weak instruments. This test looks at the F statistic for the joint significance of instruments. We report the partial R^2 and partial F-statistics from the first stage regression. The instruments are weak if the partial F-statistic testing the joint significance of the

coefficients of the instruments (the lagged values as regressors) is less than 10. For the estimated models', the partial F-statistic for all our models is higher than 10. Therefore, the instruments are not weak.

Table 3.7c: Test for weak instruments, first-stage regression summary statistics.

Variable	R-sq.	Adjusted R-sq.	Partial R-sq.	Robust F (3, 303)	Prob. > F
Real Pc GDP.^{L}	0.5667	0.5610	0.1160	15.0296	0.0000
Real Pc Agric. GDP^{L}	0.5667	0.5610	0.4762	112.356	0.0000
Real Pc Ind. GDP^{L}	0.5667	0.5610	0.2994	47.496	0.0000

3.6. Conclusion.

In this chapter, we examined the growth effects of banking development using three sets of growth specifications under two different approaches. Under approach one; we analyze the effects of banking sector development on growth in real per capita GDP (constant USD), growth in real per capita agricultural GDP and growth in real per capita industrial GDP using fixed effects panel estimation technique. In addition, we use the growth in per capita capital stock as one of the regressors, the lagged value of per capita GDP, per capita agriculture GDP (AGDP), and per capita industrial GDP (IGDP). Likewise, our model includes the lagged values of the financial development proxy (i.e., Deposit to GDP ratio, Credit to GDP ratio and Money supply to GDP ratio) and their combinations as regressors for specifications. We conduct formal diagnostic tests to verify the significance of the fixed effects, the growth effect of deposits and the growth effect for credits for all three models.

Our results show evidence of growth effects of banking development in Sub-Saharan Africa, which further suggest that the growth effects of banking development significantly contribute to the growth of per capita income. Similarly, the effects of banking development contribute significantly to per capita industrial GDP in Sub-Saharan Africa. However, growth effects of banking development in agricultural GDP are minimal. Under approach two, we use 2SLS estimation to capture the possible endogeneity of the regressor of the growth equations. For the models where we use the IV, we are concerned in the Hansen's J test, which examines the statistical significance of the instruments used in the estimation. In addition to these, we are also interested in the autocorrelations of residuals by testing if the second order autocorrelation is zero. Therefore, in both approaches, our compelling empirical interest is in the marginal effect of banking development on growth. For this, we test the statistical significance of the marginal effect of (lagged) aggregate bank deposits and credits on the growth of per capita GDP and its components for all specifications in both the fixed effects estimation and the IV estimation.

Our results indicate that the lagged per capita GDP has a statistically significant effect on growth. The negative sign shows that there is evidence of convergence for these states and, a low-income country tends to grow faster than a rich one so that the poor state catches up with the rich one regarding the level of per capita income or product Barro and Sala-I-Martin, (1995). We likewise find that lagged bank deposits to GDP have a significant effect on per capita GDP growth for all the three models. Overall, per capita growth in GDP in Sub-Saharan Africa can improve by increasing savings (i.e., bank deposits) through bank expansion.

The findings further suggest that development of banks and provision of their services to rural or remote areas is still a challenge. Agriculture, seen in Africa as the backbone of the economy has not benefited from the development of the banking or the financial sector. The

concentration of the financial sector in urban areas and the presence of the view banks in the rural agricultural areas is still a bonus to the rural community. These communities still lack the access to affordable loans and credits from the formal financial sector. However, we also contend that some country-specific characteristics that are all important in determining the degree and the level of growth and development in SSA, are yet to be examined. We also believe that, factors such as communication, physical infrastructure, and rural well-being may assist in explaining the growth effects of banking development better.

Chapter four

Communication links, productivity, knowledge transfers, growth and income distribution in an economy with the informal sector.

4.1. Introduction.

In this chapter, we investigate the linkage between financial development and economic growth in an economy with informal and formal markets. We employ a utility model inspired by Gillman and Kejak, (2011), but in particular, we extend the model developed by Parvin, (2011). Our model captures the net effects of banking development in the informal sector and further explains how communication and forming knowledge connection in the informal sector are the primary determinants of growth in developing economies. We used a general equilibrium model with households, banks, firms, and government. The households in this economy have no social class, and their endowments are the same, i.e., they are identical; they live infinitely extended by offspring. The government charges consumption tax, and therefore, agents can avoid paying consumption tax by purchasing from the informal market where transaction is generally, by cash. In our setting, there is a continua of measure, i.e., there is no discrete distribution within the households or agents, and hence solving a problem of one household, also solves for the entire economy.

More recently, static models with fixed costs are developed similar to Smith's description of the sources of gains from trade. Other models are dynamic models with specified costs and differentiated products in which output grows toward a fixed steady-state level. Formal attempts to evaluate the effects of integration using the neoclassical growth model often suggest that the gains from integration are small. Our discussions in chapter three showed that the growth effects of trade restrictions are very complicated in most nations. Depending on the condition of a rural area, integration could take the pattern of a business deal in goods, flows of ideas, or both. According to Helliwell and Putnam, (1995), the interaction between social capital and economic performance complements each other. The author defined social capital, as the networks, norms,

and causes that facilitate cooperative activities within and among groups of masses. The communication links and the social interaction may also imply a measure of generalized trust in others, or the interpersonal trust generated and backed up by the valuable kinds of social capital. One such trust, according to Helliwell and Putnam, (1995) is seen between individuals and communities or clubs such as youth clubs. Helliwell and Putnam, (1995) agree that high degrees of interpersonal trust can build many aspects of life more gratifying and more productive, in part by cutting the costs of dealing with uncertainty. Such behavior has a moral force in many religions and moral philosophies because if widespread it leads to positive outcomes for society.

While the studies above indicate the relevance of communication links to overall success, we further argue that group interactions also enhance economies to use enough knowledge to spout development and growth. The evidence according to Lucas, (1988), looks at the prospects for constructing a neoclassical theory of growth and international trade that is consistent with some of the principal features of economic development. Lucas, (1988) examined and compared three models: First; a model emphasizing the physical capital accumulation and technological modification. Second; a model emphasizes human capital accumulation through schooling and third a model emphasizing specialized human capital accumulation through learning-by-doing. The diversity of countries agreeing to Lucas, (1988), measured in per capita income levels are too big to be conceived. The study compared per capita incomes of countries using 1980 average to the industrial market economies. The statistics showed that the per capita income in the in the United States is $10,000, India's per capita income is $240, Haiti's is $270 and the poorest with a per capita income of less than $100. Lucas, (1988) asserts that the effects of this per capita income on human welfare are just staggering. He suggests that people influence the external effects of technology on productivity and so the reach of such effects must have to solve with the

ways various groups of people interact, which may be affected by political boundaries but are probably an entirely different matter to conceptualize. Many such effects can be internalized within small groups of people, i.e., firms or families. By dispensing with an infinitely lived family as a typical agent, their study assumed that such effects are dealt with at the non-market tier and thus create no gap between individual and societal returns.

On the other hand, Marshall, (1890), pioneered one of the leading theses into the roles of communication, and how it affects wealth distribution and growth. Their study contends that economics on one side is a study of wealth and on the other side is a lot more the study of humans. The author posits that people's character has been influenced by their daily work and the material resources which they procure, more than by any other influence unless it is that of his spiritual ideals. The activities and the processes by which a person makes his livelihood occupy his minds and thoughts most of the time when his brain is at its best. Thus, people who are members of a community or group during this hour are influenced by the thoughts and the tactile sensations of this group. The influences come through / by his relations and communication with his associates in work, his employers or his employees. Marshall, (1890) Concludes that it is true that in religion, in the family affections and friendship, even the poor may find scope for many of those faculties, which are the source of the highest happiness. However, the conditions, which surround extreme poverty, especially in densely crowded places, according to Marshall, (1890), have little opportunity for friendship and community. They know nothing of the decencies and the quiet, and very little even of the unity of folk spirit and religion often fails to reach them. No doubt, their physical, mental, and ill moral health are partly due to other causes than poverty, but this is the main reason. Therefore, the explanation to success in the past and the prediction of achievements in the future are not different operations, only the

same worked in opposite directions, the past effect to cause, the ultimate cause to effect. Marshall, (1890), concludes that an individual copies knowledge of a group through initiation, professional qualification or membership. The last of which is indeed nothing but the inversion of the communication employed in deductions and training along the same proclivities, the same opinions, the same needs of our intellect.

In this chapter, therefore, we examine the effects of communication links, knowledge transfers, and social interaction on growth within individuals, families, community, and institutions using an optimal multi-sector endogenous growth model in a monetary economy with households, firms, and banks. We argue that the effort in forming connections and barriers to communication impedes communication links and as a result affects growth. Further, we introduce a 'disutility parameter' to represent the initial conditions in the economy, such as the point of linguistic diversity, that help determine the monetary value of establishing knowledge links with other masses. Our main finding in chapter four is that the high cost of communication suppresses growth. The rest of the chapter is organized as follows. Section 4.2 discusses the motivation of the study. Section 4.3 presents the utility model, and section 4.4 presents the discussions from the competitive equilibrium. Section 4.5 concludes.

4.2. Motivation

According to Lazarsfeld and Merton, (1954), the makeup of an area of its functional structure, income structure, industry mix, and educational distribution influence the level of similarities and their activities. The interaction between personality, local and community values, and life experiences helps to explain the variety of responses to what appears informally similar in individual communities. Shared community values can play a role in influencing aspirations, and values and expectations can run over long distances. Communication across social groups

according to Roger, (1995) increases the pace of growth and in turn, may influence the type of work or business they practice. In addition, individual networks of trust and contacts are prevalent and act as substitutes in the informal sectors where regulation is absent. Having that trust is likely to cut the monetary values and costs from both economic and non-economic activities.

Rivera-Batiz and Romer, (1991), indicated that flows of ideas deserve attention comparable to that devoted to flows of goods, as such; public policy can influence international communications and information flow to the same extent that it influences goods flows. For instance, tax policies directly affect the incentive to station company employees in foreign lands, while immigration and visa policies directly limit the movement of the masses. Likewise, some governments restrict direct foreign investment in their telecommunication networks, which is presumably important in the international transmission of thoughts. Although these are the few examples considered, it should be clear that flows of goods and flows of ideas are not the only factors in economic integration, economic integration will also depend on money and institutional arrangements among others.

A more recent study by Gillman and Kejak, (2011) provided a clear link between developments in financial services and sectorial allocation of resources. They argued that, as long as labor decreases large enough relative to the decrease of the physical capital available, then the real wage to real interest rate ratio will rise, the capital to effective labor ratios in all sectors will rise and the real interest rate will fall. On the other hand, Parvin, (2011) claimed that, the link between financial services and rural sector development dependents on the effective deployment of labor from the formal sector. If possible, financial services produced and utilized in an informal sector are different from that produced and utilized in a formal sector. Such

services according to Parvin, (2011) have two different demands, which allow one to choose different levels of the two services. The author further argued that in an economy with formal and informal markets, the financial services that can be used in one sector also imposes a different cost of production in addition to using such a service. Intuitively, in an informal market, the utility cost of producing a financial service is much higher than the utility cost of producing a financial service in a formal market. This may be because producing and selling financial services in the informal and rural communities requires cash transaction. We build on this idea to model two financial services, one for the informal sector and the other for the formal sector, to examined growth effects of communication links, productivity and income distribution in an economy with the informal sector.

4.3. The Model

We look at an endogenous growth monetary economy with households, firms, and banks. Time is discrete and runs forever Gillman et al., (2004). There is a continua of measure one of identical, infinitely lived utility-maximizing households. Our model assumes that the households are identical in the sense that, there is no social class regarding their endowment. Household own one unit of time, $h_0 > 0$ units of human capital in the initial period, $M_0 > 0$ the measure of cash in the initial period and the property rights of the firms and the banks. Firms and banks own nothing except the technologies. Households supply factors of production to the firms and the banks and get paid for their work or investment Parvin, (2011). They use the proceeds to purchase consumption and investment goods in perfectly competitive markets.

Two markets exist in this model, an informal market for the final good sold for cash, and a formal market for the final good sold for cash and credit. Although these are the same

commodity, we model them as two different goods only because in equilibrium they may engage in different unit prices. The method of payments is primarily the financial services provided both in the informal and formal markets. The final good produced by the final good producer, get sold to sellers in both the informal and formal markets where the household can then purchase. The household, in this case, can either choose to buy from the formal market or the informal market. Two technologies for the banks exist in two types of marketplaces. Sellers in the formal market combine financial services and the final good and sell to households in exchange for credit or cash. Sellers in the informal market combine financial services and the final good and sell to households in exchange for cash. Consumption good purchased from the informal market for cash are not subject to consumption taxation, but consumption good purchased from the formal sector for cash or credit is subject to consumption tax.

The advantage of buying in the informal market is that such purchases can evade the consumption tax, while the advantage of buying in the formal market is that for such purchases credit is available. The government supplies money or make lump sum transfers to households and collects revenue through consumption taxation. All purchase in the informal and formal markets are sourced from deposits. Each deposit earns a dividend or interest. The interest in the informal market comes as a reward based on trust, networking, and communication. The representative household's discounted utility stream depends on the consumption purchased from the informal market c_{st}, the consumption purchased from the formal market c_{ft}., and leisure x_t, in a constant elasticity fashion.

$$u = \sum_{t=1}^{\infty} \beta^t \left(Inc_{st} + Inc_{ft} + \alpha Inx_t + \alpha\mu(\varepsilon(s_t)).^{\frac{1}{\sigma}} \right);\ \sigma \in (0,1), \mu > 0. \qquad (4.1)$$

Therefore, equations (4.1) represents the total welfare (utility), such that; $\alpha > 0$ is a

parameter related to the marginal utility of leisure. $\sigma \in (0,1)$, Is the elasticity of substitution between consumption, leisure and communication effort, $\mu > 0$ is the disutility coefficient. We assume that a bigger μ implies more disutility from the effort to communicate. In other words, more variations in languages (or too many languages) increase the size of μ. $\varepsilon(s_t)$Is the effort in forming connections, $\varepsilon(s_t) \in (0,1)$ is an index of knowledge connections, social interaction and networking efforts made through communications. Following Kompas and Owen, (2007), we assume a one-to-one mapping between the effort from making knowledge connections and the number of connections, i.e. $\varepsilon(s_t) = s_t$, where s_t is the number of forming connections. β Is the subjective discount factor, such that $\beta \in (0,1)$.

Equation (1) is consistent with an intertemporal consumption/leisure model of individual preferences Gillman et al., (2004), Parvin, (2011), and Kompas and Owen, (2007) where the effect of $\varepsilon(s_t)$ on utility incorporates an implicit trade-off between leisure and forming knowledge connections such that the time spent making connections is privately costly. The disutility parameter μ, represents the initial conditions in the economy, such as the degree of linguistic diversity, that help determine the cost of establishing knowledge links with other people. High levels of the disutility parameter would represent an economy where the social barrier to communication, such as a lack of a common language, makes it expensive to establish knowledge links regarding the disutility of effort. A relatively low μ makes it easier for agents to form knowledge connections lowers the 'utility-cost' of forming connections. Details for the derivation and First Order Conditions (FOC), for our utility model are provided in Appendix 4.

We extend Parvin, (2011), utility model, however, the differences in the current study

and Parvin, (2011) is that; their study follow close arguments from Gillman et al., (2004), and Gillman and Kejak, (2011), but the current study follows arguments from Kompas and Owen, (2007). Their study examines how financial developments cause growth, by investigating the effects of human capital allocations both in the informal and formal market. The current study examines the growth effects of communications links and social interaction. Our central argument is that if the economy has a balanced growth path, how does communication links, social interaction, and knowledge transfers in the informal sector impact economic growth. Overall, we extend Parvin, (2011) as follows:

i) We augment Parvin, (2011) with communication in the utility function, i.e. $\varepsilon(s_t)$. $\varepsilon(s_t) \in (0,1)$ is an index of knowledge connections, social interaction and networking efforts made through communications?

ii) Abstraction from income taxation. Our model has one tax instrument, the proportionate tax rate denoted by τ_t^c for consumption. We keep one tax so that, there is clear incentive to use in the informal market.

iii) Our model focuses on the impact of communication on growth and finally, we are interested in the analytical properties while Parvin, (2011), focus on the solutions of the numerical properties.

The endowments (budget set) in this economy includes money, transfers, dividend, and wage. The marginal utility of households should be equal to the total endowment in both sectors. In equilibrium, Price taking means everybody knows what the prices are before they act (sometimes known as agent optimization), i.e., doing the best they can. Rational expectations mean even though they are only buying one good and there are thousands in the economy they understand all the prices, and when they act they are considering all the tradeoffs, they could

make. And lastly, market-clearing means for any buyer there is a seller (the total supply and demand). But how can we determine the utility cost of forming connections in both markets? How does μ help determine the monetary value of establishing knowledge effects on growth?

Arrow and Debreu, (1954), suggested that, since economic equations 'always' have solutions, and following from the game theory (the Nash equilibrium), they theorized that, prices at equilibrium leads to a market clearing. Therefore, before discussing the competitive equilibrium, the first step we set and define all our exogenous variables and this includes the policy instruments set $\left\{ M_t, V_t, \tau_t^c \right\}_{t=0}^{\infty}$. Second, we set and define the endogenous variables, and this includes a set of prices, dividends, and wage, i.e. $\left\{ P_t, p_{ct}^s, p_{ct}^f, R_{st}, R_{ft}, p_{st}, p_{ft}, w_t \right\}_{t=0}^{\infty}$. Third and finally, we set and define the competitive equilibrium as a set of equations, i.e., equilibrium $= u\left(c_{st}, c_{ft}\right)$. Sometimes referred to as utility maximization or the derivatives of the first order conditions (FOC). All derivation and equations are presented in Appendix 4.

The set describes the optimal behavior of the household. Therefore, at equilibrium, the marginal cost of financial services in the formal market c_{ft}, induces minor or more allocation of working in the informal sector c_{st}. Similarly, the effort in forming connections s_t, and the disutility parameter μ either decrease or increase the maximum utility of households in both sectors $\left(c_{st} \text{ and } c_{ft}\right)$. Consequently, the conditions for optimal behavior include the three constraints (4.8), (4.4a) and (4.5), provided in Appendix 4.

4.4. Competitive Equilibrium and Balance Growth Path (BGP).

We give a structured summary of the market clearing condition. Market-clearing means, for any buyer, there is a seller, i.e. the total supply and demand summarized by equation (4.32) from Appendix 4.

$$A_y(n_{yt}h_t) = p_{ct}^s c_{st} + p_{ct}^f c_{ft} \quad (4.32a)$$

$$1 - x_t = n_{yt} + n_{Ht} + n_{ft} + s_t n_{st} \quad (4.32b)$$

$$A_H(n_{Ht}h_t) = h_{t+1} \quad (4.32c)$$

$$A_s(s_t n_{st} h_t)^{\gamma_s} d_{st}^{1-\gamma_s} = c_{st} \quad (4.32d)$$

$$A_f(n_{ft}h_t)^{\gamma_f} d_{ft}^{1-\gamma_f} = \psi c_{ft} \quad (4.32e)$$

Equation (4.32a) represents the goods market clearing condition, (4.32b) describes the distribution of time across leisure and work, (4.32c) describes the market clearing condition for human capital, and (4.32d) and (4.32e) represents the market clearing conditions for financial services for the informal and formal market. Equation (4.32d) and (4.32e) can be used to define a linear tradeoff between the financial services in the informal market c_{st} and the financial services in the formal market c_{ft}. A set of allocations in this framework that satisfies (4.32) is necessarily a set of possible allocations. The final consumption of the household must also be equal to the total utility stream (supply and demand). Therefore, all the above set of equations defines the general equilibrium model for the financial services in both sectors. The FOC defines the marginal utility between households in both sectors, and once we defined the competitive equilibrium, we can then solve for the unknowns.

4.4.1. Competitive Equilibrium.

To define competitive equilibrium in this model, we include communication in the utility function i.e., $\varepsilon(s_t).\varepsilon(s_t) \in (0,1)$ an index of knowledge connections, social interaction and networking efforts made through communications. Our definition does not include income taxation in our equilibrium model, but one tax instrument, the proportionate tax rate denoted by τ_t^c for consumption. We keep one tax so that, there is clear incentive to use in the informal market. Our model focuses on the impact of communication on growth, and as such, we are only interested in the analytical properties. This is a significant departure from Parvin, (2011). Therefore, competitive equilibrium in this economy is a set of prices; $\left\{ P_t, p_{ct}^s, p_{ct}^f, R_{st}, R_{ft}, p_{st}, p_{ft}, w_t \right\}_{t=0}^{\infty}$, a set of Policy; $\left\{ M_t, V_t, \tau_t^c \right\}_{t=0}^{\infty}$ and allocations;

$$\left\{ c_{st}, c_{ft}, h_{t+1}, M_{t+1}, x_t, n_{yt}, n_{ft}, s_t n_{st}, n_{Ht}, d_{st}, d_{ft}, q_{st}, q_{ft}, y_t \right\}_{t=0}^{\infty},$$

Such that:

a. Given the set of prices and the policy, the allocations $\left\{ c_{st}, c_{ft}, h_{t+1}, M_{t+1}, x_t, n_{yt}, n_{ft}, s_t n_{st}, n_{Ht}, d_{st}, d_{ft} \right\}_{t=0}^{\infty}$ solve the representative household's utility maximization problem.

b. Given the set of prices, the allocation $\left\{ h_t, n_{yt}, y_t \right\}_{t=0}^{\infty}$, solve the profit maximization problem of the representative firm in the goods-producing sector.

c. Given the set of prices, the allocations $\left\{ h_t, n_{ft}, s_t n_{st}, d_{st}, d_{ft}, q_{st}, q_{ft} \right\}_{t=0}^{\infty}$, solve the profit maximization problem of the representative bank in the intermediary financial sector.

d. Given the set of prices, the allocation $\left\{ c_{st}, c_{ft}, q_{st}, q_{ft} \right\}_{t=0}^{\infty}$, solve the profit maximization problem of the representative sellers in the informal and formal market.

e. Given the set of prices and allocations, the government policy $\left\{ M_t, V_t, \tau_t^c \right\}_{t=0}^{\infty}$, satisfies the sequence of government budget constraints.

f. All allocation satisfies the market clearing conditions.

If the representative household's optimum has an interior solution, given the production technologies and the utility function, a competitive equilibrium exists in this model. In general, we are interested in the competitive equilibria where both sectors operate, and the households purchase from both markets. Therefore, the competitive equilibrium captures communication in the utility function, with no income taxation in the equilibrium model, but tax instrument, the proportionate tax rate denoted by τ_t^c for consumption. We keep one tax so that, there is clear incentive to use in the informal market. Our model focuses on the impact of communication on growth, and as such, we are interested in the analytical properties. Therefore, the representative optimum has an interior solution if $R_{st} > 1 \; and \; R_{ft} > 1 + \tau_t^c$. From equations (4.28), $\lambda_{1t} = \dfrac{\alpha}{x_t w_t h_t}$ and from (4.28-4.29) and (4.30), from appendix 4:

$$\lambda_{2t} = \frac{1}{p_{ct}^s c_{st}} - \frac{\alpha\left(1 - R_{st}\right)}{x_t w_t h_t} = \frac{1}{p_{ct}^f c_{ft}} - \frac{\alpha\left(1 + \tau_t^c - R_{ft}\right)}{x_t w_t h_t} \; and \; \lambda_{3t} = \frac{\alpha}{x_t A_H h_t} . = s_t^{\left(\frac{1}{\sigma} - 1\right)} = \frac{\alpha n_{st}}{\mu}$$

The equations above represent the shadow prices of the budget constraint, the cash in advance constraint, the human capital accumulation constraint and the efforts in forming connections, so long as $R_{st} > 1 \; and \; R_{ft} > 1 + \tau_t^c$ and are strictly positive. Therefore, the competitive equilibrium is defined by equation (4.33) below.

$$\frac{1}{p_{ct}^f c_{ft}} - \frac{1}{p_{ct}^s c_{st}} = \frac{\alpha}{x_t w_t h_t}\left(\tau_t^c + R_{st} + R_{ft}\right) \tag{4.33}$$

4.4.2. The Balance Growth Path (BGP).

The Balanced Growth Path (BGP) includes a set of government policy $\{\tilde{M}_t \tilde{V}_t, \tilde{\tau}_t^c\}_{t=0}^{\infty}$ and the endogenous variables $w_t, x_t, n_{yt}, n_{ft}, s_t n_{st}, n_{Ht}$. From equation (4.32a), the BGP y_t, h_t and aggregate consumption expenditure $\frac{p_{ct+1}^s c_{st+1} + p_{ct+1}^f c_{ft+1}}{p_{ct}^s c_{st} + p_{ct}^f c_{ft}}$ grow at the same rate, and thus:

$$\frac{y_{t+1}}{y_t} = \frac{h_{t+1}}{h_t} = \frac{p_{ct+1}^s c_{st+1} + p_{ct+1}^f c_{ft+1}}{p_{ct}^s c_{st} + p_{ft}^f c_{ft}} = 1 + g \tag{4.37}$$

Note that, the endogenous variables $w_t, x_t, n_{yt}, n_{ft}, s_t n_{st}, n_{Ht}$ are stationary. Stationarity in the BGP means the time (t) subscript does not change, or it is not a determinant of the endogenous variable. $\frac{M_{t+1}}{M_t} = 1 + \delta$ and $m_t = \frac{M_t}{P_t}$, variables that grow at the same rate, and therefore $\frac{m_{t+1}}{m_t} = 1 + g,$ which in turns imply that $\frac{P_{t+1}}{P_t} = \frac{1+\delta}{1+g} = 1 + \pi$. The increase in nominal deposits follows the increase in the nominal money supply since the sum of deposit at any time in any sector bank is only equal to the money assigned to that sector's bank. $q_{st} = c_{st}$ *and* $q_{ft} = \psi c_{ft}$, therefore, along with the BGP:

$$\frac{c_{st+1}}{c_{st}} = (1 + \delta)\left(\frac{1+g}{1+\delta}\right)^{\gamma_s} \tag{4.38a}$$

$$\frac{c_{ft+1}}{c_{ft}} = (1 + \delta)\left(\frac{1+g}{1+\delta}\right)^{\gamma_f} \tag{4.38b}$$

$$\frac{p_{ct+1}^s}{p_{ct}^s} = \left(\frac{1+\delta}{1+g}\right)^{\gamma_s} \tag{4.38c}$$

$$\frac{p_{ct+1}^{f}}{p_{ct}^{f}} = \left(\frac{1+\delta}{1+g}\right)^{\gamma_f} \quad (4.38d)$$

$$\frac{p_{st+1}}{p_{st}} = \left(\frac{1+\delta}{1+g}\right)^{\gamma_s - 1} \quad (4.38e)$$

$$\frac{p_{ft+1}}{p_{ft}} = \left(\frac{1+\delta}{1+g}\right)^{\gamma_f - 1} \quad (4.38f)$$

Along the BGP, the real output and aggregate expenditure grow at a constant rate g, but expenditure in individual sector grow at rate δ. This implies that the ratio of the growth rate in expenditure across two sectors is constant. The growth rate in the production of financial services along the BGP in the informal sector bank and in the formal sector bank is characterized by the growth in the amount of consumption from these two markets, characterized by (4.38a) and (4.38b), respectively. Since wage is fixed in this model, equation (4.38c) and (4.38d) imply that the unit price of financial services in the informal sector bank and in the formal sector bank grow at constant rates, given by equation (4.38e) and (4.38f) above.

4.5. The Analytical Properties of the BGP and composite statics.

Proposition 1: The representative optimum has an interior solution if $R_{st} > 1 \; and \; R_{ft} > 1 + \tau_t^c$.

Proof: from equations (4.28), $\lambda_{1t} = \dfrac{\alpha}{x_t w_t h_t}$, and from (4.28-29) and (4.30),

$\lambda_{2t} = \dfrac{1}{p_{ct}^{s} c_{st}} - \dfrac{\alpha(1 - R_{st})}{x_t w_t h_t} = \dfrac{1}{p_{ct}^{f} c_{ft}} - \dfrac{\alpha\left(1 + \tau_t^c - R_{ft}\right)}{x_t w_t h_t}$ *and* $\lambda_{3t} = \dfrac{\alpha}{x_t A_H h_t}$. These are the shadow prices of the budget constraint, the cash in advance constraint, the human capital accumulation constraint and the efforts in forming connections, so long as $R_{st} > 1 \; and \; R_{ft} > 1 + \tau_t^c$ and are

strictly positive. The competitive equilibrium is characterized by: $\frac{1}{p_{ct}^{f}c_{ft}} - \frac{1}{p_{ct}^{s}c_{st}} = \frac{\alpha}{x_t w_t h_t}\left(\tau_t^c + R_{st} - R_{ft}\right).$

Equation (4.23) explains the relative difference between purchasing from the informal market and purchasing from the formal market. $p_{ct}^{s} - p_{ct}^{f} = p_{st} + 1 - \psi p_{ft} - 1$. Simplifying it further gives, $p_{ct}^{s} - p_{ct}^{f} = p_{st} - \psi p_{ft}$. The consumer price of the same commodity from the two markets has two different prices, p_{ct}^{s}. and p_{ct}^{f}. we model the difference between the unit cost of financial services attached to these two goods. Therefore, the difference between the equilibrium consumer prices of the two goods merely is equal to the difference between p_{st} and p_{ft}, given by the addition of ψ.

Proposition 2. A Balanced Growth Path (BGP) in this economy is a path along which for a set of government policy $\{\tilde{M}_t \tilde{V}_t, \tilde{\tau}_t^c\}_{t=0}^{\infty}$ the endogenous variables $w_t, x_t, n_{yt}, n_{ft}, s_t n_{st}, n_{Ht}$, remain stationary and the remaining endogenous variables grow at constant rates.

Proof. We can demonstrate this using equation (4.32a), which states that along the BGP y_t, h_t and aggregate consumption expenditure $\frac{p_{ct+1}^{s}c_{st+1} + p_{ct+1}^{f}c_{ft+1}}{p_{ct}^{s}c_{st} + p_{ct}^{f}c_{ft}}$ grow at the same rate, and therefore; $\frac{y_{t+1}}{y_t} = \frac{h_{t+1}}{h_t} = \frac{p_{ct+1}^{s}c_{st+1} + p_{ct+1}^{f}c_{ft+1}}{p_{ct}^{s}c_{st} + p_{ct}^{f}c_{ft}} = 1 + g$. Notice that $\frac{M_{t+1}}{M_t} = 1 + \delta$ and $m_t = \frac{M_t}{P_t}$.

Along the BGP all growing real variables grow at the same rate, and therefore $\frac{m_{t+1}}{m_t} = 1 + g,$

which in turns imply that $\frac{P_{t+1}}{P_t} = \frac{1+\delta}{1+g} = 1+\pi$. The growth in nominal deposits follows the growth in nominal money supply because the amount of deposit at any time t to any sector bank is simply equal to the cash allocated to that sector's bank.

Proposition 3. We now turn to the BGP properties of the retail sector where the households purchase consumption. In the retail sector, the growth properties are determined by the marginal cost of financial service for the retailer, which is represented by the parameter $\psi > 0$.

Proof. From the appendix 4, the BGP condition to support this proposition using equation (41) entails that:

$$\frac{sn_s}{n_f} = \left[\frac{\gamma_s}{\gamma_f}\left(\frac{p_{st}c_{st}}{p_{ft}c_{ft}}\right)\right]\frac{1}{\psi} \tag{4.47}$$

Equation (47) indicates that the term $\frac{sn_s}{n_f}$ is decreasing in ψ. Thus, higher marginal cost of financial services in the conventional retail market makes the purchase price of consumption in the formal market higher, which in turn results in a fall in need for consumption from the formal marketplace. The switch in demand from the conventional to the informal market implies that more financial service is now demanded in the informal sector. Likewise, from equation (4.27i) and (4.41c), it is clear to examine that the effort in forming connections s_t is directly relative to the share parameter γ_s in the informal sector and the equilibrium price p_{st} for financial services in the informal market c_{st}.

Proposition 4. The marginal rate of substitution across consumption, leisure and the effort in making connections describe their relative prices.

Proof. We can explain how the marginal rate of substitution across consumption, leisure and the effort in making connections can be described by their relative prices using equations.

Given $(s_t)^{\left(\frac{1}{\sigma}-1\right)}\mu = \lambda_{1t} w_t h_t n_{st}$, *and* $\lambda_{1t} = \frac{(s_t)^{\left(\frac{1}{\sigma}-1\right)}\mu}{w_t h_t n_{st}}$ such that;

$\frac{1}{p_{ct}^f c_{ft}} - \frac{1}{p_{ct}^s c_{st}} = \frac{\mu(s_t)^{\left(\frac{1}{\sigma}-1\right)}}{n_{st} w_t h_t}\left(\tau_t^c + R_{st} - R_{ft}\right)$ Using the Cobb-Douglas utility function and the theorem of general equilibrium (taking the sum of logs), we can optimize utility by;

$\frac{MU(c_{st}, c_{ft})}{p_{ct}^s} = \frac{\frac{3}{4}}{p_{ct}^s c_{st}} = \frac{\frac{1}{4}}{p_{ft}^f c_{ft}} = \frac{MU(c_{st}, c_{ft})}{p_{ft}^f}$ From Appendix 4, the slope of the indifference curve $\frac{MU(c_{st})}{MU(c_{ft})}$ equals to the slope of the budget set $\frac{p_{ct}^s}{p_{ft}^f}$. i.e. $\frac{MU(c_{st})}{MU(c_{ft})} = \frac{p_{ct}^s}{p_{ft}^f}$. The general assumption for the above statement is that an individual household will spend $\frac{3}{4}$ of his / her income (endowment) in the informal sector, and $\frac{1}{4}$, of his / her income (endowment) in the formal sector presented in appendix 4.

Proposition 5. Along the BGP, a higher tax rate on consumption tax reduces economic growth. **Proof**. The BGP condition (4.40a) implies that economic development is decreasing in consumption tax and the BGP condition (4.40b) imply that economic development decrease when the government promotes the use of consumption tax τ^c. $\frac{(1+g)(1+\pi)}{\beta} = R_f\left[1 + \frac{\gamma_f}{(1-\gamma_f)n_f}\left(\frac{x}{\alpha}\right)\right] - \tau^c$. The insight in proposition 5 is that because higher consumption tax increases the purchase cost of consumption from the formal market, an increase in this tax rate means the households respond with lower spending on consumption.

Proposition 6. A decrease in the effort to form communications and knowledge links makes it easier for agents to interact and as a result, lowers the 'utility-cost' of forming connections.

Proof. From equation (4.27i), $s_t^{(\frac{1}{\sigma}-1)} = \frac{\alpha n_{st}}{\mu}$ where $\mu > 0$ is the disutility coefficient. We assume that a bigger μ implies more disutility from the effort to communicate. In other words, more variations in languages (or too many languages) increase the size of μ. $\varepsilon(s_t)$Is the effort in forming connections, $\varepsilon(s_t) \in (0,1)$ is an index of knowledge connections, social interaction and networking efforts made through communications. Following Kompas and Owen, (2007), we assume a one-to-one mapping between the effort from making knowledge connections and the number of connections, i.e. $\varepsilon(s_t) = s_t$, where s_t is the number of forming connections. $\alpha > 0$ is a parameter related to the marginal utility of leisure.

Proposition 7. Real output and aggregate expenditure grow at a constant rate g, and expenditure in the informal and formal sector grows at the rate δ.

Proof. The proportion of the increase in expenditure across two sectors is constant. Increase in the production of financial services along the BGP in the informal sector bank, and the formal sector bank characterizes the growth in the quantity of uptake from these two markets, categorized by (4.38a) and (4.38b), respectively, i.e. $\frac{c_{st+1}}{c_{st}} = (1+\delta)\left(\frac{1+g}{1+\delta}\right)^{\gamma_s}$ *and* $\frac{c_{ft+1}}{c_{ft}} = (1+\delta)\left(\frac{1+g}{1+\delta}\right)^{\gamma_{fs}}$. Since wage is fixed in this example, equations (4.14a) and (4.17a) below; implies that the unit cost of financial services in the

informal sector bank and in the formal sector bank grows at constant rates, given by equations (4.38e) and (4.38f). $\frac{p_{st+1}}{p_{st}} = \left(\frac{1+\delta}{1+g}\right)^{\gamma_s - 1}$ *and* $\frac{p_{ft+1}}{p_{ft}} = \left(\frac{1+\delta}{1+g}\right)^{\gamma_f - 1}$.

Similarly, $w_t = p_{st}\gamma_s A_s \left(s_t n_{st} h_t\right)^{\gamma_s - 1} d_{st}^{1-\gamma_s}$ *and* $w_t = p_{ft}\gamma_f A_f \left(n_{ft} h_t\right)^{\gamma_f - 1} d_{ft}^{1-\gamma_f}$. In addition, development in the informal sector is equal to growth in the formal sector. Equations (4.14b) and (4.17b), i.e. $R_{st} = p_{st}\left(1-\gamma_s\right)A_s \left(s_t n_{st} h_t\right)^{\gamma_s} d_{st}^{-\gamma_s}$ *and* $R_{ft} = p_{ft}\left(1-\gamma_f\right)A_f \left(n_{ft} h_t\right)^{\gamma_f} d_{ft}^{-\gamma_f}$, only means that, $\frac{R_{st+1}}{R_{st}} = \frac{R_{ft+1}}{R_{ft}} = \frac{1+g}{1+\delta}$. Hence in both sectors, the list of growing variables includes; $h_t, y_t, c_{st}, c_{ft}, q_{st}, q_{ft}, d_{st}, d_{ft}, p_{st}, p_{ft}, p_{ct}^s, p_{ct}^f$. The rest of the endogenous variable remains constant. Also, from (4.38) it is straightforward to verify that consumption expenditure from the two sectors grows at the same rate, and this is simply equal to the rate of growth in nominal money supply, i.e. δ. We present a detailed solution to the balanced growth path in appendix 4.

4.6. Conclusions.

In this chapter, we examined growth effects of communication links, knowledge transfers and social interaction within individuals, families, community, and institutions using an optimal multi-sector endogenous growth model in a monetary economy with households, firms, and banks. We argue that the effort in forming connections and barriers to communication impedes communication and as a result affects growth. Our model further generates testable growth properties. For example, propositions six states that, a decrease in the effort to form communications and knowledge links makes it easier for agents to interact and as a result lowers the utility-cost of forming connections. Proposition five states that, aggregate economic growth is limited by the aggregate consumption expenditure and the accrual of human capital, both of

which decrease for any gain in consumption tax rates. An increase in consumption tax results in lower aggregate economic growth.

Our model focuses on the impact of communication on growth, and as such, we are interested in the analytical properties not the solutions of the numerical properties. Therefore, one distinct property in this model are propositions five and six. These propositions relate directly to economic development. We contend that where the informal sector is predominant, and so is the total consumption expenditure from the informal market, the growth effect of tax increases is more severe. If consumption tax is fixed, this shift results in lower demand for the financial services in the formal sector. More purchase from the informal sector implies that the government brings in revenues from consumption tax. An adverse policy effect of this proposal is that production of financial services in the formal sector implies the net growth effect of tax reform must remain invariant. An increment in the use of consumption tax rate encourages more evasion, which results in more shifting of consumption expenditure towards the informal market; hence, an overall net effect is a decrease in aggregate economic growth. In proposition six, we contend that a decrease in the effort to form communication links and knowledge transfers makes it easier for agents to interact and as a result lowers the utility-cost of forming connections. Proposition six means that, group interactions enable economies to use large quantities of specialized knowledge to spur growth Kompas and Owen, (2007).

Chapter five

Growth effects of Banking, communication and infrastructural development in Sub – Saharan Africa.

5.1. Introduction.

In the previous chapter, we studied the relationship between banking development and the local economic growth. The chapter examined the growth effects of banking development in real per capita Gross Domestic Product (GDP). Also, we reviewed the effects of banking development on growth in both industrial and agricultural component of GDP. The primary objective of chapter three is to study how and to what extent banking development has affected economic growth and its components in Sub-Saharan Africa (SSA). Furthermore, our study in chapter three contends that the discrepancy in growth effects of deposits and credits, in Sub-Saharan Africa, could be another exciting field for further inquiry. However, growth effects of banking development on GDP components show that growth in the rural sector is not only dictated by the access of loans and credits from the banks. The findings suggest that other country-specific features might be necessary for setting the level and access of financial services to the rural communities. Chapter three suggests therefore that, communication, physical infrastructure, and rural well-being may assist in explaining the growth effects of banking development better. This chapter extends our findings from chapter three.

In chapter five, we probe the effects of banking development, communication, physical infrastructure and rural wellbeing in regional development in Sub Saharan Africa. Our primary objective is to examine how banking and access to information can explain the growth effects in chapter three using both agricultural and industrial portions of GDP. We use an annual panel data of 14 Sub Saharan Africa countries over the period 1990 – 2013. We examine the link between growth in real per capita GDP, infrastructure and social well-being, and further study the relationship between growth in both industrial and agricultural components of GDP.

We run the model in our previous study by controlling for infrastructure, health, and communication to capture the point of interaction using telephone (mainlines and mobile phone) subscribers (per 1,000 people).

Human development and social wellbeing include education, wellness, training, information and other investments in people Kasekende, (2010) as well as other factors that enhance an individual's productivity. Support to the human development literature and social well-being gain prominence, especially with the emergence of the endogenous growth theory by Romer, (1987, and 1989). Both Romer, (1987, 1989) and Lucas, (1988) proposed that if capital is set to include human development, then the long-run capital might not exhibit diminishing returns but constant returns to scale. We capture the interaction of human well-being using life expectancy. We assume that long life means a healthy life and healthy life includes all the attributes such as wellness, training and better choices.

Looking at the degree of diversity in sub-Saharan Africa, the challenges of economic growth and prosperity are enormous. Fowowe, (2013), showed that the effect of education on economic growth varies among individual countries. This is evident in the difference of the number of wages paid to persons for the same occupation but in a different region Mlambo, et al., (2012). Despite the education and training, empirical results from chapter three indicate that the growth effects of banking development in SSA are weak in low-income nations. This implies that more finances without sound knowledge, information access, communication and infrastructural development may not succeed in delivering long-term economic benefits in these countries Demetriades and Luintel, (1996). Therefore, the principal motivation for this chapter is the additional impact of information and communication on growth. The common

understanding is that when individuals become more aware of the opportunity available, they use their resource more effectively.

According to Fowowe, (2013), the relationship between financial development and growth is not as straightforward as suggested by McKinnon and Shaw, (1973). This is because imperfections – which are inherent in financial markets, can adversely affect economic development. These imperfections in financial markets arise because of asymmetric information, which is the inadequate distribution of information between two positions in a transaction. The nature of financial proceedings in which the borrower usually gets more information about the likelihood of the loan being repaid than the lender makes asymmetric information inherent in this market. Borrowers can be screened, and funds will only be made available to those who possess a high grade of risk aversion or those who appear unlikely to default.

Still, in a situation where financial intermediaries are not efficient in their roles, Fowowe, (2013), claims that prudential regulation and banking supervision become important in retaining an 'eye' on the financial system. Prudential regulation is indispensable in society to keep intermediaries in check and ensure the minimization of informational asymmetries. With an unregulated financial system, information asymmetries are likely to lead to the financial crisis because it would be possible for careless bankers to cover excessively high-interest charge per units. These excessively high-interest rates aggravate adverse selection and moral hazard problems in the credit marketplace, which can contribute to unreasonable risk-taking by firms. This takes on the effect that some firms will not be capable of paying back loans and thus leaving banks insolvent. Financial predicament occurs in such a situation,

which adversely affects economic activities and can, therefore, slow economic development Fowowe, (2013).

On the other hand, Kumari and Sharma, (2017) noted that infrastructure dramatically affects national economic growth and is a significant factor that contributes to overall economic growth. According to Kumari and Sharma, (2017), infrastructure services not only assist economic growth, but also maintain the agricultural and regional growth, and help bring down poverty. Infrastructure services are exceedingly crucial to surviving in a modern economy and maintaining high living standards. Such components of modern society rely on infrastructure, without which essential services such as training, health facilities, transportation systems, high-speed telecommunications services and proper sanitation facilities would not exist. Thus, improved infrastructure helps remove barriers such as impoverishment, unemployment, regional imbalances, poor livelihood, illiteracy and inadequate health, which negatively affect national development Kumari and Sharma, (2017).

Besides, Farhadi, (2015) argued that, growth impacts on public infrastructure. They use a panel of 18 OECD countries from 1870–2009. Their work goes beyond the traditional analysis of growth accounting models by exploring the indirect effect of stock of core infrastructure for production increase through its impact on productivity. Their results show that growth in both labor productivity and total factor productivity are positive, but not influenced by growth in the breadth of infrastructure. The findings suggest that, although the pace of returns to investment in infrastructure exceeds the private rate in OECD countries, it is not as high as positive externalities associated with investment in equipment and construction investment. The study focusses on a more precise classification of infrastructure that includes

roads, primary roads, airports, railway tracks, inland waterways and public transport, on productivity growth. Farhadi, (2015) further suggested that the impact of infrastructure on economic development is likewise to the indirect effect of capital infrastructure. They reasoned that capital infrastructure shifts productivity in an economic system in various ways, such as improvements in learning by doing, increasing the efficiency of labor, and saving working time.

Still, according to Servaes, (2008), the missing link between information, institutions and physical infrastructure is the purpose of communication techniques and media, which give people powerful tools both to experience modification and to pass it. Put simply; development cannot create change without an ongoing, culturally and socially relevant communication, dialogue among investors and clientele, and within the recipient group itself. The author equally distinguishes simple communication from the systematic nature of strategic communication, which contrasts sharply with the practice of designing an occasional poster, television or radio spot for a feed event. Strategic communication according to Servaes, (2008), blends a series of factors such as extensive utilization of data, careful planning, stakeholder participation, creativity, high-tone programming, and linkages to other curriculum elements and levels, among others that stimulate positive and measurable behavior change among the specified audience. On the other hand, government officials, academics, practitioners and others operating in the development field may have different perceptual experiences of what the setting characteristics of the development communication includes, both lines of argument are not what we intend to examine in this chapter.

The communication dimension in this chapter includes; telephone and mobile communication used in disseminating information, improvement of the transport infrastructure which links rural communities in market towns and regional cities. We argue that improved transportation, access to banking services and branch networks in rural towns and villages, availability of phone networks and sources of electric power gives people more choice to make efficient decisions. Access to communication and the right to information required to forge an investment and public opinion are some of the indicators we examined in this chapter.

We use three sets of growth specifications under two different methodologies.

i) Under method one, we study the impact of banking sector development on growth in real per capita GDP (constant USD), growth in real per capita Agricultural GDP (AGDP) and growth in real per capita Industrial GDP (IGDP) using fixed effects panel estimation technique. Also, we use the growth in per capita capital stock as one of the regressors. Our model also includes the lagged values of the financial development indicators as the regressors for models (1, 2 and 3). We conduct formal diagnostic tests to affirm the significance of the fixed effects, the growth effect of deposits and the growth effect for credits for all three examples.

ii) Under method two, we extend the full analysis using Instrumental variables (IV) estimation to capture the potential endogeneity of the regressors of the growth equations. For the models where we employ the 2SLS estimation, we are interested in the Hansen's J test, which tests the statistical significance of the instruments used in the estimation.

Therefore, in both approaches, our interest is in the marginal effect of banking, communication and physical infrastructural development in the state-level growth of per capita GDP and its components. We analyze the statistical significance of the effects of (lagged) aggregate bank deposits, credits M2-GDP ratio, and control for phones, life expectancy, roads and roads squared in both the fixed effects estimation and the 2SLS estimation.

We find that the lagged per capita GDP has a significant negative effect on the growth of per capita real GDP. This is merely showing that there is evidence of convergence for these states and a weak state tends to grow faster than a rich one so that the poor state catches up with the rich one regarding the level of per capita income or product Barro and Sala-i-Martin, (1995). Most interestingly, we find that communication has a statistically significant effect on per capita GDP growth for all the three examples. Overall, economic growth in Sub-Saharan Africa can improve if there are a better approach to information and communication infrastructure, long and healthy lifestyles and quality savings.

The rest of this chapter is organized as follows; Section 2 reviews the background of the subject areas in Sub Saharan Africa and the associated literature and section 3 presents our empirical framework as well as the information. Section 4 presents and discusses the outcomes from the fixed effects panel estimation and the effects of the 2SLS estimation. Finally, Section 5 concludes the paper.

5.2. Background to the studies.

In chapter three and four, we showed that banking development has several effects. First, banks reduce risk through proper allocation of loans to potential investors by providing

short-term loans. The Short-term loans extended to the productive sector grew faster according to Fowowe, (2013), suggesting that banks, in general, are useful agents for growth. Second, most banks in Sub Sahara Africa can attract highly qualified and quality personnel, which are central in leading and monitoring projects. Third, the development of banking as the dominant financial institution in SSA, countries demonstrate that commercialization improves the efficiency of lending. Our result further indicates that banks increase the productivity of investments by directing funds to high-production technology Brown and Duguid, (2000). Banks can further cut the resource list in transforming, saving into investments through efficient communication by allocating savings more efficiently and resulting in higher productivity of capital through their financial intermediaries Greenwood and Jovanovich, (1990). This process according to Levine, (2005), gradually helped banks to pool the liquidity risk of depositors and invest funds in more productive projects.

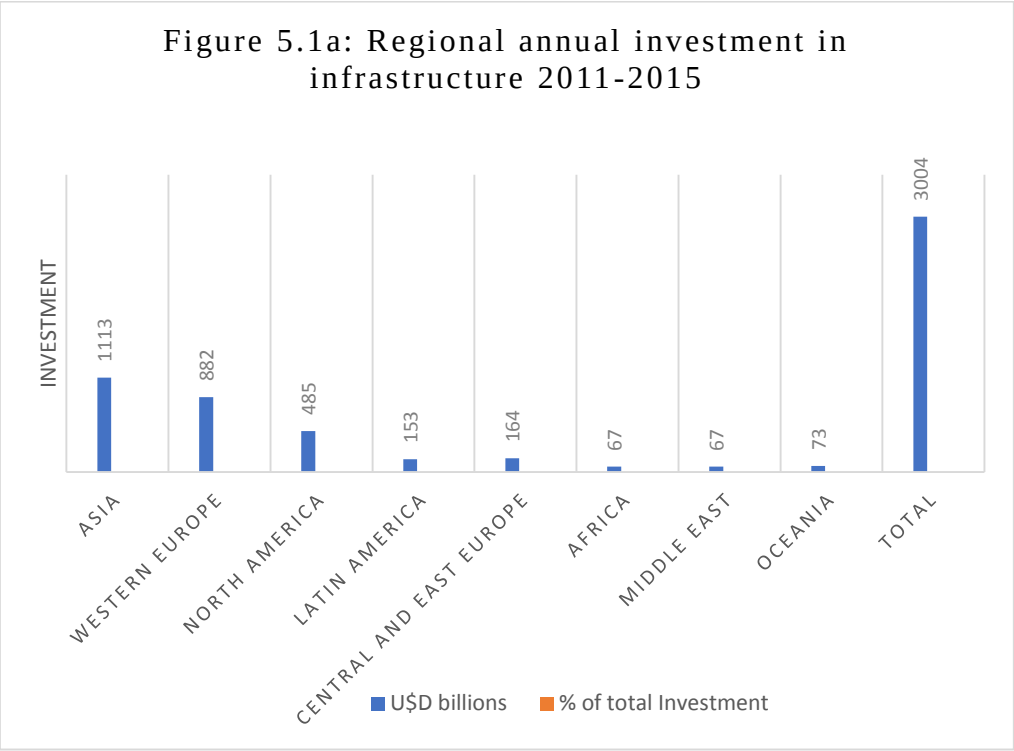
In this section, we argue that banking, information, and communication, and infrastructure affect growth positively. We discuss this as it helps us in establishing the causal link between banking development and access to infrastructure on growth in our empirical analysis. In Sub Saharan Africa, banks are the central financial institutions that dominate most financial transactions. They are the means by which, individuals and households pay rent, receive salaries, transfer money, pay their children's school fees and pay bills. These activities are mainly widespread in towns or cities but absent in rural or remote towns. Therefore, in the section that follows, we discuss the background of the financial institutions in Sub Saharan Africa and the state of both information and physical infrastructure in the region to guide our empirical exercise.

5.2.1. Infrastructure in Sub Saharan Africa.

According to the African Economic Conference (AEC) report 2008, infrastructure in Africa is most commonly discussed regarding its features such as scale, physical infrastructure, and costs. However, its significance has been changing from one focusing on physical fixed assets such as roads, airports, seaports, telecommunications organizations, water distribution systems and sanitation to notions of the milder types of infrastructure, such as information systems and knowledge bases. In a more comprehensive approach, the Millennium Development Goals (MDGs) identifies economic infrastructure to include transport, energy, ICT, water, sanitation, and irrigation, and covers the use of telephones, personal computers, and internet users. The African Economic Conference (AEC) in 2008, further indicates that investments in infrastructure reinforce all the MDGs, including halving income poverty more than the other goals.

According to the OECD, the global infrastructure investment gap is large and growing. Apart from information and communications technology (ICT) infrastructure, current estimates based on Boston Consulting Group (BCG) indicate that the world needs around $4 trillion in infrastructure investment per year (figure 5.1a). However, current annual total spending amounts to only around $3 trillion, with $1 trillion, about 37 percent of that amount invested in Asia and only 2% about 0.06 trillion in Sub Saharan Africa. Infrastructure also affects non-income aspects of poverty, contributing to improvements in health, nutrition, training, and social coherence. Indeed, infrastructure makes valuable contributions to all the MDGs according to AEC, (2008). The United Nations Millennium Project has also supported

the many benefits of infrastructure from 2005, which advocates for significant growth in essential infrastructure investments to developing economies to break away the poverty trap



Source: Authors work. Data is from the World Bank Private Participation in Infrastructure Database, 2017

By most standards, sub-Saharan Africa trails behind other parts of the globe regarding infrastructure service quality and deliverance. The answers given by World Bank, (2017) in their annual report, the 'Africa pulse' indicate that the differences are unusually substantial in the case of paved roads, telephone mainlines, and power generation capacity especially in the final two decades as presented in figure 5.1b below. Total private investments in core power and transport infrastructure has been restricted to just $51 billion over the last 25 years. That figure is low considering the scale of the opportunity and the levels of private investment in core infrastructure in other parts of the world. Although investment in power generation has

spread across a reasonable number of projects and countries, few transport sector transactions have taken place (figure 5.1a and 5.1b). The challenge is not the absence of potentially profitable investment opportunities or, as the case of ICT demonstrates, but capital and lack of capacity World Bank, Africa pulse, (2017). One explanation is the difficulty involved in creating suitable commercial returns from long-distance, intercity, and rural road and rail nets. However, urban roads and railways, bridges, and port and airport infrastructure offer more opportunities, notably when endorsed by government incentives.

Figure 5.1b: Total Investments in SSA (U$D million)

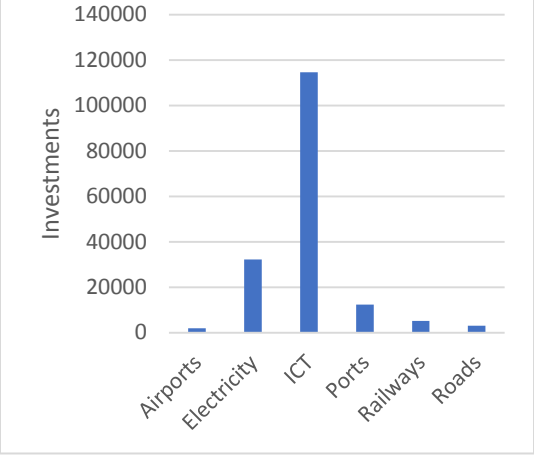
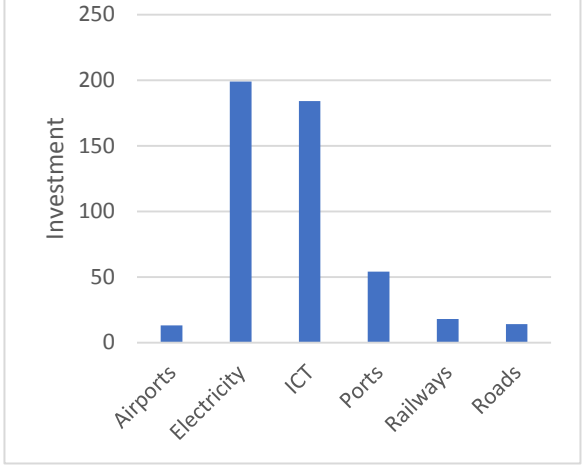


Figure 5.1c: Project reaching financial closure in SSA



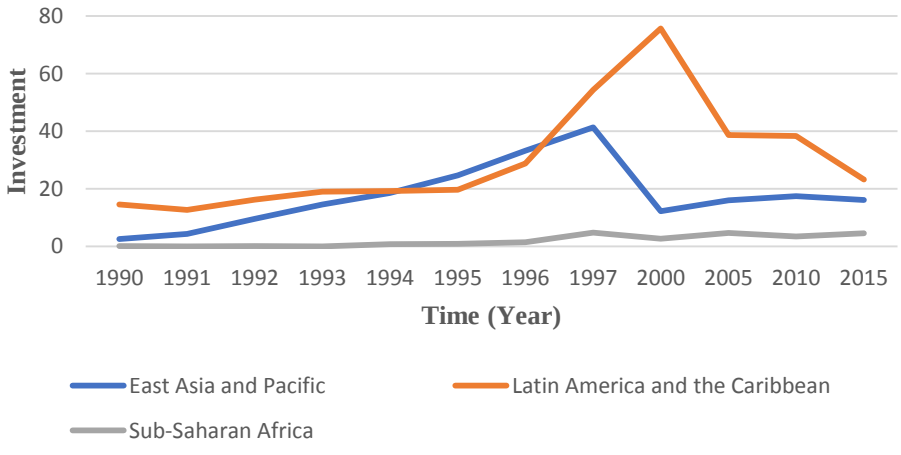
Source: Authors work. Data is from the World Bank Private Participation in Infrastructure Database, 2017.

According to the Africa Finance Corporation (AFC), Sub Saharan African's record of accomplishment of investment suggests that the private sector by itself is unlikely to supply the form of near-term support needed to address these defects. In summation, the unique nature of the area in terms of its diversity; in legal traditions, regulatory environment, levels of political stability, human capability, financial sector, maturity, historical background, cultures, languages, natural resources, climate, and geography, can significantly bear on a country's

attractiveness to individual investors. With Africa's low levels of infrastructure investment in the face of rapidly growing needs, the private sector appears capable of providing only a fraction of the estimated US$ 38 billion annual investment needs in Africa's infrastructure over the succeeding ten years. This is equivalent to 5.3 percent of GDP, according to estimates provided by the Africa Infrastructure Country Diagnostic, Infrastructure Consortium for Africa, and report of 2008.

The Boston Consulting Group (BCG) estimates Sub-Saharan Africa's annual infrastructure gap at around $100 billion. Every dollar of that gap represents a drag on Africa's development and a diminution of its potential. Unless and until it acquires the modern transport systems, power generation capacity, and other essential infrastructure that it needs, it will lag not only the developed world but other emerging regions as well, yet Africa presents a tremendous market opportunity. Africa has 52 cities with a population of one million or more and has a shallow current level of intraregional trade. Its urban population is expected to increase by 50% by 2030.

Figure 5.1d: Infrastructure Investments in Emerging economies 1990 - 2015



Source: Authors work. Data is from the World Bank Private Participation in Infrastructure Database, 2017.

Trends in figure 5.1d show that Latin America and the Caribbean explained much of the decline in 2015. After peaking at US$23 billion in 2000. Sub-Saharan Africa was the only region where private activity remains low for the entire period. Forecast by the World Bank, (2017) predicts that the purchasing power of Africa's middle class is growing and in a decade, the continent will experience the most significant workforce in the world, along with 60% of the world's uncultivated arable land and abundant energy resources ranging from hydrocarbons to renewable. Africa's governments should, therefore, recognize the infrastructure problem and must pool together the fiscal resources and the technical ability needed to close the gap by them.

5.2.2. Transport Network in Sub-Saharan Africa.

Transport infrastructure (roads, railways, sea, river, and airports) enhances production and trade potential of local, national, and regional economic systems. It also eases access to economic and social services essential for reaching the MDGs. Transport impacts on SMEs and business dealings in Africa, which explains why projects on SMEs has begun to feature internationally as a recognized issue in trade policy and provision. Small businesses hold the burden of transfer in rural Africa, for these firms to grow Africa transport must provide an effective and efficient transport infrastructure to better access to outlying townships and hamlets.

Sub Saharan Africa policies on transport over the last decade have seen a significant rise in foreign investment, especially from China. This has enabled African governments to reform the transport sector to accommodate the complexities in negotiations and contracts.

Most rural areas in Sub Saharan Africa have modified their transport policies to let market-determined decisions, enterprise autonomy, and individual participation in the ownership and management of the transport line. Most regimes have also piloted various forms of public, private partnerships in large projects such as airports, seaports, and railway projects. According to Jerome, (2008), the number of private contractors in Africa is replacing aid account in the rehabilitation and maintenance of roads and transport infrastructure. Also, public enterprises have been given considerable autonomy, and regulation has substituted arbitrary rule through consensual performance contracts. In that, respect is also a visible rise in the number of independent road agencies and dedicated road funds in the transport sector and has begun to show positive results in some rural areas.

However, Africa is still considerably disadvantaged in all prospects of the transport sector with less than one-twenty percent of the road network in sub-Saharan Africa just paved, compared to more than a quarter in Latin America and East Asia. (See figure 5.1d above). Conditions of the newly built roads are severely affected by overloading of trucks and poor drainage. Maintaining rural roads and the transport network in remote towns according to AEC report costs are twice as high in sub-Saharan Africa compared to building a new road. These higher prices are due to a compounding of factors, such as lower road quality, time-consuming administrative procedures, and in some rural areas, insufficient competition between service providers.

5.2.3. Telecommunication network in Sub Saharan Africa.

The current debates on infrastructure in sub-Saharan Africa indicate that most investments are geared towards telecommunications. The evidence from Estache, (2006), Jan Christoph Steckel, et al., (2017), Julian Donaubauer, et al., (2016), and Kodongo and Ojah, (2016), indicates that, most nations are undergoing sectorial reform, and foreign investment is now actively promoted across the continent as privatization and liberalization are progressively being introduced. Statistics from the International Telecommunication Union, 2017 report, show that more than one-third of all state telecommunications companies in Sub Saharan Africa have already been privatized and several more are ready to undergo privatization soon. Also, Africa is currently among the world's fastest growing market for mobile phones over the last decade, with over 265 million new subscribers in 2015 alone and much of this figure being mobile subscribers. These statistics correspond to the number of investments in telecommunication infrastructure in Africa from 1990 to 2015, presented in table 5.1 below.

Table 5.1: Regional Snapshots for Infrastructure investments in SSA by top Projects 1990 – 2015

Project	Country	Investment (U$D million)
Telkom SA	South Africa	23,045
MTN Nigeria	Nigeria	12,263
Vodacom SAF	South Africa	10,611
MTN	South Africa	7,929
Globacom Nigeria	Nigeria	5,564
Airtel Nigeria	Nigeria	5,546
Safaricom	Kenya	4,200
Gautrain light rail concession	South Africa	3,483
One port expansion, Phase 4B	Nigeria	2,900

Source: Authors work. Data is from the World Bank Private Participation in Infrastructure Database, 2017

South Africa accounted for over half of all Africa's telecommunication projects, followed by Nigeria. Sub Saharan Africa has also experienced an increase in the growth of mobile phones and other wireless technologies in the past ten years. Most of this investment offer prepaid services commonly known as 'pay as you go.' This mobile service comes prepared with data for internet usage, and subscribers can use these services for banking activities such as money transfer and small-scale trading. Consequently, the advancement in telecommunication has problematic bypass issues of billing and revenue collection. The most competitive markets are Kenya, Nigeria, and South Africa, with three or more operators with South Africa, boosting Africa has a most developed market, registering a market penetration

rate of 67 percent in 2015, followed by Nigeria. Despite falling tariffs, competition is still needed in some markets, mainly where monopolies have been retained, such as Sudan and Uganda with the lowest penetration rates, Jan Christoph Steckel, et al., (2017), Julian Donaubauer, et al., (2016), and Kodongo and Ojah, (2016).

5.3. Review of related literature

Research on the importance of infrastructure and its function in growth were absent from economic discussions for over a century Estache, (2006). However, recently, written reports on infrastructure gained prominence following the development of the Millennium Development Goals (MDGs) in addressing poverty. The United Nations Millennium Development Goals recognizes infrastructure as a critical participant in reducing poverty, and this contributed to a renewed involvement in the effects of infrastructure on growth Estache, (2006). The author suggests that infrastructure plays a vital part in advancing a sustainable growth, either through individual or public capacity, although the consistency of evidence in the private sector in infrastructure is only just developing. In that respect are several shortcomings in the literature, especially in methodology and scope.

Most studies have tended to concentrate on case studies, but despite this deficiency, the relevance of infrastructure to growth and poverty alleviation is quite analytically robust. Whatever the estimate used for infrastructure, the econometric evidence shows that it positively influences growth. The most substantial impact comes from the telecommunications sector, followed by roads and electricity Estache, (2006). Andres et al., (2008) address some of the shortcomings in the literature. It puts on new methodologies and systemic cross-country approach to test the impact of private sector participation in the electricity,

telecommunications, and water sectors in Latin America. Despite the defects of the cross-country approach, their survey was able to create two crucial methodological contributions, both directed at avoiding the previous overstatement of the benefits of private sector participation; First, the distinction between transition period effects and longer-term changes in performance and second, the comparison of pre-and post-private sector participation trends rather than classes. The principal findings of this analysis are that the changes associated with private sector participation had a substantial positive effect on labor productivity and efficiency. The robust results of this analysis suggest that the benefits of private sector participation in infrastructure development are essential, particularly in situations when the quality of service and access are paramount.

On the other hand, Frone and Frone, (2014) argued that theoretical and empirical research on the relationship between infrastructure capital and economic growth should provide solutions to the infrastructural situation in Romania. Their work was mainly prompted by the rise in public capital stock and how the mass growth in inventory can stimulate growth in Romania. According to Frone and Frone, (2014), the issue of investment in infrastructure is critical to infrastructure development in Romania, and the EU Structural and Cohesion Funds must support such a case, according to their findings. They compared channels and models of economic growth with one factorial variable characterizing the infrastructure, and the other analyzes the limits. They calculated the correlation between water supply and sewerage infrastructure and economic development indicator GDP per capita, at the regional county level. Besides, they incorporated human capital, public infrastructure into the production function to explain the residual growth factor. Their findings suggest that a public good

financed by public saving may be insufficient, hence delaying economic growth and convergence with other nations.

Kodongo and Ojah, (2016), studied whether investment in public infrastructure does indeed act as a significant part of furthering economic growth in the Sub Saharan Africa region. Their study defines Public infrastructure to include, physical installations such as highways and roads, airports, telecommunication facilities, water supply systems, electricity, and waste handling facilities. They reasoned that infrastructure provision promoted human development and safer quality of life through improved productivity and sustained economic growth. Also, public infrastructure provision may enhance trade and commerce and play an essential role in alleviating poverty and inequality. They view infrastructure as an essential binding constraint on some traditional experiences of economic development, in addition to the fact that it may also directly enable growth.

In the Sub-Saharan Africa region, most of the evidence from diverse works of individual countries pointt to the regions' lost growth opportunities which they variously attribute to low infrastructure investment that has threatened the region's international competitiveness, increased the price of doing business, inhibited foreign direct investment and derailed trade. These explanations imply an indirect connection between infrastructure access and economic development. Similarly, geographical impediments, such as the landlocked nature of many Sub Saharan African states, which might potentially be redressed through adequate provision of transport and telecommunications infrastructure, put the region at a disadvantage in attracting trade and investment Acemoglu and James, (2008). Kodongo and Ojah (2016) indicate that infrastructure access, and quality, pertain to economic growth

indirectly via trade competitiveness, and cross-border capital flows and export diversification, respectively. Their finding supports the notion that, infrastructure leads to growth than merely examining only their direct association. Therefore, initiating growth, according to Kodongo and Ojah, (2016) does not call for many growth-inducing policies and institutions instead, a government's favorable attitude to the private sector and the elimination of impediments to the enterprise, and market-oriented incentives are essential for determining sustainable growth Kodongo and Ojah, (2016).

Cheng and Degryse (2010) indicated that understanding the financial and development issue in China is of exceptional importance because China's case is not unique. Most transition countries, like China, suffer from relatively weak infrastructure and fiscal arrangements. Thus, the Chinese experience could be relevant for other nations with similar growth potential and similar infrastructural challenges. Also, with the increasing globalization of trade and international capital flows, the sustainability of China's development and the constancy of its financial system matter not just for the land itself but as well for the rest of the world. These effects are more pronounced in states that enjoy more different entry. Their study compared non-bank financial institutions that provide most of their loans to smaller households in China with the formal financial institution. They observed that non-bank financial institutions are not significant in fostering local development. Such effects are robust across different specifications controlling for omitted variables or reverse causality. Cheng and Degryse, (2010) attribute this difference to the fact that banks, relative to non-bank financial institutions, have benefited much more from the Chinese ongoing financial reforms. In total, the reforms include commercialization of state-owned banks, market entry deregulation, and liberalization of interest rates. Their results suggest that, despite the relatively weak Chinese

financial sector, banks played a significant part in the allocation of funds, and in turn spurred growth. The study by Cheng and Degryse, (2010) is one of the few in the literature that has attempted to study the effects of banking on rural growth. Their work indicated that the state-owned sector still contributed about 40% of GDP growth. As banks can to some extent screen good borrowers from bad and allocate the capital to profitable state-owned enterprises, bank loans are still very important in supporting local, regional, and industrial growth. Hence, banks with access to the rural towns in mainland China made it easier to disseminate resources and financial services for the benefits of their clients than their informal finance counterparts. The bearing of a financial institution within the rural provinces indirectly spurred growth through social interaction and communication. This connection is evident through learning and networking, political campaigns and social or cultural interactions and training.

Parvin, (2011) did a similar study. Their study examined how, and to what extent development in infrastructure and rural wellbeing can help in explaining the banking development led growth in state-level output, agricultural output and industrial production in India. They used state-level data for India for a sample period of 1999-2008. Parvin, (2011) demonstrate that there is clear evidence of growth effects of commercial and rural banking development, infrastructure development and growth in rural wellbeing in 26 states and union territories of India. The results from Parvin, (2011), suggest that expansion of road transportation and rail routes generally improves state-level growth and industrial output. Their study contends that more allocation of output in the informal sector can hurt growth, but improvement in rural wellbeing can bring in more growth to the economic system.

This current study looks at the communication effects on growth. Our sample includes 14 different SSA countries, a significant departure from both Cheng and Degryse, (2010) and Parvin, (2011). The communication variable used in this chapter is a phone, and it includes both phone lines, and mobile phones use per 1000 people to capture the degree of communication and interaction in our example. We assume that telephone communication (voice, data, text, and SMS) represents the capital efficiency of the individuals and are anticipated to impact positively on economic development.

5.4. The Empirical Framework and Data

5.4.1. The Panel OLS Framework

The main aim of this chapter is to examine the effects of banking sector development, communication, infrastructure and rural wellbeing on growth in Sub Saharan African, countries. For this we start with a specification of fixed effects panel model controlling for country and time fixed effects, following King and Levine (1993b, 1993a):

$$Y_{,it} = \beta_o + \beta_1 InY_{i,t-1} + \beta_2 Y_k + \beta_3 Inbd_{i,t-1} + \beta_4 InP_{t-1} + \beta_5 InH_{t-1} + \beta_6 R_{t-1} + \beta_7 Rsq_{t-1} + \theta_i + \varphi_t + \varepsilon_{i,t}. \quad (5.1)$$

where $Y_{,it}$ is the growth rate of real per capita GDP at time t and in country i $Y_{i,t-1}$ is the lagged value of real GDP per capita in country i, Y_k is the growth rate of real per capita capital stock in country i, and $bd_{i,t-1}$ is the lagged financial development indicator of either bank deposits, bank credits or money supply (M2) to GDP, $P_{i,t}$ is telephone (mainlines and mobile phones), , $H_{i,t}$, is life expectancy, , $R_{i,t}$, is roads (total length of roads in kilometers, , $Rsq_{i,t}$, total

length of roads per square kilometer. θ_i is a set of state dummy variables, φ_t a set of time dummy variables, and $\varepsilon_{i,t}$ are stochastic disturbance terms which are independently and identically distributed with zero mean and constant variance equal to σ, all for country i in period t , $i = 1,2, \dots \dots N \; and \; t = 1,2, \dots T$.

Equation (5.1) is the benchmark empirical model, where β_0 which is expected to be negative shows the convergence Sala-i-Martin, (1995). From the theoretical position, this is the estimable equation derived from a generalized Cobb-Douglas production function where banking development is a determinant of production growth. In equation (5.1), β_o shows the convergence. Two full concepts of convergence appear in discussions of economic development across countries. In one position such as that of Barro and Sala-I-Martin, (1992, 1995, 1997), Baumol, (1986), Delong, (1988), Barro, (1991), convergence applies if a weak economy tends to grow faster than a rich one so that the weak economy catches up with the rich one regarding the level of per capita income.

The second concept, such as that in the second concept, such as that in Easterlin, (1974), deals with the cross-sectional dispersion. According to this view, convergence occurs if the measured dispersion declines over time. Convergence of the first kind tends to generate a convergence of the second kind, β_o corresponds to the first concept of convergence. We estimate two more growth equations that are similar to equation (5.1) using different measures of growth in state-level per capita income to examine the impact of banking development on the growth rate in agricultural and industrial growth of per capita income. For this, we estimate:

$$Y_{agrit} = \beta_o + \beta_1 InY_{agri,t-1} + \beta_2 Y_k + \beta_3 Inbd_{i,t-1} + \beta_4 InP_{t-1} + \beta_5 InH_{t-1} + \beta_6 R_{t-1} + \beta_7 Rsq_{t-1} + \theta_i + \varphi_t + \varepsilon_{agrit}. \quad (5.2)$$

WhereY_{agrit}, is the growth rate of real per capita agriculture GDP at time t and in country i, $Y_{agri,t-1}$, is the lagged value of per capita agriculture GDP at time t and in country i, ε_{agrit} are independently and identically distributed error terms with zero mean and constant variance equal to σ, all for the country i, in period t. For growth in the industrial sector, we estimate;

$$Y_{ind.i,t} = \beta_o + \beta_1 InY_{ind.i,t-1} + \beta_2 Y_k + \beta_3 Inbd_{i,t-1} + \beta_4 InP_{t-1} + \beta_5 InH_{t-1} + \beta_6 R_{t-1} + \beta_7 Rsq_{t-1} + \theta_i + \varphi_t + \varepsilon_{ind.i,t}. \quad (5.3)$$

Where $Y_{ind.i,t}$ is the growth rate real per capita industry GDP for country i at time t. $Y_{ind.i,t-1}$, is the lagged value of real per capita industry GDP for country i at time t, and $\varepsilon_{ind.i,t}$, are independently and identically distributed error terms with zero mean and constant variance equal to ç, all for country i in period t. The Bank Deposit equals the ratio of the savings in the banking system to local GDP. Bank deposit measures "financial depth" of the local banking sector. A second indicator is Bank Credit, which equals the credit extended by banks to local enterprises over local GDP. This indicator measures financial access, i.e., the money provided by banks to firms. A third indicator is the money supply (M2) to GDP ratio. M2 includes M1 (physical money supply), plus short-term time deposits in banks and 24-hour money market funds. $P_{i,t-1}$, Is the lagged value of the Telephone (mainlines and mobile phone) subscribers (per 1,000 people), an indicator for communication, H_{t-1} is the specification for life expectancy variable, measured as Life expectancy at birth, (total in years). We use H_{t-1} to capture well-being. $R_{i,t-1}$, is the specification for road, which measures the total length of roads in kilometers. $Rsq_{i,t-1}$, measure the total length of roads per square kilometer, all lagged with one-year Cheng and Degryse, (2010). The financial indicators measures financial access, i.e., the

money provided by banks to firms, a positive effect is expected for all the banking indictors Levine, (1993a). Our results are significant with a probability value of 0.0002, and therefore we reject the null. The main idea is that the FE estimator is consistent under both null and alternative hypothesis, but not effective under the null. A significant issue with this approach is the potential endogeneity, i.e., the bias of fixed effects. We directly control for endogeneity between state-level finance and growth by using Instrumental variables (IV) proposed by Arellano and Bover (1995), Anderson and Hsiao, (1981), and Hsiao, (2007).

5.4.2. The Two-Stage Least Squares (2SLS) estimation procedures

We rewrite the model in equation (5.1) as follows. $Y1 = Y2'\beta + X1'\beta 2 + u$. Where $Y1$, is the dependent variable,$Y2$ is the endogenous variable,$X1$ are the exogenous variables, and $X2$, are the instruments (the lagged dependent variables as regressors). Our emphasis is on single equation models with auto regressive dynamics and explanatory variables that are not strictly exogenous Arellano and Bond, (1991), Ahn and Schmidt, (1995). We regress the first-differenced 2SLS (reduced form) equation with only exogenous regressors for the AR (1), and then calculate the predicted values $\widehat{Y2}$ and substitute them in the structural equation model. Hence, our structural equation model involves a combined set $X = [Y2, X2]$ of both endogenous and exogenous variables. The structural equation for the OLS regression will be: $Y1 = Y2'\beta 1 + X1'\beta 2 + u$. The 2SLS, first-stage equation is: $Y2 = x1'Y1 + X2'y2 + e$. And finally Equation (5.4), for the 2SLS, second-stage equation is:

$$Y1 = \widehat{Y2}'\beta 1 + X1'\beta 2 + u. \qquad (5.4).$$

To test the validity of this approach, we employ Hansen's J statistic to derive the degrees of freedom of the J test statistic. Here the degree of freedom is equal to the instrument rank minus the number of parameters in the model. Therefore, for all models, our interest is in the effect of communication and infrastructure development on growth. We simply test whether the marginal effect of lagged bank deposits or credits on per capita GDP, per capita AGDP or per capita IGDP is statistically significant. Also, we perform a simple Wald test to verify if this coefficient estimate is statistically significantly different from zero. The effect of the coefficients is merely the estimated coefficient of the banking development indicator involving all the independent variables. Our results are robust, and we can reject the null hypothesis, again indicating that the coefficients for bank deposits, bank credits, communication, and infrastructure are not simultaneously equal to zero, meaning that including these variables create a statistically significant improvement in the fit of the model.

5.4.3. Data Description

We use annual panel data set from 14 Sub Saharan Countries namely; Botswana, Tanzania, Kenya, Uganda, Rwanda, Ghana, Togo, Sudan, Malawi, Congo DR, Cameroon, Chad, South Africa and finally Namibia, covering the period 1990–2013. The choice of the period and the number of countries in our sample is governed by the availability of data for the primary variables. Data for GDP per capita growth rates, inflation, M2/GDP, bank deposit and credit, domestic credit to the private sector (agriculture and industry), banking development indicator is from the World Bank and African Development Indicators database of 2015 measured in US Dollar.

The World Bank data set performs better in this regard because it is gotten from a wide

variety of sources, which makes it more reliable. Also, the number of countries and territories used by other individual data firms (for example, the Corruption Perception Index (CPI) of Transparency International (TI)) is less than the number available from the World Bank database. However, some of our data contain missing values especially for DR. Congo and Angola. In such a case, we extrapolate (using the previous data) as a recorded observation for the missing values. Communications is proxy by Telephone (mainlines and mobile phone) subscribers (per 1,000 people). Fixed lines are telephone mainlines connecting a customer's equipment to the public switched telephone network. Mobile phone subscribers refer to users of portable telephones subscribing to an automatic public mobile telephone service using cellular technology that provides access to the public switched telephone network. The financial development indicators include:

i. **Bank Deposits to GDP.** The total value of demand, time and saving deposits at domestic deposit money banks as a share of GDP. Banks deposits comprise commercial banks and other financial institutions that accept transferable deposits, such as demand deposits. Demand, time and saving deposits in deposit money banks as a share of GDP. Raw data are from the electronic version of the IMF's International Financial Statistics version 2017.

ii. **Bank Credit to GDP.** Domestic credit to private sector refers to financial resources provided to the private sector, such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable that establish a claim for repayment. For some countries, these claims include credit to public enterprises. We also use the GDP and the banking data to create some proxies that account for the level of financial development in the 14 Sub Saharan Countries. These proxies are; Real Deposits (USD)

is the ratio of bank deposits (current U$D) to the Deflator. Real Credit (USD) is the ratio of Net Credit (current U$D) to the Deflator. Real Money Supply is the ratio of M2 (current U$D) to the Deflator. Others in this category include; Credit – GDP ratio is the ratio of real credit to real GDP. The real GDP is the ratio of GDP at current U$D to the GDP Deflator. Deposits – GDP ratio is the ratio of actual deposits to real GDP and M2 – GDP ratio, which is the ratio of real money supply to real GDP.

iii. **Money and quasi money (M2) as a percentage of GDP.** Money supply (or money stock) is the total value of monetary assets available in an economy at a specific time. It includes currency in circulation and demand deposits. Changes in M2 according to the World Bank report, 2015 affects the price level, inflation, the exchange rate and the business cycle. According to the World Bank, (2015). M2 comprises the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government. Data is from the World Bank, Africa Development Indicators 2015 database.

Table 5.2: Summary Statistics of Regression Variables.

VARIABLES	Obs.	mean	Std. Dev.	Min	Max
GDP per capita (constant USD)	322	8.863	11.26	0.827	42.23
Growth in Real PC GDP (constant USD) [LL]	308	1.015	0.0583	0.527	1.371
Real PC Capital Stock (constant USD) [L]	322	188.5	287.3	2.047	1,355
Industry value added Per Capita (Real USD)	322	2.945	4.631	0.125	21.44
Agriculture value added per capita (Real USD)	322	96.32	47.42	10.50	230.7
Growth in Real PC Agriculture GDP [LL]	308	1.007	0.0873	0.517	1.524
Growth in Real PC Industry GDP[LL]	308	1.045	0.141	0.565	1.899
Bank Deposit to GDP Ratio [LL]	322	0.200	0.140	0.0116	0.639
Bank Credit to GDP ratio [LL]	322	0.269	0.350	4.510	3.658
Money Supply (M2) to GDP Ratio [LL]	322	0.271	0.290	1.10e-05	3.351
The ratio of Deposit to Agriculture value added PC GDP	322	0.736	0.0230	0.0117	1.286
The ratio of Credits to Agriculture value added PC GDP	322	7.014	3.646	6.253	12.642
Telephone (mainlines and Mobile phones) [LL]	322	183.86	287.401	388.19	1501.84
Life expectancy	322	52.40	6.289	26.82	64.02
Roads (Total length of roads in kilometers)	322	0.073	0.087	0.074	0.362
Road Squared (Total length of roads per square kilometer)	322	0.152	0.138	0.0251	0.556

Source: Authors work, 2017.

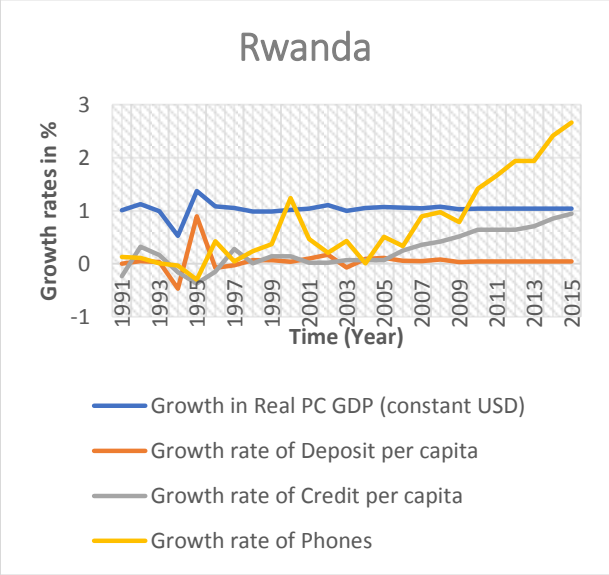
[L]: Logarithm in regression. [LL]: Logarithm and Lagged value in regression

Table 5.2, provides summary statistics. We highlight some substantial variation among the 14 Sub Saharan African states. For instance, the highest average annual real per capita GDP growth pace in our sample is 1.371 (constant USD), and the lowest is 0.527 with a mean of 1.015 a standard deviation of 0.0583. South Africa is the most productive country in our sample and in Sub Saharan Africa with an average yearly per capita GDP 4,224 U$D and the most troubled nation in our sample with an average per capita GDP of 827 U$D. The World Bank report in 2017 projected growth in Sub Saharan Africa to rise to 3.2 percent in 2018, slightly above population growth. These forecasts, according to the report will remain unchanged from April and are predicated on moderate improvements in reasonable costs and reforms to tackle macroeconomic imbalances.

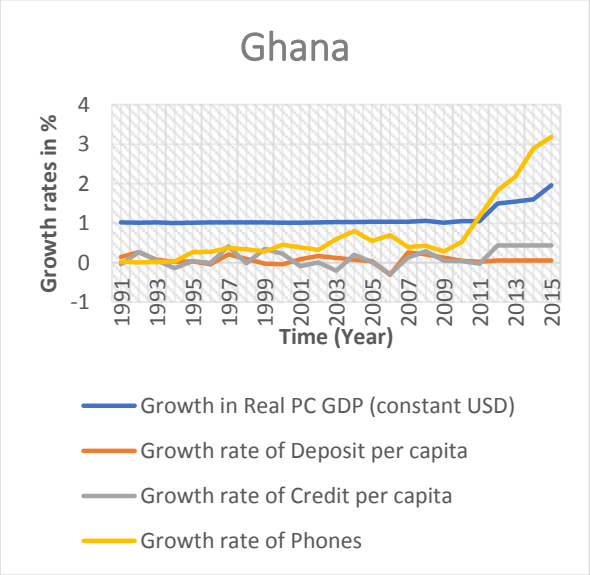
For example, growth in Angola is projected to slow, from 1.2 percent in 2017 to 0.9 percent in 2018, as the government embarks on fiscal consolidation to stabilize the public debt. The proposed growth rates are below pre-crisis averages, reflecting a moderate expansion in the region's large economies with a standard deviation of 0.0583 (Constant USD). These statistics confirm the degree of individual difference when dealing with Sub Saharan African nations. Another sector that has seen substantial improvement in the telephone and communication infrastructure. Our data indicate that growth rates of phones in Rwanda, South Africa, Ghana, Cameroon, and Kenya has accelerated dramatically from 2010, spurred by the increasingly global economy, technological advances, increased competition, and the loosening of trade restrictions Kodongo and Ojah, (2016). A panel of these figures is presented below.

Figure 5.2.1b: Growth of PC (GDP, credits, and deposits) and phones in selected countries.

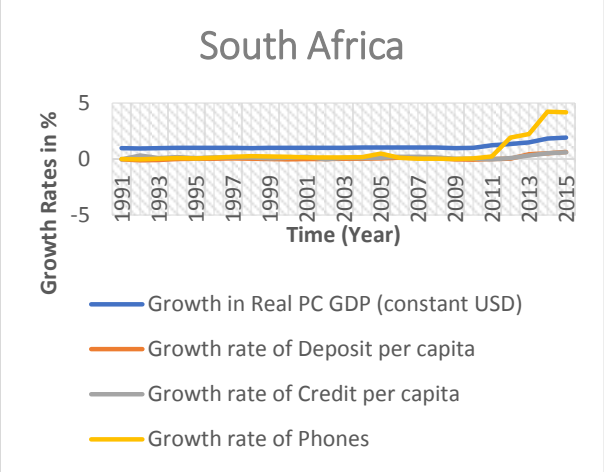
A



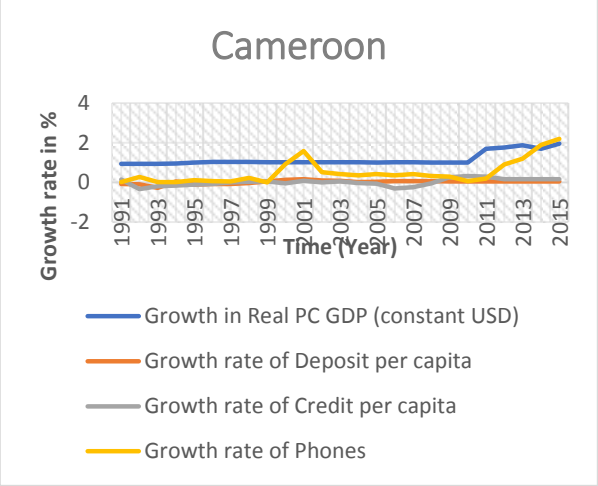
B



C

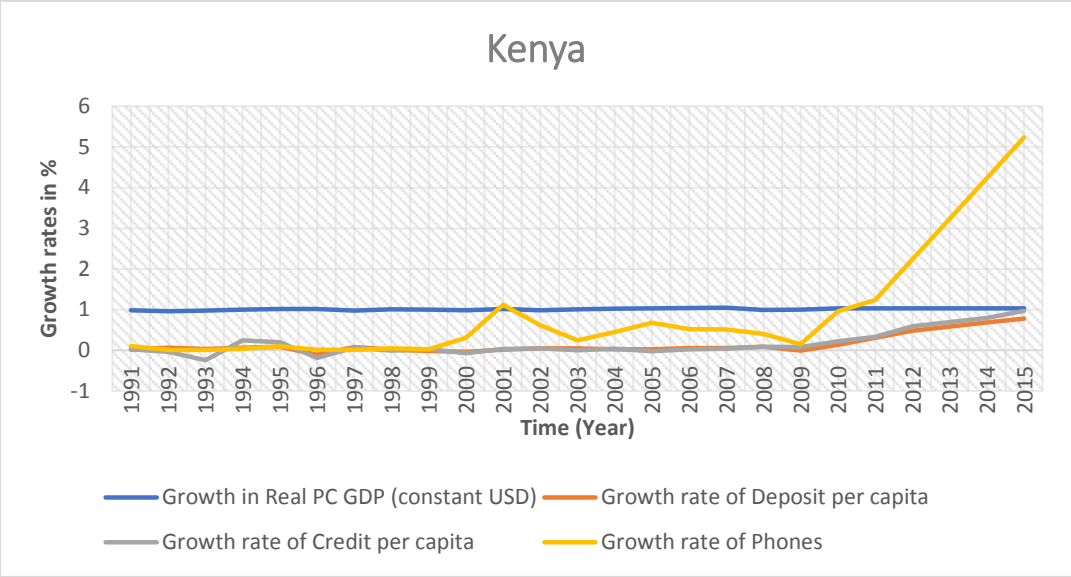


D



Source: Authors work. Data is from the World Bank Private Participation in Infrastructure Database, 2017.

Figure 5.2c: Growth of pc (GDP, credits, and deposits) and phones in Kenya.



Source: Authors work. Data is from the World Bank Private Participation in Infrastructure Database, 2017

The case of Kenya is exceptional because of Reliable, affordable, and cost-effective telecommunication infrastructure. Kenya registered a growth of over 5% in phones compared to Ghana and South Africa. According to the Kenya Ministry of Information and Telecommunication, the leading provider Safaricom is a crucial player in the improvement of essential services, especially on the money transfer platform, 'M-Pesa'. Growth rates of phones pick up from 2009 and continued till the present day. Similarly, growth rate of credit per capita and deposit per capita increase from the same year.

5.5. The growth effects of financial development in Sub Saharan Africa.

In the table below, we summarize the results from fixed effects panel estimation for the nine specifications. We report the estimated coefficient and its associated p-value (in parenthesis).

5.5.1. Results from Fixed effects panel estimation.

Table 5.4 reports the three different models with the dependent variables, I.e., growth in real per capita income, growth in per capita agriculture GDP and growth in per capita Industrial GDP. In the left-hand panel, we use nine variables, i.e., Lagged value of the dependent variable, per capita GDP, capital stock, phones, life expectancy, roads, and roads square, and the banking development indicators. The right-hand panel reports the specification and regressions using bank deposits, bank credits, and money supply to GDP for the three models (1, 2 and 3). We summarize the results from fixed effects panel estimation and report the estimated coefficient and its associated standard errors (in parenthesis). For example, Life expectancy is significant at 10%. The phone is positive and significant at the 10% level. Roads in kilometers are positive but not significant. Roads square is negative and not significant.

For all the nine specifications, we find that the lagged per capita GDP has a significant negative marginal effect on the growth of per capita GDP. The results of per capita capital stock growth on growth are significant for models 1 and 3. However, the results for model 2 is positive but not significant. This finding could be an indication that, developments in the service sector did not contribute in the growth of per capita stock of physical capital. The results for communication for models 1 and 3 are statistically significant, but the results for model 2 is positive but not significant. The results for Health and social wellbeing are statistically

significant for all the three models. However, results for infrastructure, in general, are not significant, and the coefficients are negative. Both rural wellbeing proxies and communication have a significant effect on growth.

5.5.2. Effect of banking, communication, and infrastructure on growth.

We also analyzed the variance using the F-statistics, the standard deviations, and the standard errors to determine how much variation in income is captured from these results. The F-Statistics shows that there is 0.42% that, the improvements we see in banking development is due to random chance alone. The marginal effects of per capita GDP on growth converge at a rate of 11.9 % annually, i.e., $\overline{R}^2$ using ($R^2 = \sum (x_i - \bar{x})^2 / SS = 0.4771 \approx 48\%.$), this means that 48% variation in growth of per capita GDP is explained by the developments in communication and infrastructure development.

Given this change, we can determine the magnitude of the change. From Table 5.2, the standard deviation of growth in pc GDP is 0.0583. This means that the magnitude of the change is $0.0583 \times (-0.119) = -0.00694$. Using the results from the magnitude of change of Growth in per capita GDP above, we can easily show that, an increase of one standard deviation in per capita GDP results in convergence by 17.147 units,' i.e. $\frac{-0.119}{0.00694} = -17.147$. We use the same arguments to interpret the results for models 1b and 1c, and both results are significant. (See table 3.3.2a above). If the null hypothesis is true, i.e., $(\beta_1 = 0)$ for model 1a, the chance of us getting a sample as extreme as $(\bar{\beta}_1 = 0, is -0.0119)$ is 0.42%. (P-value = 0.0042). We can reject the null that $(\beta_1 = 0)$ at 1% level of significance. In summary, we find that the coefficient of per capita GDP = -0.119 so that increasing per capita GDP by one-unit results in growth by 11.9 %

(0.119), with a magnitude of 17.147 of standard deviation in growth. The negative sign shows convergence.

In model (2), growth in real per capita Agriculture GDP is statistically significant and negative. Using the same arguments and methodology, we find that, the $\overline{R}^2$ is 0.107. This means that 10.7% variation in agricultural development is explained by the developments in banking, communication, and infrastructure. The overall F- statistics is 3.665 with a probability of 0.0026. The marginal effects of per capita agriculture GDP on growth converge at a rate of 14.5% annually, i.e. $\frac{\partial E\lfloor y_{agr} \rfloor}{\partial InpcGDP_{t-1}} = a_2 = -0.145$.

In summary, we find that the coefficient of per capita agriculture GDP = -0.145. This means that the states with the least agricultural development will benefit most from banking development. Our estimate further indicates that these countries will grow at a rate of 14.5%. In Model (3), we find a significant marginal effect of the lagged per capita IGDP all specifications, which captures convergence. However, the capital stock on aggregate growth in the industry is statistically significant and positive. This could be an important indicator of the impact of finance on industrial GDP and growth. From our results in model 3, the $\overline{R}^2$ is 0.230. This means that 23% variation in industrial development explained by the developments in banking. The overall F- statistics is 3.23 with a probability of 0.0001. The marginal effects of per capita industry GDP on growth is insignificant at the 5% level, and at 1% level of significance for growth in the capital stock.

Table 5.4: Results from the fixed effects OLS estimation.

VARIABLES	Model 1a	Model 1b	Model 1c	Model 2a	Model 2b	Model 2c	Model 3a	Model 3b	Model 3c
Pc GDP	-0.119***			-0.105***			-0.0839***		
	(0.0126)			(0.0229)			(0.0179)		
Capital Stock	0.195**	0.0769	0.194**	0.197**	0.0754	0.195***	0.199**	0.0752	0.196***
	(0.0713)	(0.0600)	(0.0448)	(0.0713)	(0.0606)	(0.0472)	(0.0711)	(0.0607)	(0.0465)
Deposits-GDP	-0.00103	0.0200	-0.0375						
	(0.0114)	(0.0219)	(0.0454)						
Phone	0.013***	0.00141	0.0202*	0.0112***	0.00417	0.0161*	0.00809**	0.00342	0.0136*
	(0.00362)	(0.00290)	(0.0101)	(0.00348)	(0.00343)	(0.00746)	(0.00274)	(0.00320)	(0.00672)
Life expectancy	0.0627*	0.0876*	0.132**	0.0645**	0.0880*	0.135**	0.0723**	0.0903*	0.148**
	(0.0303)	(0.0441)	(0.0524)	(0.0285)	(0.0459)	(0.0516)	(0.0260)	(0.0470)	(0.0498)
Roads (Km)	-8.8908	-1.4906	5.7607	-4.9608	-1.6106	6.9607	5.9908	-1.5506	8.6207
	(1.0406)	(2.1806)	(1.2506)	(9.9107)	(2.2706)	(1.3506)	(8.0507)	(2.1206)	(1.2506)
Road (km2)	-0.113	0.110	-0.535	-0.112	0.113	-0.545	-0.110	0.115	-0.545
	(0.221)	(0.480)	(0.341)	(0.208)	(0.500)	(0.359)	(0.177)	(0.492)	(0.342)
Agriculture GDP		-0.145***			-0.152***			-0.148***	
		(0.0384)			(0.0424)			(0.0486)	
Industrial GDP			-0.174**			-0.180**			-0.173**
			(0.0601)			(0.0627)			(0.0579)
Credits - GDP				0.00215	-0.000938	0.000499			
				(0.00204)	(0.00430)	(0.00266)			
M2-GDP							0.00641	0.00109	0.00532
							(0.00392)	(0.00812)	(0.00414)
Constant	-0.0783	0.420*	-0.578**	-0.0971	0.410	-0.512**	-0.151	0.383	-0.559**
	(0.109)	(0.225)	(0.232)	(0.111)	(0.242)	(0.217)	(0.0993)	(0.273)	(0.208)
Observations	308	308	308	308	308	308	308	308	308
R-squared	0.477	0.107	0.230	0.479	0.104	0.226	0.491	0.104	0.228

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

5.5.3. 2SLS Estimation Results

In table 5.5, we report the results from 2SLS estimations for all the three models (1, 2 and 3). We use the lagged variable of the dependent variables as instruments for all specifications. In the left-hand side panel, we use nine variables, i.e., Lagged value of the dependent variable, per capita GDP, capital stock, and the banking development indicators, phones, life expectancy, roads, and roads squared. The right-hand panel for reports the specification and regressions using bank deposits (models 1), the specification and regressions using bank credits (2) and finally, for models (3) reports the specification and regressions using real money supply (M2) to GDP ratio. Growth in Per Capita GDP is significantly negative in all specifications. It captures the convergence effect of growth within the Sub Saharan African states. The capital stock variable in the 2SLS estimation is statistically significant for all specifications. This may be because within-country aggregate measures of capital stock growth suffer less from cross-country labor mobility, compared to measures of income. Also, the primary results of the impact of banking and communication on growth are statistically significant.

According to Arellano and Bond, (1991), Arellano and Bover, (1995) and Blundell and Bond, (1998), to ascertain the validity of the instruments, specification tests must be performed. We performed Hansen's J test of over identifying restrictions, which examines for the overall validity of the instruments. The null hypothesis is that all instruments as a group are exogenous. Thus, a higher p-value for AR1 is better (insignificant). Therefore we reject the null. Hence, our results for telephone set are significant at the 1% level for model (1) and 10 % level for models (2 and 3). Therefore, after instrumentation, we find that the coefficients of the capital stock are positive and significant at the 1% level, phone (communication) is significant for models 1 and 2. Roads in kilometers are significant for models 1, 2 and three but negative. The growth rate for

agriculture GDP is statistically significant at the 5% levels for all models. The marginal effects of communication on growth are 0.005 i.e. $\frac{\partial E[y_{it}]}{\partial InP_{t-1}} = d_2 = 0.005$

Given this change, we can see the magnitude of the alteration. From Table 5.2, the standard deviation of telephone subscribers is 287.401. These results signify that the magnitude of change is $287.401 \times (0.005) = 1.437$. We apply the same lines to interpret the solutions for models 1b and 1c, and both effects are substantial. (See table 3.3a above). If the null hypothesis is true, i.e., for example, 1a, the prospect of us catching a sample as extreme as $(\bar{d}_1 = 0, is\ 0.005)$ is 0.5%. (P-value = 0.005). We can reject the null that $(d_1 = 0)$ at 1% level of significance for both (1a) and (1b) and (1c) at 10%. We apply similar statements to interpret model 1b and model 1c. We eliminate the null that the coefficients of both estimates are zero (at both 1% degree of significance model 1b and 1c). Overall, our results indicate a significant economic impact of communication on development.

Model (2), describes the results of growth in agriculture growth. We noticed that growth in Per Capita agriculture GDP is significantly negative in the most specification. It captures the convergence effect of development inside the Sub Saharan African nations. The capital stock variable in the 2SLS is statistically significant for all specs. Similarly, in Model (3), the capital stock variable in the 2SLS is statistically significant for all specs. This may be because, with in-country aggregate measures of capital stock growth suffer less from cross-country labor mobility, compared to measures at per-capita level.

Table 5.5: Results from the 2SLS estimation.

VARIABLES	Model 1	Model 1	Model 1	Model 2	Model 2	Model 2	Model 3	Model 3	Model 3
Deposits-GDP	0.00433	0.0130	-0.00779						
		(0.00895)							
	(0.00594)		(0.0142)						
Capital Stock	0.210***	0.093***	0.237***	0.211***	0.089***	0.241***	0.209***	0.088***	0.238***
	(0.0164)	(0.0295)	(0.0421)	(0.0159)	(0.0293)	(0.0419)	(0.0155)	(0.0292)	(0.0416)
Phone	0.0052***	3.3805	0.00172	0.00421**	0.00143	-0.000931	0.00247	0.000138	-0.00302
		(0.00334)			(0.00302)	(0.00479)		(0.00314)	
	(0.00187)		(0.0049)	(0.00179)			(0.00181)		(0.0049)
Life expectancy	0.0210	0.0131	0.0987	0.00516	0.0174	0.0597	0.0123	0.0192	0.0671
	(0.0275)	(0.0564)	(0.0714)	(0.0265)	(0.0562)	(0.0689)	(0.0255)	(0.0559)	(0.0674)
Roads (Km)	-1.0007***	-1.0707*	-7.3108	-8.5008**	-9.1308	-4.9708	-6.2808*	-7.7208	-2.2608
	(3.6408)	(6.2408)	(9.2508)	(3.5408)	(6.2208)	(9.2208)	(3.5008)	(6.2708)	(9.3008)
Road (km2)	0.0202	-0.000522	-0.00706	0.00587	0.000411	-0.0432	0.00565	-0.000706	-0.0446
	(0.0239)	(0.0408)	(0.0635)	(0.0224)	(0.0409)	(0.0602)	(0.0216)	(0.0405)	(0.0594)
Pc GDP	-0.00341			-0.00293			-0.00354		
	(0.00440)			(0.00349)			(0.00341)		
Agriculture GDP		-0.0297**			-0.0280**			-0.0277**	
		(0.0116)			(0.0114)			(0.0112)	
Industrial GDP			-0.00541			-0.00791			-0.00853
						(0.00686)			(0.00684)
			(0.0079)						
Credits-GDP				0.00606***	0.00350	0.00715*			
					(0.00281)	(0.00394)			
				(0.00151)					
M2-GDP							0.00988***	0.00630*	0.0119**
								(0.00331)	(0.00470)
							(0.00176)		
Constant	-0.0749	0.113	-0.373	-0.00366	0.0656	-0.176	-0.0213	0.0647	-0.193
	(0.113)	(0.206)	(0.292)	(0.104)	(0.200)	(0.272)	(0.0996)	(0.197)	(0.265)
Observations	308	308	308	308	308	308	308	308	308
R-squared	0.393	0.055	0.113	0.423	0.053	0.122	0.450	0.060	0.131

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

5.6. Robustness Tests.

In this subsection, we investigate the robustness of our results from both the fixed effects model and the 2SLS models. We report the results of four additional tests; two of them focus on the fixed effects model, and the other two relates to the 2SLS models.

i. The **Durbin-Wu-Hausman test for endogeneity.** In this test, we report the Durbin score which is Chi2 (1) statistics and the p-values in parenthesis in table 5.6a. Our results for all the three models are significant, and we reject the null hypothesis that the regressors are exogenous. Therefore, all our variables are endogenous regressors, and we need to use an instrumental variables approach.

ii. The **Test for over identifying restriction**. In table 5.6b, we use a GMM model, to form a test statistic. We are only interested in the Hansen's J Chi2 (1) and the associated p-values. The results for all the three models are significant, and we do not reject the null. This means that, all our instruments are valid and that, the test statistic is asymptotically distributed as a chi-square variable with (m – k) degrees of freedom. Where m is the number of instruments and k is the number of endogenous variables. In addition to the J test, there is a high correlation among instruments and endogenous variable, of about 0.40 - 0.56 in absolute value.

iii. **Test for weak instruments.** This test looks at the F statistic for the joint significance of instruments. We report the partial R^2 and partial F-statistics from the first stage regression presented in table 5.6c. The instruments are weak if the partial F-statistic testing the joint significance of the coefficients of the instruments (the lagged values as regressors) is less than 10. For the estimated models', the partial F-statistic is greater than 10. Therefore, the instruments are not weak.

iv. **Wald test for OLS-FE models.** We present a summary of the Wald tests that we perform for model the OLS-FE estimation in table 5.6d. In this table, we report the null hypotheses and their associated Chi-square test statistics (together with p-values).

Table 5.6a: Durbin-Wu-Hausman test for endogeneity.

	Model (1)	**Model (2)**	**Model (3)**
Null hypothesis.			
variables are exogenous	2.62807 (0.1050)	6.35843 (0.4252)	6.75389 (0.4112)

The P-values in parenthesis.

Table 5.6b: Test for over identifying restriction.

	Model (1)	**Model (2)**	**Model (3)**
Null hypothesis.			
Over-identifying restrictions are valid.	17.4619 (0.0016)	4.04277 (0.4002)	5.57423 (0.2333)

The P-values in parenthesis.

Table 5.6c: Test for weak instruments, first-stage regression summary statistics.

Variable	R-sq.	Adjusted R-sq.	Partial R-sq.	Robust F (3, 303)	Prob. > F
Real Pc GDP.^{L}	0.6692	0.6603	0.2415	13.6283	0.0000
Real Pc Agric. GDP^{L}	0.6692	0.6603	0.2415	13.6283	0.0000
Real Pc Ind. GDP^{L}	0.6692	0.6603	0.2415	13.6283	0.0000

Table 5.6d: Summary of Wald tests related to the results for OLS FE models.

Null hypothesis	Model 1a	Model 1b	Model 1c	Model 2a	Model 2b	Model 2c	Model 3a	Model 3b	Model 3c
Growth effects of deposits is equals to zero	14.59 (0.0122)	-	-	15.20 (0.0095)	-	-	13.64 (0.0180)	-	-
Growth effects of credits are equals to zero	-	18.20 (0.0027)	-	-	14.16 (0.2146)	-	-	15.20 (0.0095)	-
Growth effects of M2 are equals to zero	-	-	17.73 (0.0033)	-	-	17.21 (0.0041)	-	-	15.44 (0.0086)
All time dummies are equal to zero.	51.65 (0.000)	63.81 (0.000)	76.12 (0.000)	89.09 (0.000)	90.11 (0.000)	58.10 (0.000)	93.14 (0.000)	80.30 (0.000)	71.00 (0.000)
All coef. est. (except time dummies) are zero	46.001 (0.000)	41.670 (0.000)	35.109 (0.000)	25.800 (0.000)	37.110 (0.000)	23.001 (0.000)	31.870 (0.000)	39.230 (0.000)	25.110 (0.000)

Note: Chi-square test statistic p-values reported in parenthesis.

The results from the Wald test in table 5.6d for all the specifications with bank deposits are significant. For specification 1(a), and 2(a), this effect is significant at the 1% level, while for models 3(a), it is significant at the 5% level. The net effect of bank deposits for specifications in models 1(a) is equal to 0.0559, and it is statistically significant at 10% and 5% levels. We do not reject the null hypothesis that the growth effect of bank credits is equal to zero for specification 1(b). However, for specification 2(b) where we use credits, the individual effects are insignificant, but the net marginal growth effect of credits, which is equal to 0.112, is statistically different from zero at the 10% level. For specification 1(c), 2(c) and 3(c), where we use M2, the individual effects are also significant. Therefore, bank deposits have a positive and significant net marginal effect on the growth of per capita GDP. However, the findings on the net marginal effect of credits contribute little to growth in agriculture.

We also tested for time fixed effects, to see if the dummies for all years are equal to zero. If they are, then no time fixed effects are needed when running an FE model. From the table above, we do not reject the null, and therefore, conclude that the coefficients for all years are jointly equal to zero. Hence, no time fixed effects are needed in this case.

5.7. Conclusion

Using a state - level panel dataset over the period 1990–2015, we find that development in communication infrastructure dramatically contributes to development. We estimate three sets of growth specifications under two different methodologies. Under method one; we examine the impact of banking, communication, and infrastructure development on growth in per capita GDP (constant USD), per capita Agricultural GDP (AGDP) and per capita Industrial GDP (IGDP) using fixed effects panel estimation technique. We use the

growth in per capita capital stock as one of the regressors, the lagged values of per capita (GDP; AGDP and IGDP), phones, life expectancy, roads and roads squared. We used the lagged values of the financial development indicators as regressors for models (1, 2 and 3) and conduct formal diagnostic tests to affirm the implication of the fixed effects, the growth effect of deposits and the growth effect for credits for all three examples. Under method two, we use 2SLS estimation to capture the possible endogeneity of the regressors of the growth equations. For the examples where we use the 2SLS estimation and we are concern in the Hansen's J test, which examines the statistical implication of the instruments used in the regression.

Thus, in both approaches, our empirical interest is in the marginal effects of banking, communication and infrastructure development on growth. We also analyzed the statistical implication of the marginal change of (lagged) aggregate bank deposits and credits along with the growth of per capita GDP and its components (agriculture GDP and industrial GDP) for all specifications in both the fixed effects estimation and the 2SLS estimation. We find that the lagged per capita GDP has a significant negative effect on growth. The negative sign is just demonstrating that there is evidence of convergence for these states and, a weak state tends to spring up faster than a plentiful one so that the poor state catches up with the rich one regarding the level of per capita income or product Barro and Sala-I-Martin, (1995). We also find that lagged bank credits to GDP have a significant effect on per capita GDP growth for all the three examples. Overall, economic growth in Sub-Saharan Africa can improve if there are a better approach to information and communication infrastructure, long and healthy lifestyles and the availability of financial services.

Overall, banks have gradually built up a commercial base, liberalized and got rid of the intervention from the local government, attracted better quality personnel, and improve their viability to attract foreign establishments. These findings on the effects of communication and banking on growth show that growth in the rural sector in Sub Saharan Africa requires the availability of credits from the formal financial sector as well as access to information, enabled through communication. Finally, our findings in chapter five means that other attributes such as knowledge connections might lead to explaining the growth effects of banking development better.

Chapter six

Conclusion and policy recommendations

6.1. Conclusion

There are four main chapters examined in this study. Chapter one is an introductory chapter that states the aims, contribution, and the outline of each chapter. In chapter two, we review the literature on financial development and growth, King and Levine, (1993a, 1993b), Demirguc-Kunt and Levine, (1996), Rajan and Zingales, (1998), Cheng and Degryse, (2010), Parvin, (2011) among others. We note that most of this study mainly focuses on the OECD and the emerging markets especially China and India, but there was no study on SSA. In chapter three, we studied the effects of banking development and the local economic growth in 14 SSA counties. We examined three sets of growth specifications, i.e., per capita GDP, Agricultural GDP, and Industrial GDP, with three sets of models, i.e., a model with deposits, credits and money supply using two different approaches, (FE and 2SLS). Our results in chapter three show evidence of growth effects of banking development in SSA on industrial components of GDP. Growth in agricultural GDP is positive but not significant.

In chapter four, we examine growth effects of communication links, knowledge transfers and social interaction in a multi-sector economy using an optimal endogenous growth model in a monetary economy with households, firms, and banks. Our main findings in chapter four are that the high cost of communication suppresses economic growth. We used a general equilibrium model with household, and banks, following Parvin, (2011), and Kompas and Owen, (2007). Our model in chapter four incorporates three key ideas;

i. Cooperation and group interactions enable economies to use large amounts of specialized knowledge. Becker and Murphy, (1992), Lucas, (1988).

ii. Although knowledge is inherently non-rival, the creation and transfer of tacit knowledge (know how) is highly dependent on communication links within social groups. Brown and Duguid, (2000), and Marshal (1980).

iii. Individuals communicate more easily the higher the similarity between them. Lazarsfeld and Merton, (1954).

This chapter focused on the macroeconomic effects of social barriers to communication, productivity, and growth, Kompas, and Owen, (2007), and acts as a robustness check for both chapter three and chapter five. However, in Chapter four, we used one income tax, i.e., the consumption tax, with no income taxation. This means our model is limited to one tax instrument, the proportionate tax rate. We keep one tax so that, there is clear incentive to use in the informal market. We believe, our model has not captured the effects of other tax instruments such as labor income tax among others comprehensively. Secondly, we focused on the impact of communication on growth, and our primary interest is on the analytical properties. Therefore, we leave the rest of the work for other future research and possible extension of the model.

In chapter five, we extend chapter three. We ran the same model/specifications but this time controlled for social infrastructure, and communications. We included three critical variables in the growth specifications, i.e., Health, (to capture social wellbeing), Infrastructure (Roads / Road squared), and finally Communication (i.e., main lines and mobile phones per 1000 people) proxies by phones. Our results indicate evidence of growth effects of communication on development, (i.e., phones are positive and significant). We are content that, no studies have evaluated the effects of banking development in SSA empirically, and we are the first to do so. Second, no equilibrium model has been used to study the effects of communication links on banking development in SSA.

6.1.2. Policy recommendation

Building and renewing a critical mass of domestic capacity for the design and implementation of sound agricultural policy in rapidly changing environments is, therefore, necessary for the acceleration of Africa's development. More so, the African continent remains an essential and growing target for the export of subsidized agricultural commodities, including food products, that threaten to displace local producers from national and regional markets, and which carry implications for national and regional food security. At the same time, many new producers have emerged in the world market that compete vigorously with African cash crop exports, eroding the continent's share of the global trade in many critical primary commodities.

Besides, it has been noted that the practical use of climate-related information is essential to helping governments build capacity to service needs across various sectors, including land use planning, infrastructure planning, agricultural development, and power generation. Furthermore, the mainstreaming of climate information and services will increase the ability of regional and national early warning networks to anticipate and respond to extreme climate events. Unfortunately, on the continent, policy and practice remain far behind regarding integrating climate information (CI) and climate information services (CIS). This is due in part to the scarcity of CI and CIS on the continent, but also to the absence of planning frameworks that are designed to integrate CI and CIS into laws, policies, and practices. Supporting decision-makers with climate-related information is critical to advance agricultural development. Integrating of Climate Information (CI) and Climate Information Services (CIS) into development and practice has paramount importance to advance cross-sectoral climate resilient development in the continent.

6.1.3. Agricultural policy.

This study will serve the policy concerns which most African governments share, such as, improving agricultural output and productivity, nurturing the linkages between agriculture and other economic sectors, increasing national food security, combating poverty, expanding employment, promoting environmental sustainability, and enhancing sustainable rural livelihoods, including gender equality. These are concerns that have also been embraced by the African Union, the Regional Economic Communities (RECs), the Economic Commission for Africa (ECA), and the African Development Bank (AfDB). In general, our findings and application of this research answer some policy questions in Sub Saharan Africa.

i. Agricultural production and the domestic trade in agricultural products are central to the functioning of local markets, the fight against poverty, the provision of employment, and the quest for greater national food security. African agricultural exports enjoy a dominant position in the international trade relations of the continent, including formal and informal intra-African cross-border exchanges.

ii. Furthermore, the agricultural sector serves as a critical source of raw materials for the production of a variety of semi- and fully-processed commodities. Services connected to the promotion of agricultural production and productivity also occupy a significant position in most African economies.

iii. Agriculture continues to offer one of the best opportunities for promoting overall economic development in Africa, including contribution to the growth of other sectors and expansion of the industrial sector. There is a broadly shared consensus that if African countries succeed in mastering their agricultural policies in a manner that not only diversifies output and boosts productivity but also promotes strong linkages with other

economic sectors and serves broad social policy objectives, the continent will be well on its way to turning the table of underdevelopment. Our focus on a recent period and the examination of both the formal an informal sectors in our model shows that the impact of growth is relevant to rural SSA.

This study strengthens the knowledge and capacity of African policymakers, including senior managers, negotiators, advisors, planners, and analysts, to meet the core challenges of growing the agricultural sector as a central engine of national economic development and social policy, while taking the advantages of continually expanding the financial system in Africa. In doing so, rural farmers get exposed to the current state of knowledge and the comparative innovations which are available and around them. More importantly, Africa's policymakers can adopt some of the best practices that serve as relevant examples of how an integrated and comprehensive agricultural policy regime has been used to promote economic transformation and social well-being.

New issues centering on oligopolistic controls exercised by major corporations in the global seed market, the introduction of genetically-modified crops, the sustainability of the environment, and the increased interest of international financial speculators in international agricultural markets have posed new policy challenges to African countries. These challenges come against the backdrop of new pressures on African smallholders who constitute the bulwark of the agricultural sector in most of the continent and a massive scramble for - and grabbing of - arable land across the continent by a range of international commercial interests, including multinational agribusiness firms. An agricultural policy which is fit for the challenges faced by African countries must capture the complex inter-connections between domestic and global

processes if durable national development is to be delivered through the mobilization of the opportunities offered by the agricultural sector

6.1.4. Banking policy.

The IMF and World Bank annual report 2015, among the many statistics discussed in chapters three and five cited three central statistics i.e. 1.4%, 1.6% and 1.8% denoting the IMF's 2016 projection for sub-Saharan Africa's GDP growth, the projection for US GDP growth, and the estimate for export growth in the advanced economies. The report noted that the IMF's projection for SSA's GDP growth of 1.4%, is particularly disappointing given the SSA's potential growth rate. Our study in chapter three indicates that financial development can protect against risks during an economic downturn. Also, more broadly, it can boost growth and dampen the impact of shocks for firms and households by alleviating borrowing constraints and helping to calibrate foreign currency liabilities. However, financial inclusion in lower-income countries is uneven, especially in the regional case of SSA.

Inclusive growth in developing economies needs to be a key focus. Growth that lowers the poverty rate and ensures equality of access to markets, resources and an unbiased regulatory environment should be promoted with improved financial inclusion, access to and availability of financial services to all. This is our opinion would play a crucial role as many low-income economies would benefit from more employment opportunities which would also bring increased security to the economy. The quality of jobs and security of the workforce both in the private and public sectors matters as well. SSA's vulnerable employment, in own account and unpaid civil servants, is estimated at 70% of total employment. However, even though financial inclusion and better financial intermediation are proven to encourage growth with higher paid

jobs in the formal sector, around half of working-age adults still lack access to financial services in the informal sector.

We believe this study will evaluate the banking expansion programs and possibly redirects policy channels and priority for SSA policymakers. Relaxing of financial constraints, such as greater access to bank accounts, and a lower cost of financial intermediation can amplify growth significantly. A fundamental channel is the mobilization of savings that provide future access to liquidity, allowing households to manage financial risks and to cushion against shocks. However, more finance does not automatically lead to more growth. Its effect on economic growth is 'bell-shaped' and weakens at higher levels of financial development Alfred and Jansen, (2010). This weakening stems from premature financial deepening (increased size of the market), rather than from greater access. From a macroeconomic perspective, broader banking coverage would heighten the impact of monetary policy-driven interest rate changes. If financial inclusion is to increase, a policy reset is needed to safeguard domestic financial stability alongside SSA financial deepening.

Although the complexity of SSA economies' supervisory capacity varies significantly, the strengthened macro-prudential policy can protect against the higher risks of transmitting financial shocks – a fundamental policy gap in some pan-African banks. Stability and inclusion can be achieved through better banking supervision and, more concretely, in adopting international standards such as loan loss provisioning and financial reporting. Given the uncertain economic outlook ahead, regulatory progress would lay the foundations for broader banking coverage by the next decade, an area that we believe could be improved or possible examined or further researched.

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Appendix

Appendix. 4.

Household

The representative household uses the nominal money, M_t, or lump sum transfer of cash, denoted by V_t, given by the government to purchase consumption from the informal market at the informal market price P_{ct}^{s}, or purchase consumption from the formal market at the formal market price P_{ct}^{f}. The households face the cash-in-advance (CIA) constraint following Gillman et al., (2004) and Parvin, (2011) below.

$$M_t + V_t \geq P_{ct}^{s} c_{st} + P_{ct}^{f} c_{ft}. \quad (4.2)$$

Following Parvin, (2011), expenditures are obtained from deposits d_{st} and d_{ft}, which accrues an interest payment R_{st} *and* R_{ft}. Therefore, total nominal dividends paid will be $P_t R_{st} d_{st}$ *and* $P_f R_{ft} d_{ft}$ for the informal and the formal sector, respectively. The exchanged constraints become:

$$P_t d_{st} = P_{ct}^{s} c_{st}. \quad (4.3a)$$

$$P_t d_{ft} = P_{ct}^{f} c_{ft}. \quad (4.3b)$$

We use the final good price P_t, to normalize the equations, hence the cash in advance constraint and the exchange constraints as:

$$\frac{M_t + V_t}{P_t} \geq P_{ct}^{s} c_{st} + P_{ct}^{f} c_{ft}. \quad (4.4a)$$

Where $\frac{M_t + V_t}{P_t}$ is real money supply. $p_{ct}^{s} = \frac{P_{ct}^{s}}{P_t}$, Is the individual retail price in the informal sector and $p_{ct}^{f} = \frac{P_{ct}^{f}}{P_t}$, is the retail price in the formal market.

$$d_{st} = p_{ct}^{s} c_{st} \quad (4.4b)$$

$$d_{ft} = p_{ct}^{f} c_{ft} \quad (4.4c)$$

Following Gillman et al., (2004), Human capital is a Constant Return to Scale (CRS) production function, and this accumulation is assumed an internal process, hence not used in goods production. Effective labor is hard labor plus skill Gillman et al., (2004). The households use effective labor and stock of human capital in this production process Parvin, (2011), and Gillman et al., (2004). $A_H > 0$, represents a portion of working time in the production of human capital by n_{Ht}, hence investment in human capital is:

$$h_{t+1} = A_H(n_{Ht} h_t). \quad (4.5)$$

$A_H > 0$ is the human capital productivity parameter. Some Segments due to labor include the final good production n_{yt}, banking production in the informal sector n_{st}, and the banking production in the formal sector n_{ft}. , therefore, total working time utilized is $(1 - x_t)$. The time allocation constraint is:

$$1 + x_t = n_{yt} + n_{Ht} + n_{ft} + \varepsilon(s_t) n_{st}. \quad (4.6)$$

Our time allocation constraint is different from Parvin, (2011), one unit of time; $1 = n_{yt} + n_{Ht} + n_{ft} + \varepsilon(s_t) n_{st} + x_t$. such that, $1 - x_t - n_{Ht} - \varepsilon(s_t) n_{st} = n_{yt} + n_{ft}$. Where $\varepsilon(s_t)$, represents the effort of forming connections. The government has one tax instrument, the proportionate tax rate denoted by τ_t^c for consumption, an abstraction from Parvin, (2011). The household's budget constraint for time t can be written as;

$$P_{ct}^{s} c_{st} + (1 + \tau_t^c) P_{ct}^{f} c_{ft} + M_{t+1} \leq M_t + V_t + P_t R_{st} d_{st} + P_t R_{ft} d_{ft} + P_t w_t h_t \left(\varepsilon(s_t) n_{st} + n_{yt} + n_{ft}\right). \quad (4.7)$$

In this context, we characterize the household behavior by the solution to the

representative household's utility maximization problem. The household chooses allocations $\left\{c_{st}, c_{ft}, h_{t+1}, M_{t+1}, x_t, n_{yt}, n_{ft}, n_{st}, n_{Ht}, d_{st}, d_{ft}, \varepsilon(s_t)\right\}_{t=0}^{\infty}$ to maximize discounted utility defined by (I) subject to constraints (2), (3a), (3b), (5), (6) and (7). The household's normalized budget constraint (7) divide by (P_t), and using (6), (4b) and (4c) to substitute out (n_{yt}, n_{ft}) *and* d_{st}, d_{ft}, becomes:

$$p_{ct}^{s} c_{st} + (1 + \tau_t^c) p_{ct}^{f} c_{ft} + \frac{M_{t+1}}{P_t} \leq w_t h_t (1 - x_t - n_{Ht} - \varepsilon(s_t) n_{st}) + \frac{M_t + V_t}{P_t} + R_{st} p_{ct}^{s} c_{st} + R_{ft} p_{ct}^{f} c_{st}. \quad (4.8)$$

Firms.

The economy consists of one final good y_t. There is a continuum of measure one of the identical profit-maximizing firms in this sector, who hire effective labor in the production of the final good, Gillman et al., (2004), and Parvin, (2011). Hence final good production technology can be written as;

$$y_t = A_y(n_{yt} h_t). \quad (4.9)$$

$n_{yt} h_t$, denotes the fraction of effective labor allocated to production in this sector, and $A_y \in (0, \infty)$

Firms hire effective labor, pays a wage equal to w_t per unit of effective labor, and sells this final good in both the informal market and the formal market at price P_t, Parvin, (2011). The firm's profit maximization problem can be written as in equation (10), Subject to (9).

$$\max_{n_{yt} h_t} \prod yt = P_t y_t - P_t w_t n_{yt} h_t. \quad (4.10)$$

Equation (4.11) represents the first order condition associated with the competitive profit maximization problem. It merely says that in this economy, the equilibrium wage is inelastic of working time or effective labor, and this is fixed.

$$w_t = A_y \tag{4.11}$$

Bank Technologies:

Following Gillman et al., (2004), Parvin, (2011), and Gillman and Kejak, (2011), there is a self-produced exchange function by walking to the informal sector. The production for financial services is Constant Return to Scale (CRS) in effective labor and deposited funds. Exchange cost in this sector is just carrying the cash, but most importantly, networking, social interaction, and communication represented by s_t is key in dealing with the informal market Kompas and Owen, (2007). Banks in this sector do not own assets, but only the technology. With $A_s \in (0,\infty), \gamma_s \in (0,1)$, the production function is given by;

$$q_{st} = A_s(s_t n_{st} h_t)^{\gamma s} d_{st}^{1-\gamma_s} \tag{4.12}$$

A_s, is constant, $d_{st} = M_{st} = cash\ and\ q_{st}$ represents the financial services available in the informal market. $s_t n_{st} h_t$, are communication-augmented units of effective labor, where the productivity of labor is increasing in the number of economy-wide knowledge connections, and communication links, a significant extension from Parvin, (2011). Return on per unit deposit R_{st} results after sales using two inputs, i.e. effective labor and deposits. Therefore, profits are equals to the revenue $P_{st} q_{st}$ $\min us\ \cos ts\ P_t w_t s_t n_{st} h_t$, and the dividend payout $P_t R_{st} d_{st}$. the profit maximization problem can be written as:

$$\max_{\underbrace{s_t n_{st} h_t d_{st}}\ s.t.eqn\ (4.10)} \prod_t^{qs} = P_{st} q_{st} - P_t w_t s_t n_{st} h_t - P_t R_{st} d_{st} \tag{4.13}$$

With normalized variables, and with $p_{st} = \frac{P_{st}}{P_t}$, . The FOC becomes:

$$w_t = p_{st} \gamma_s A_s (s_t n_{st} h_t)^{(\gamma_s - 1)} d_{st}^{1-\gamma_s} \tag{4.14a}$$

$$R_{st} = p_{st}(1-\gamma_s)A_s(s_t n_{st} h_t)^{\gamma_s} d_{st}^{1-\gamma_s} \quad (4.14b)$$

The production for financial services is a constant return to scale in effective labor, and deposited funds with $A_f \in (0,\infty), \gamma_f \in (0,1)$ Parvin, (2011).

$$q_{ft} = A_s(n_{ft}h_t)^{\gamma_f} d_{ft}^{1-\gamma_f} \quad (4.15)$$

$d_{ft} = M_{ft} = cash\ and\ q_{ft}$, represents the financial services available in the formal market, R_{ft}, is the return per unit of deposit. Competitive profit maximization problem in this sector describes profit maximization with two inputs, effective labor and deposit, subject to equation (4.15). The profit maximization problem becomes:

$$\max_{n_{ft}h_t d_{ft}} \prod_t^{qf} = P_{ft}q_{ft} - P_t n_{ft} h_t w_t - P_t R_{ft} d_{ft} \quad (4.16)$$

We normalize the variables with P_{ft}, such that, $p_{ft} = \frac{P_{ft}}{P_t}$. The FOC, can be written as:

$$w_t = p_{ft}\gamma_f A_f (n_{ft}h_t)^{(\gamma_f - 1)} d_{ft}^{1-\gamma_f} \quad (4.17a)$$

$$R_{ft} = p_{ft}(1-\gamma_f)A_f(n_{ft}h_t)^{\gamma_f} d_{ft}^{1-\gamma_f} \quad (4.17b)$$

The informal market

Following Parvin, (2011), sellers in this sector mix each unit of goods sold with a unit of financial service q_{st} which is then sold to households at a price P_{ct}^s. Profit maximization problem for the individual seller in this sector becomes:

$$\underbrace{max}_{c_{st}} \prod_t^s = P_{ct}^s c_{st} - (P_{st}q_{st} + P_t c_{st}) \quad (4.18a)$$

$$s.t.\ q_{st} = c_{st} \quad (4.18b)$$

$P_{ct}^s c_{st}$, is total revenue, and $P_{st}q_{st} + P_t c_{st}$, is the total cost. FOC becomes:

$$P_{ct}^s = P_{st} + P_t \quad (4.19)$$

Let $p_{ct}^{s} \equiv \frac{P_{ct}^{s}}{P_t}$ *and* $p_{st} \equiv \frac{P_{st}}{P_t}$, hence the FOC becomes:

$$p_{ct}^{s} = p_{st} + 1 \tag{4.20}$$

The formal Market

Following Parvin, (2011), in this sector, sellers combine each unit of the good with $\psi > 0$ units of financial services and sell to households at a unit price P_{ct}^{f}. Profit maximization problem in this sector for the representative seller in this sector becomes:

$$\underbrace{max}_{c_{ft}} \prod_t^f = P_{ct}^f c_{ft} - P_{ft} q_{ft} - P_t c_{ft} \tag{4.21a}$$

$$s.t. q_{ft} = \psi c_{ft} \tag{4.21b}$$

Moreover, the FOC associated with this problem becomes:

$$P_{ct}^{f} = \psi P_{ft} + P_t \tag{4.22}$$

Let $p_{ct}^{f} \equiv \frac{P_{ct}^{f}}{P_t}$ *and* $p_{ft} \equiv \frac{P_{ft}}{P_t}$, the first order condition can be written as:

$$p_{ct}^{f} = \psi P_{ft} + 1 \tag{4.23}$$

Equation (4.23) explains the relative difference between purchasing from the informal market and purchasing from the formal market. $p_{ct}^{s} - p_{ct}^{f} = p_{st} + 1 - \psi p_{ft} - 1$. Simplifying it further gives, $p_{ct}^{s} - p_{ct}^{f} = p_{st} - \psi p_{ft}$. The consumer price of the same commodity from the two markets has two different prices, p_{ct}^{s}. and p_{ct}^{f}. we model the difference between the unit cost of financial services attached to these two goods. Therefore, the difference between the equilibrium consumer prices of the two goods merely is equal to the difference between p_{st} and p_{ft}, here given by the addition of ψ.

The government

Money supply from the government through transfers of a lump sum of cash, represented by V_t, to households. The government has one tax instrument, the proportionate tax rate denoted by τ_t^c for consumption Parvin, (2011). The government's budget constraint becomes:

$$V_t + M_t = M_{t+1} + P_{ct}^f \tau_t^c c_{ft} \tag{4.24}$$

$M_{t+1} = (1+\delta)M_t$, Where δ is the constant growth rate of money supply, we rewrite the budget constraint as:

$$V_t = \delta M_t + P_{ct}^f \tau_t^c c_{ft} \tag{4.25}$$

And divide by P_t, (25) becomes;

$$\frac{V_t}{P_t} = p_{ct}^f \tau_t^c c_{ft} + \delta m_t \tag{4.26}$$

Where $m_t \equiv \frac{M_t}{P_t}$ is the real money supply, and $\frac{M_{t+1}}{M_t} = 1+\delta$

Utility maximization.

We define the characteristics of the utility (welfare) stream of the households in this economy by equation (4.1) $\underbrace{Max}_{c_{st}, c_{ft}, h_{t+1}, M_{t+1}, x_t, n_{Ht}, \varepsilon(s_t)}, \sum_{t=0}^{\infty}\left(Inc_{st} + Inc_{ft} + \alpha Inx_t + \sigma\mu\left(\varepsilon(s_t)\right)^{\frac{1}{\sigma}}\right)\beta^t$, subject to constraints defined by the budget set (4.8) and (4.4a), and the human capital accumulation constraint defined by equation (4.5). Therefore, to maximize utility defined by (4.1), the representative household chooses allocations $\left\{c_{st}, c_{ft}, h_{t+1}, M_{t+1}, x_t, n_{Ht}, \varepsilon(s_t)\right\}_{t=0}^{\infty}$ to constraints (4.5), (4.4a), and (4.8). Following Parvin, (2011), we let $\lambda_{1t}, \lambda_{2t}$ *and* λ_{3t} denote the current value multipliers associated with the budget constraint, (4.8), the cash-in-advance constraint (4.4a), and

the human capital accumulation constraint, (4.5). The Lagrangian of the individual household problem becomes;

$$L = \left(\sum_{t=0}^{\infty} \left(Inc_{st} + Inc_{ft} + \alpha Inx_t + \sigma\mu \left(\varepsilon(s_t)\right)^{\frac{1}{\sigma}} \right) \beta^t \right) +$$

$$\beta^t \lambda_{1t} \left(\begin{array}{l} w_t h_t (1 - x_t - n_{Ht} - \varepsilon(s_t) n_{st}) + \dfrac{M_t + V_t}{P_t} + R_{st} p_{ct}^s c_{st} + \\ R_{ft} p_{ct}^f c_{ft} - p_{ct}^s c_{st} - \left(1 + \tau_t^c\right) p_{ct}^f c_{ft} - \dfrac{M_{t+1}}{P_t} \end{array} \right) +$$

$$\beta^t \lambda_{2t.} \left(\frac{M_t + V_t}{P_t} - p_{ct}^s c_{st} - p_{ct}^f c_{ft} \right) + \beta^t \lambda_{3t} \left(h_{t+1} - A_H n_{Ht} h_t \right)$$

The FOC with respect to $c_{st}, c_{ft}, h_{t+1}, M_{t+1}, x_t, n_{Ht}, \varepsilon(s_t)$ gives;

$$c_{st}: \frac{1}{c_{st}} = \lambda_{1t} p_{ct}^s (1 - R_{st}) + \lambda_{2t} p_{ct}^s \tag{4.27a}$$

$$c_{ft}: \frac{1}{c_{ft}} = \left(1 + \tau_t^c - R_{ft}\right) \lambda_{1t} p_{ct}^f + \lambda_{2t} p_{ct}^f \tag{4.27b}$$

$$x_t: \frac{\alpha}{x_t} = \lambda_{1t} w_t h_t \tag{4.27c}$$

$$M_{t+1}: \lambda_{1t} = \beta \, \frac{P_t}{P_{t+1}} (\lambda_{1t+1} + \lambda_{2t+1}) \tag{4.27d}$$

$$h_{t+1}: \lambda_{3t} = \beta [\lambda_{1t+1} w_{t+1} (1 - x_{t+1} - n_{Ht+1}) + \lambda_{3t+1} (A_H n_{Ht+1})] \tag{4.27e}$$

$$n_{Ht}: \frac{\lambda_{3t}}{\lambda_{1t}} = \frac{w_t h_t}{A_H h_t} \tag{4.27f}$$

$$s_t: s_t^{\frac{1}{\sigma} - 1} = \frac{\lambda_{1t} w_t h_t n_{st}}{\mu} \tag{4.27g}$$

$$s_t . s_t^{\frac{1}{\sigma}-1} = \frac{\lambda_{1t} w_t h_t n_{st}}{\mu} = \frac{\alpha n_{st}}{\mu} \quad (4.27h)$$

Since $\lambda_{1t} = \frac{\alpha}{x_t w_t h_t}$ equation (27h) becomes:

$$s_t^{\frac{1}{\sigma}-1} = \frac{\alpha n_{st}}{\mu} \quad (4.27i)$$

From (27c) we get;

$$\lambda_{1t} = \frac{\alpha}{x_t w_t h_t} \quad (4.28)$$

We substitute (4.28) in (4.27a) to derive λ_{2t} .

$$\lambda_{2t} = \frac{1}{p_{ct}^s c_{st}} - \frac{\alpha(1-R_{st})}{x_t w_t h_t} \quad (4.29)$$

We substitute (4.27c) in (4.27b) and derive: $\lambda_{2t} :\Rightarrow \frac{\alpha}{x_t} + \lambda_{1t} w_t h_t = 0$ *Therefore,* $\lambda_{1t} = \frac{\alpha}{x_t w_t h_t}$

such that;

$$\lambda_{2t} = \frac{1}{p_{ct}^f c_{st}} - \frac{\alpha\left(1+\tau_t^c-R_{ft}\right)}{x_t w_t h_t} \quad (4.30)$$

Substitute (4.27c) in (4.27f) to derive λ_{3t} after re-arranging equation (4.27f), such that $\lambda_{3t} = \frac{\lambda_{1t} w_t h_t}{A_H h_t}$, we derive;

$$\lambda_{3t} = \frac{\alpha}{x_t A_H h_t} \quad (4.31)$$

The difference between equations (4.23) and (4.20), i.e. $p_{ct}^s - p_{ct}^f = \left(p_{st}+1\right) - \left(\psi p_{ft}+1\right) = p_{st} - \psi p_{ft}$ explains the relative difference between purchasing

from the informal market and purchasing from the formal market. Substituting (4.27c) and (4.30) in (4.27d) gives us the Euler equation (4.34), and the same substitution in (4.27e) gives us the Euler equation (4.35). Equations (4.34) and (4.35) explains the intertemporal allocation of human capital regarding current use of goods and services and other current levels of allocations and costs,

$$\frac{x_{t+1}w_{t+1}h_{t+1}}{x_t w_t h_t} = \beta \frac{P_t}{P_{t+1}}\left[R_{st+1} + \frac{1}{p^s_{ct+1}c_{st+1}}\left(\frac{x_{t+1}w_{t+1}h_{t+1}}{\alpha}\right)\right] \tag{4.34}$$

$$\frac{x_{t+1}w_{t+1}h_{t+1}}{x_t w_t h_t} = \beta \frac{P_t}{P_{t+1}}\left[R_{ft+1} - \tau^c_{t+1} + \frac{1}{p^f_{ct+1}c_{ft+1}}\left(\frac{x_{t+1}w_{t+1}h_{t+1}}{\alpha}\right)\right] \tag{4.35}$$

Combining equation (4.27e) and (4.27f) we derive the equilibrium condition:

$$\frac{x_{t+1}h_{t+1}}{x_t h_t} = \beta[A_H(1 - x_{t+1})] \tag{4.36}$$

A solution of the BGP

From competitive equilibrium condition (4.32c) and (4.32b),

$$x = \frac{\beta(A_H - (1-g))}{\beta A_H} \tag{4.39a}$$

$$n_H = \frac{g}{A_H} \tag{4.39b}$$

The competitive equilibrium conditions (4.34) and (4.35) become:

$$\frac{(1+g)(1+\pi)}{\beta} = R_s\left[1 + \frac{\gamma_s}{(1-\gamma_s)sn_s}\left(\frac{x}{\alpha}\right)\right] \tag{4.40a}$$

$$\frac{(1+g)(1+\pi)}{\beta} = R_f\left[1 + \frac{\gamma_f}{(1-\gamma_f)n_f}\left(\frac{x}{\alpha}\right)\right] - \tau^c \tag{4.40b}$$

From equations (4.11), (4.14a), (4.11), and (4.17a), we derive;

$$\gamma_s p_{st} c_{st} = A_y s n_s h_t \tag{4.41a}$$

$$\psi \gamma_f p_{ft} c_{ft} = A_y n_f h_t \tag{4.41b}$$

$$s = \frac{\gamma_s p_{st} c_{st}}{A_y n_s h_t} \tag{4.41c}$$

The equation, (4.41c) determines the number of knowledge and effort in making connections such that, $s = \frac{\gamma_s p_{st} c_{st}}{A_y n_s h_t}$ which is directly proportional to the share parameter γ_s in the informal sector and the equilibrium price p_{st} for financial services in the informal market c_{st}. Equation (4.41c) describes the increase in revenue presented in equation (4.18a) and (4.18b), i.e. total revenue is given by $p_{st} c_{st}$.

From equations (4.20) and (4.23) in (4.41a) – (4.41b), it is easy to show that;

$$c_{st} = p_{ct}^{s} c_{st} - \frac{A_y s n_s h_t}{\gamma_s} \tag{4.42a}$$

$$c_{ft} = p_{ft}^{f} c_{ft} - \frac{A_y n_f h_t}{\gamma_f}$$

(4.42b)

Also, from the BGP versions (4.14b) and (4.17b), we can derive;

$$p_{ct}^{s} c_{st} = \frac{(1-\gamma_s)}{\gamma_s} \left(\frac{A_y s n_s h_t}{R_s} \right) \tag{4.43a}$$

$$p_{ct}^{f} c_{ft} = \frac{(1-\gamma_f)}{\gamma_f} \left(\frac{A_y n_f h_t}{R_f} \right) \tag{4.43b}$$

Substituting (4.42) and (4.43) in (4.32a), we derive:

$$n_y = \frac{(1-\gamma_s)sn_s}{R_s\gamma_s} + \frac{(1-\gamma_s)n_f}{R_f\gamma_f} \tag{4.44}$$

Substituting (4.40) in (4.44) we derive:

$$n_y = \beta\left[\frac{(1-\gamma_s)}{\gamma_s}\left(\frac{sn_s+\left(\frac{\gamma_s}{1-\gamma_s}\right)\frac{x}{\alpha}}{((1+g)(1+\pi))}\right) + \frac{(1-\gamma_f)}{\gamma_f}\left(\frac{n_f+\left(\frac{\gamma_f}{1-\gamma_f}\right)\frac{x}{\alpha}}{(1+g)(1+)+\beta\tau^c}\right)\right] \tag{4.45}$$

Notice that with (4.27i), (4.32b), (4.39) and (4.41c), the BGP condition (4.45) is merely an equation with two unknowns, n_s and n_f. In addition to equation (4.45), we can derive another equation to solve h_t. Using (4.43) in the BGP versions of the CIA constraint (4.4a) and the market clearing condition (4.32a), for a set of policy $\{\tilde{M}_t\tilde{V}_t, \tilde{\tau}_t^c\}_{t=0}^{\infty}$, we derive:

$$\frac{\widehat{M_t}+\widehat{V_t}}{P_t} = A_y h_t\left[1 - x - n_H - sn_s - n_f\right] \tag{4.46}$$

The BGP conditions (4.45) give unique solutions for the two unknowns n_s and n_f. Using these solutions in (4.40) gives a solution to R_s *and* R_f, and using them in (4.44) gives a solution to n_y. The BGP condition (4.46) gives a unique solution to h_t. Once we derive this solution, (4.41) gives a unique solution to, $p_{st}c_{st}$ i.e., the solution for d_{ft} *and* d_{st}. The BGP conditions (4.32d) and (4.32e) then can be solved to derive the solution for c_{st}, c_{ft}, q_{ft} *and* q_{st}, respectively.