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A Study on the Impact of Financial Intermediation on Economic Growth: Panel Evidence from West Africa

Bah Boubacar Alpha[1], Yibing Ding[2], Kone Abdrahmane[3] & Mohamed Kargbo[4]

Abstract

Weak growth episode has been the case in many African countries since 1970 up to 2000s. One fundamental intermediation gap in the Sub-Saharan Africa (SSA) region is the extremely limited financing for medium to long term lending facilities to promote growth. This situation is also the case for the West Africa (WA) region. The financial sector in the WA region is faced with problems of non-performing loans, weak credit evaluation mechanism, and high intermediation cost. Given the importance of financial development on economic growth, this study therefore, investigates the impact of financial intermediation on economic growth in WA countries. The study adopts panel data framework from 1985 to 2013. The findings of the study among others indicate that interest rate spread and inflation are high, as shown by the result of the summary statistics. In terms of the dynamic panel growth regression, broad money (M2) and the level of financial intermediation (M3) impact positively on growth in the region. Credit supply, inflation, and interest rate spread impact negatively on growth in the West Africa Region. The findings of this study are relevant to policy makers in formulating appropriate growth policies that can enhance sound and stable financial intermediation. These findings also are of significance to development organizations that are assisting with the growth process of African countries in shaping the future financial sector infrastructure and hence economic growth in the entire West Africa region and global.

Keywords: Financial Development, Economic Growth, Financial Intermediation, Panel Data Framework and West Africa

Introduction

The link between financial intermediation and economic growth has attracted a lot of debate among academicians, policy makers, and finance practitioners particularly during the financial crisis of 2007-2009, that has affected the global world in terms of output, remittance, employment, and economic growth. Central to this debate is the question of whether strong economic performance can be attributable to sound financial intermediation. The issue is because the examination of the causal link between financial intermediation and growth has significant implications for policy-makers' decisions, development organization and researchers about the most feasible growth and development framework to be adopted. The fact that strong link exists between financial intermediation and economic growth has been well documented in the economic development literature.

For instance, Greenwood (1990), and Bencivenga (1991) noted that an efficient and vibrant financial intermediation transmits better information and monitoring the activities of borrowers to mitigate the risk of default for sound growth to be achieved.

[1]School of Economics, Jilin University, China. Email: bbah2702@yahoo.fr
[2]School of Economics, Jilin University, China.
[3]School of Management, Jilin University, China.
[4]School of Management and Economics, Dalian University of Technology, China.

The role of financial intermediaries in an economy cannot be overemphasized; however, among the role plays by financial intermediaries to growth are many folds, not limited to credit creation, savings mobilization, and risk management mechanism but are also monitoring and proffer financial guidance to borrowers, in ensuring positive returns on investment and hence economic growth.

However, previous empirical studies have produced conflicting outcomes on the direction of the causal link between financial intermediation and economic growth. Despite advances in the growth literature, the issue as to whether financial intermediaries play an important role on economic growth remains mixed and the debate still ongoing. Schumpeter (1969) observed that, financial intermediaries are relevant in promoting innovations, risk management, capital allocation, and saving mobilization, and that economies with more effective and efficient financial intermediation grow faster relative to those without. The view that the development of a country's financial intermediation fosters economic growth is in line with the "supply-leading" view of the finance-growth relationship (Patrick 1966). The main trust of this view is that, the existence of a positive causal link flowing from financial intermediation to economic growth is well acknowledged by the "supply-leading" argument of the finance-growth literature which states that the development of a viable financial intermediation is precursor for economic growth.

It is the general understanding that, the financial intermediation in Sub-Saharan Africa is relatively less developed and less diversified compared to other regions of the world (World Bank, 1994). A key feature of the formal financial system in most Sub-Saharan African countries is the tendency for these institutions to be concentrated in urban areas, thereby making access to credit opportunities difficult for people in the rural areas. In some countries, the financial system is predominated by banking related activities. Aryeetey and Senbet (2004) observe that the existing money markets in a number of SSA countries are ineffective. A good number of the money markets are dominated by treasury bills, central bank bills and other government securities. The poor performance of money markets in these countries has often been anchored on the government financing approach. The common practice of government issuing large quantity of very high-yielding bills to meet fiscal requirement is a major deterrent to the trading of private commercial bills.

Financial intermediation in Sub-Sahara Africa have been largely driven by the financial repression argument advanced in the early 1970's by McKinnon (1973) and Shaw (1973), who underscored the appalling outcome of government failures in the financial sector. Advocates of the McKinnon-Shaw hypothesis have argued that financial intermediation in Sub-Saharan Africa has been subjected to financial repression, characterized by low or negative real interest rates, high reserve requirements; mandatory credit ceilings; directed credit allocation to priority sectors; and heavy government ownership and mismanagement of financial institutions. The latter suggests that much credit is given on political rather than commercial considerations and giving rise to a huge pile of non-performing loans in the banks' portfolios. There is also limited competition, with government and parastatals major borrowers due to the large deficits that they experience and consequently resulted to a good number of Sub-Saharan African countries lagging behind in all the measures of financial intermediation when compared to the various regions of the world.

It is important to note that, the instability of financial intermediaries including banks provides an important theoretical basis and policy implication that are necessary in areas of the world that are affected by banking instability and financial turmoil, low level of domestic resource mobilization for productive investment and hence weak economic growth. Consistent with the idea of building less risky, sound and stable financial intermediation in line to promote economic growth, Sub-Saharan African countries have suffered significantly from low level of resource accumulation, due to constraints on capital inflows, deteriorating export volume, weak terms of trade and mounting external borrowing that has constrained financial intermediation and consequently posed difficulty of maintaining financial sector stability and economic growth in the region(Aryeetey and Senbet , 2004).

The above financial intermediation scenarios are the case for West Africa (WA) countries, the banking sector dominates the financial sector and as such, any failure in the sector has an immense implication on the economic growth of the country. Financial intermediation in the West of Africa region has been faced with the following features:(i) limited political will and mixed policy choices that undermine financial intermediation efforts (World Bank,

1994); (ii) continuous government interference in financial markets limits the implementation of financial liberalization measures (Reinhart and Tokatlidis 2003); and (iii) macroeconomic volatility and instability, including inflation volatility (Gelbard and Leite, 1999).

Most studies conclude that, more needs to be done, especially in terms of promoting economic and institutional reforms to support financial intermediation activities. Amongst the many other problems, development in West Africa countries is handicapped by weak financial sectors. While banking facilities have expanded and improved in the last decade, insurance, non-bank financial intermediaries and stock markets are in general have made little progress, and any shock to a major export sector in the less diversified countries could result to most bad loans in the banking sector. Despite, the banking sector is the most developed of the financial sector in West Africa, as it accounts for more than 80 percent of financial assets. However, insurance, the few stock markets, non-bank financial intermediaries, and microfinance are few. The West of Africa region experienced moderate growth in the 1970s and growth performance in the 1990s and 2000s was mixed. The poor performance of the region is partly blamed to the ineffective functioning of financial system as evidenced by inadequate banking supervision, weak coordination among financial institutions, inadequate payment system infrastructure and the subjective assessments of credit creation not consistent across financial institutions, including banks that ultimately resulted to high volume of non-performing loans, and liquidity difficulties which impacts negatively on the region's financial system and hence growth (Reinhart and Tokatlidis 2003).

Given the growing concern by the West of Africa region to improve on the weak growth episodes of the 1970s. Development of the financial system attracted considerable momentum from policymakers across the region with particular focus on supporting financial intermediaries. Since the mid-1980s, most countries in West Africa have experimented with policies of financial sector reforms partly motivated by the Structural Adjustment Programs (SAP) promoted by the World Bank and International Monetary Fund (IMF), with a view to catch up with the pace at which other developing economies have been growing. The focus of the reform agenda in most of these countries aimed at accomplishing extensive liberalization of interest rates, deregulation of the financial sector, strengthening the banking system, introduction of new financial instruments, and development of securities markets, particularly, the stock market with effort to provide the enabling environment for effective and efficient financial intermediation drive and hence economic growth (World Bank, 1994).

Despite the widespread financial sector reforms that have taken place, the financial systems in West Africa still exhibits some level of inefficiency, illiquidity, thinness and limited range of financial instruments and investment opportunities. Owing to widespread over-regulation of the financial systems, the region continues to experience high levels of capital flight and financial intermediation bottlenecks. In addition, informal savings channels are prevalent in view of the grossly inadequate formal financial systems and leading to capital flight, low level of domestic resource mobilization and untapped resources in the informal sectors with considerable financing gap, which adversely affected growth and poverty alleviation in West Africa (Gelbard and Leite, 1999).

It is more imperative to continue to accumulate knowledge on the theoretical and empirical ideas on development at a time when the region has set its sight on growth. The financial sector development, with particular focus on financial intermediation is one key area for growth and development, and now that growth promotion in the financial sector is being actively supported by the IMF, World Bank, and other international institutions and the Government, all these efforts require research to find out how the growth in financial intermediation would impact on the economic growth. The West Africa region provides a good test case to be experimented. Reliable data is available for sample of West African countries that allows for an econometric analysis to make reasonable conclusions about the relationship between financial intermediation and economic growth.

Studies thus far have looked at some of the key determinants to sustained economic growth, but studies on how financial intermediation can impact on the economic growth of West of Africa region are limited. Despite the intervention of the IMF and World Bank programs in the West of Africa region, growth in these countries has been dismally weak.

To bring these issues to light and possibly providing recommendations in addressing these issues, this study therefore endeavors to carry out a step by step investigation onthe extent to which financial intermediation has affected growth in West Africa. Specifically, the study aims to; (i) determine the effect of specific financial intermediation measures on economic growth in West Africa (WA) region; (ii) investigate the direction of causal link between financial intermediation and economic growth; and (iii) providing policy recommendations to academics, researchers, policy makers and development partners in guiding the future financial sector infrastructure and hence economic growth.

These specific characteristics of the West Africa region growth path offer us the test case to examine the link between financial intermediation and economic growth in the region and thus, constitute one of the motivations of this present study.

Therefore, we advanced the following hypotheses that can be empirically tested. This is because hypotheses are statements that are subjected to be falsified. To this end, we test the Null hypothesis against the alternative hypothesis thus;

Null Hypothesis ($\mathbf{H_0}$): There exist positive correlation between financial intermediation and economic growth in West Africa

Alternative Hypothesis ($\mathbf{H_1}$): There exist negative correlation between financial development and economic growth West Africa

Null Hypothesis ($\mathbf{H_2}$)**:** Causality exists between financial intermediation and economic growth in West Africa

Alternative Hypothesis ($\mathbf{H_3}$): Causality does not exist between financial intermediation and economic growth West Africa

The attempt to provide logical and reasonable conclusions on the above issues constitutes major challenges of this present study. Data on annual growth variables such as per capita income, financial data on an annual basis such as broad money to GDP (measures as the level of financial depth in an economy), quasi liquid liabilities (measures as the level of financial intermediation in an economy and domestic credit supply to the private sector by banks, interest rates spread-the difference between the lending rate and the deposit rate (measured as the relative efficiency of banking competitiveness), and growth control variables such as inflation, gross investment to GDP and gross national savings to GDP were collected from the International Financial Statistics, the World Bank, over the period 1985-2013. The estimation techniques in this present study are done in the context of panel data framework with the fixed effects, random effects and dynamic effect estimate by the applications of the Huasman and Sargan tests. The Hausman test is applied to determine the choice of validity between the fixed and random effects estimate and the Sargan test is used in the study to capture the dynamic effects estimates and the validity of the instruments. The Pair-wise correlation matrices are also applied to test the first hypothesis and the Granger Causality test is used to test the second hypothesis. Stata software is used in the study.

This study contributes to the literature in the following ways: First, studies on the effect of quasi liquid liabilities-the level of financial intermediation in an economy on growth are limited; this study explores the extent by which financial intermediation affects per capita income in a sample of ten West African countries, namely; Sierra Leone, Ivory Coast, Senegal, Ghana, Nigeria, Mali, The Gambia, Liberia, Burkina Faso, and Cameroon based on available information. Second, the study investigates the impact of financial restraints (Control variables) on per capita income growth in West Africa and finally providing an econometric understanding of relationships in finance and growth. This understanding is relevant for academics and policy makers in guiding the future stability of the financial sector infrastructure in the African region and global.

Primary weakness of the study is the limited availability of data; analysis is therefore restricted to a smaller number of financial intermediation and growth control variables than desired, because of these restrictions. However, reasonable data is still available for the purpose of this current study. The rest of this paper is structured as follows: section 2 is review of the literature, followed by section 3, the theoretical framework, and methodology. Section 4 is results and discussions of the results and finally, section 5 concludes.

2. Literature Review

This section discusses the body of existing knowledge theoretically and empirically in the context of developing and developed countries and to review a broader literature strand on the connection between financial intermediation and economic growth. This understanding is very crucial and important for carrying out an empirical analysis on the link between financial intermediation and economic growth.

2.1 Theoretical Literature

The theoretical link between financial intermediation and growth remains a controversial issue amongst economist and policymakers as well. Schumpeter (1911) was the first to argue that the services provided by financial intermediaries through the development of the financial sector spur technological innovation and economic growth. Likewise, works by Goldsmith (1969) and McKinnon (1973) demonstrate a positive link from financial intermediation to economic growth. Contrary to this, Robinson (1952) contends that financial intermediation is only but a by-product of economic growth. Singh (1997) argues that the development of financial intermediaries may as well turn out to be an impediment to economic growth when it induces volatility and subsequently discourage risk-averse investors from undertaking investment projects.

For instance, Greenwood and Jovanovic (1990) stress the role of financial intermediaries in pooling funds and acquiring information that enables them to allocate capital to its highest valued use, thereby raising the average return to capital, and argues that economic growth is a forward looking activity based largely on investments, and other growth determinants; investment is driven by investors' expectations regarding future returns and confidence that they can place on financial intermediaries. However, Greenwood and Jovanovic (1990) argued that, the existence of well-functioning financial intermediaries will enable investors to sell their stakes in the project if they need their savings before the project matures. In the absence of financial intermediaries, individual must allocate their portfolios between capital and currency to maximize expected utility.

The McKinnon-Shaw proposition-which derives from the classical assumption that savings determine investment and that resources are fully utilized, highlighted the adverse effects of "financial repression" on economic growth. Financial repression refers to the distortion of domestic financial markets, through measures such as ceiling on interest rates and credit expansion, selective allocation of credit and high reserve requirements. They pointed out that, such misguided policies have damaged the economies of many developing countries by reducing savings and encouraging investment in inefficient and unproductive activities. Stiglitz and Weiss (1981) observed that raising interest rates have favourable effects on financial intermediation and on growth. However, they noted also that excessively high real interest rates have adverse economic effects, it is the case extremely high interest rates will not permit the financing of investments projects that otherwise have good economic rational and will favour projects that have a high risk. The latter problem has become known as the heat of "adverse risk selection" on the assumption that risk tends to rise with the rate of return.

In such a situation, Stiglitz and Weiss (1981) argued that borrowers are more likely to default than when interest rates are low. This may lead banks not to raise the interest rate to its market clearing level. As a result, credit rationing may occur where only large size loans are allocated. Mankiw et al. (1992) discusses the problem of financial collapse in this context and presented a model in which small changes in the interest rate may alter the riskiness of the pool of borrowers. This may lead to a collapse of the credit market, if the pool of loan applicants is too risky to give the banks their required return.

However, Green word and Jovanovich (1990) examined the role of information and risk-sharing by financial intermediaries. In their model, there are two production technologies, a safe and low return one, and a risky and high return one. A risky technology has two disturbances; an aggregate and a project –specific shocks completely by managing their portfolios and can detect the existence of an aggregate shock by noting simultaneous disturbances involving more than one project. Hence, financial intermediaries can allocate resources to the place where they earn the highest return, while individuals without financial intermediaries' cannot select the appropriate technology for the realization of a shock.

Diamond and Dybvig (1993) noted that financial intermediaries are to provide liquidity to individual investors, unless financial intermediaries or financial markets exist, households can invest only in illiquid assets (for production). However, their precautions against an idiosyncratic liquidity shock might discourage them from investing in higher-yield, but more illiquid assets. Financial intermediaries can reduce such inefficiency by pooling the liquidity risks of depositors, and hence allows individual to reduce the risks associated with their liquidity needs. In spite of the uncertainty individuals face about future liquidity needs, financial intermediaries such as banks face a predictable demand for liquidity from their depositors as a result of the law of large numbers.

Accordingly, banks are enabled to allocate investment funds more efficiently. Furthermore, socially unnecessary capital liquidation can be reduced because individuals are no longer forced to liquidate investment in the presence of financial intermediaries.

In terms of intermediaries, Diamond (1984) develops a model in which financial intermediaries improves corporate governance. Financial intermediaries mobilize savings of many individuals and laon these resources to firms. This "delegated monitor" economizes on aggregate monitoring costs and eliminates the free-rider problem since the intermediary does the monitoring for all the investors. Furthermore, as financial intermediaries and firms develop long-run relationships; this can further lower information acquisition costs. However, in the costly state verification approach financial intermediaries can verify the success of investment only at a monitoring cost, which they try to minimize (Diamond, 1984). Information asymmetries are a problem, because they may lead to capital misallocations and monitoring costs. Moral hazard is an issue often discussed with respect to deposit insurance schemes. Originally designed to correct negative externalities running from banks' business activities to their customers, deposit insurance may cause yet another type of market failure. It may encourage risk taking by bank managers. Gennotte and Pyle (1991), for instance, show that implementing more stringent capital requirements in the presence of deposit insurance may lead to an increase in asset risk. Monitoring and control of asset risk through the regulation authorities must counteract this.

In terms of economic growth, a number of models have shown that a well-functioning financial intermediaries influence growth by boosting corporate governance. For instance, Bencivenga and Smith (1992) observes that financial intermediaries that improve corporate governance by economizing on monitoring costs will reduce credit rationing and thereby boost productivity, capital accumulation, and growth. Bencivenga and Smith (1992) argued that financial intermediaries facilitate the flow of resources from savers to investors in the presence of informational asymmetries with positive growth effects. Focusing on innovative activity, De La Fuente et al (2000) develop a model in which intermediaries arise to undertake the particularly costly process of monitoring innovative activities. This improves credit allocation among competing technology producers with positive ramifications on economic growth.

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

Therefore, poor financial intermediation will lead to sub-optimal allocation of capital. These explanations provide the theoretical underpinnings to the current study.

2.2 Empirical Literature

The next question concerns the empirical evidence of financial intermediation and economic growth, available evidence is is presented on the relationship between financial intermediation and economic growth.

Following Mckinnon and Shaw (1973), made estimates on the assumption that causation goes from financial intermediation to economic growth a "supply-leading" relationship. But, the causation may also run from economic growth creates demand for financial services, such a "demand following" relationship was postulated by Goldsmith (1969). However, Patrick et al. (1994) suggested that the direction of causality changes in the course of economic development. In his view, financial intermediation is necessary for sustained economic growth to take place but "as the process of real growth occurs the supply-leading impetus gradually becomes dominant" However, the existing empirical evidence, particularly by Spears (1992) and Odedokun (1996), made significant progress in our understanding of the finance-growth linkage in Sub-Sahara Africa. Odedokun (1996) and Spears (1992) find that aggregate measures of financial intermediation have positive and statistically significant effects on the growth rate of real per capita GDP.

Mckinnon and Shaw (1973), also examined the relationship between the rate of growth of per capita GDP on one hand and the rate of growth of per capita real balances and the ratio of the broad money supply to GDP on the other hand. He found that the two variables representing the extent of financial intermediation were highly significant statistically in a cross-section regression for 67 developed and developing countries in 1967-1974.

Fritz (1984) employed the Granger Causality test to examine the direction of causality between financial intermediation and economic growth in the Philippines. He used factor analysis to define booth financial intermediation and economic growth as composite sets of variables. The result obtained supports the Patrick's hypothesis that financial intermediation causes economic growth at an early stage of development and the causation is reversed at a later stage.

A survey of the empirical literature on financial intermediation and growth reveals that extensive empirical work has been done. Earlier studies on the finance –growth relationship employ cross-country analytical procedures. The pioneering work by Goldsmith (1969), for instance, generated data on the value of financial intermediary assets as a share of economic output from 35 countries over the period 1860 to 1963. This study sought to enquire (i) whether financial intermediation exerts a causal influence on growth, and (ii) whether the mixture of markets and intermediaries operating in an economy influence economic growth. A critical observation that unfolds from this study is that, the absence of data on securities market development for a broad range of countries led to the inability of the study to provide much cross-country evidence on the relationship between economic growth and the structure of the financial system. Despite the limitation, the study provides a positive relationship between financial intermediation and growth

Attempts to generate further empirical evidences involving cross-country studies on the relationship between financial development and economic growth gained momentum since the wake of the early 90s. Studies that subsequently build on Goldsmith's work include King and Levine (1993a), La Porta et al (2001). In particular, King and Levine (1993a) collected data on growth indicators as well as some indices of financial intermediation from 77 countries over the period 1960 -1989. The study aims at investigating whether the level of financial intermediation predicts long-run growth, capital accumulation and productivity growth. The study made use of three key measures of financial intermediation indicators as follows; (i) DEPTH[5] - which is a measure of the size of financial intermediaries,

[5] DEPTH equals liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and nonblank financial intermediaries) divided by GDP.

(ii) BANK[6] - which measures the relative degree to which the central bank and commercial banks allocate credit, (iii) PRIVY – which is the ratio of total banks credit to the private sector to GDP.

The study also identify three key indicators of growth as follows; (i) the average rate of real per capita GDP growth, (ii) the average rate of growth in capital stock per person, and (iii) total productivity growth, which is defined as the difference between per capita GDP growth and 0.3 times the rate of growth in capital stock per person. The result of the study indicates that a sound financial intermediation is good for economic growth.

A good number of the empirical tests on the relationship between economic growth and financial intermediation have often used broad money and private sector credit to GDP ratios as measures of financial sector development. For example, the World Bank (1994) has estimated that policies that would raise the M2/GDP ratio by 10% would increase the long-term per capita growth rate by 0.2–0.4% points. Lanyi and Saracogulu (1989) provide evidence on the relationship between interest rates and the growth of broad money supply (M2), measures as the real value of the sum of monetary and quasi-monetary deposits with financial intermediaries mainly the banking sector in a cross section relationship of 21 countries for the period 1971-1980 classifying countries according to whether they had positive real interest rates, moderates negative real interest rates or severely negative. The authors regresses the rates of broad money supply on interest rates. The results show a high correlation between the two variables with a regression co-efficient of the interest rate variable being statistically significance at the 1 percent level. In two similar approaches, Warman and Thirlwall (1994), and Athukorala (1998) arrive at rather opposite conclusions. For the case of Mexico over the period 1960 to 1990, Warman and Thirlwall (1994) find a positive impact of real interest rates on financial savings alone. Athukorala (1998) shows a positive impact of interest rates on all kinds of savings for India in the period 1955 to 1995, even though a weaker one for total saving (which includes the public sector). He is not able, however, to detect significant evidence for asset substitution as predicted by the neo-structuralists.

On balance, literature survey reveals that numerous studies have looked at the link between financial intermediation and economic growth; results of these studies are mostly inconclusive. The contradictory conclusions emerging from previous empirical studies are also one of the motivations for the present study. Furthermore, empirical research on the link between financial intermediation and economic growth in the West Africa region is still limited. This study is different from most of the previous studies by examining the case of West Africacountries that are structurally constrained and the financial sector climate still quite underdeveloped. This study therefore seeks to provide a systematic investigation along the above challenges and to also explore the extent by which financial intermediation affects per capita growth in a sample of ten West African countries by applying an econometric understanding of relationships in finance and growth.

3. Theoretical Framework and Methodology

This section draws largely from the line of reasoning advanced by the selected theory on finance and growth: "The theory of financial intermediation and growth,"which is based onDiamond and Dybvig (1983) andRomer (1986).Here we assume that the economy consists of a sequence of three-period-lived, overlapping generations. At time t = 0, there is an initial old generation, endowed with an initial capital per firm capital stock of k_0, as well as an initial "middle –aged" generation, which is endowed with a per firm capital stock of k_1 units at time t =1. It is also assumed that the economy consists of two goods – a single consumption good and a capital production good. Capital is owned by old agents (called entrepreneurs) who use only their own capital in production. Letting k_t denote the capital held by an individual entrepreneur at time t , and $\overline{k_t}$ the "average capital stock per entrepreneur" at t. The production function for the consumption good is given as:

[6] BANK equals the ratio of bank credit divided by bank credit plus central bank domestic assets.

$$Y_t = \bar{K}_t^{\delta} K^{\theta} L_t^{1-\theta} \quad (1)$$

Where L_t is units of labour, $\theta \in (0,1)$ and $\delta = 1-\theta$, (where δ is an external effect in production). Furthermore, capital is assumed to depreciate completely in one period. With the exception of the initial old and middle-aged generations, agents have no endowment of capital or consumption good ant any date. The young generation is assumed to comprise of a continuum of identical agents, each endowed with a single unit of labour supplied in-elastically when young. There is no labour endowment at age 2 or 3. Letting c_i denote age i consumption, all young agents are assumed to exhibit a utility function taking the form:

$$u(c_1, c_2, c_3; \phi) = \frac{-(c_2 + \phi c_3)^{-\gamma}}{\gamma} \quad (2)$$

Where $\gamma > -1$, and ϕ is an individual specific random variable realized at the beginning of age 2. ϕTakes the value 0 with probability $1-\pi$, and 1 with probability π . As can be noted in equation (2), c_1 does not enter the utility function due to the assumption that young agents do not value age one consumption. This therefore implies that all young period income is saved. Hence, financial structure trivially cannot affect agents' decision about how much of their income to save[7]. The economy consists of two assets namely – a "liquid investment"[8] and an "illiquid" capital investment, in which one unit of the consumption good invested at t return R units of capital good at t + 2. If investment in the capital good is liquidated after one period, its "scrap value" is x units of the consumption good.

From the assumptions made earlier regarding the labour units, it can be deduced that all capital resides in the hands of age-3 entrepreneurs at each date. The absence of a rental market for capital implies that for any inherited capital stock k_t , and an average per "per entrepreneur" capital stock of $\bar{k}_t$, a representative entrepreneur chooses a quantity of labour employed (L_t) to maximize profit, where the maximizing level of $L_t = \arg\max\left\{\bar{K}_t^{\delta} K_t^{\theta} L_t^{1-\theta} - w_t L_t\right\}$ - where w_t , the real wage rate- is taken as parametric.

There are equal numbers of young and old agents at each date, and each young agent supplies one unit of labour. Not all old agents are entrepreneurs. A fraction $1-\pi$ of all agents have a realized value of zero for the random variable ϕ. Because these agents don't care for old age consumption, they liquidate all their assets at age two and hence own no capital. For each unit deposited at date t, banks place $z_t \in (0,1)$ units in the liquid investment, and $q_t \in (0,1)$ units in the illiquid investment, where:

$$z_t + q_t = 1 \quad (3)$$

[7] The formulation of preferences (2) and (3) implies a "desire for liquidity" on the part of savers from Diamond Dybvig (1983)
[8] This is best thought of as inventories of consumption good.

The assumption here is that depositors who made a withdrawal one period after making a deposit receive r_{1t} units of consumption good for each unit deposited at the initial period t. For those agents that withdraw two periods after making a deposit, they receive r_{2t} units of the capital good, and $\tilde{r}_{2t}$ units of the consumption good per unit deposited[9]. Let α_{1t} and α_{2t} be respectively the fraction of the bank's liquid and illiquid assets liquidated after one period.

Then the relevant resource constraints are:

$$(1-\pi)r_{1t} = \alpha_{1t}z_t n + \alpha_{2t}q_t x \quad (4)$$

$$\pi r_{2t} = (1-\alpha_{2t})Rq_t \quad (5)$$

$$\pi \tilde{r}_{2t} = (1-\alpha_{1t})z_t n \quad (6)$$

At date t, it is assumed that all young agents deposit[10] their entire labour income, w_t. Taking $\bar{k}_{t+2}$ (the "average per entrepreneur capital stock" at t + 2) as given, each agent who withdraws at t + 2 become an entrepreneur and earn the profit $\theta\psi k_{t+2}$. These agents also receive $\tilde{r}_{2t}w_t$ units of the consumption good. The expected utility of a representative depositor, evaluated at t, then is:

$$-\left(\frac{1-\pi}{\gamma}\right)\left(r_{1t}w_t\right)^{-\gamma} - \left(\frac{\pi}{\gamma}\right)\left[\theta\Psi\left(r_{2t}w_t\right) + \tilde{r}_{2t}w_t\right]^{-\gamma} \quad (7)$$

Where $k_{t+2} = r_{2t}w_t$, has then been used in (7). In so doing, they take $\bar{k}_{t+2}$ as given, since each bank views itself as being unable to influence the "average per entrepreneur capital stock".

Assuming reserves are entirely liquidated after one period while none of the capital investment is liquidated "prematurely". Setting α_{1t} = 1 and α_{2t} = 0 in equations (1) - (6), and substituting the resulting equations along with (3) into (7), we obtain the following problem from the bank at time t as:

$$\max_{0\le q_t\le 1} -\left(\frac{1-\pi}{\gamma}\right)\left[\frac{(1-q_t)nw_t}{1-\pi}\right] - \left(\frac{\pi}{\gamma}\right)\left[\theta\psi\left(Rq_t w_t/\pi\right)\right]^{-\gamma} \quad (8)$$

The solution to (10) is:

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[9] These payments must satisfy a set of resource constraints

[10] At time t +1, a fraction $1-\pi$ of these agents experience ϕ = 0, liquidate all assets and realized a consumption of r_{1t} per unit deposited. The fraction π of agents with ϕ = 1 do not withdraw until t + 2 and they receive r_{2t} units of the capital good each per unit deposited, along with $\tilde{r}_{2t}$ units of the consumption good.

$$q_t = \Phi/1+\Phi \quad (9)$$

Where

$$\Phi = \left(\frac{\pi}{1-\pi}\right)^{1/(1+\gamma)} \left[\frac{\pi n}{(1-\pi)\theta\psi R}\right]^{\gamma/(1+\gamma)} \quad (10)$$

Now we need to verify that agents with ϕ = 1 will prefer to withdraw from the bank after two periods rather than one, and that all savings are intermediate. To obtain the first result, observe that equilibrium consumption for agents who withdraw at t + 2 (having deposited w_t) is $\theta\psi r_{2t} w_t = \theta\psi R w_t/\pi$. Agents who withdraw at time t + 1 have time t + 1 consumption equal $r_{1t} w_t = (1-q_t) n w_t/(1-\pi)$. The agents with ϕ = 1 will withdraw at time t + 2 iff :

$$\left(\frac{\theta\psi R}{\pi}\right)\left(\frac{\Phi}{1+\Phi}\right) \geq \left(\frac{n}{1-\pi}\right)\left(\frac{1}{1+\Phi}\right) \quad (11)$$

By substituting (10) into (11) and re-arranging terms yields the equivalent expression $\theta\psi R \geq n$, which has been assumed to hold[11].

In equilibrium, of course,

$$\bar{k}_{t+2} = r_{2t} w_t = R q_t w_t/\pi = k_{t+2} \quad (12)$$

Then (12) imply that,

$$\bar{k}_{t+2}/\bar{k}_t = R(1-\theta)\pi^{\theta-1} q_t = R(1-\theta)\psi\Phi/(1+\Phi) = \mu \quad (13)$$

Since per firm output at time t, denoted y_t, equals $\bar{k}_t^{\delta} k_t^{\theta}\psi = \psi\bar{k}_t$ (in equilibrium), and since the number of firms is constant over time, (13) also gives the equilibrium rate of growth of output. In particular,

$$\bar{k} = \begin{cases} \mu^{t/2} k_0; & t \text{ even} \\ \mu^{(t-1)/2} k_1; & t \text{ odd} \end{cases} \quad (14)$$

The fact that the time t + 2 capital stock depends on the time t wage rate derives, of course, from the fact that capital formation takes two periods. Generally, the growth rate can be greater or less than one.

[11]Thus only agents with ϕ = 0 withdraw after one period. That all savings are intermediated is immediate, since intermediaries choose returns to maximize the expected utility of young savers.

Hence, positive or negative real growth[12] can be predicted, depending on parameter values. It is also possible to consider the effects of varying one parameter at a time, so that Φ will change along with the change in the relevant parameter.

We now pursue a modified version of the endogenous growth framework in specifying a model of growth that can account for the effects of finance in the growth process. In the previous section, we were only able to establish the fact that financial development affects growth generally. This section, however, draws from the theoretical foundation developed earlier to provide a more rigorous link between finance and growth. Following Romer (1989) and Pagano (1993), we assume a competitive economy with identical firms and households such that there is a coincidence between per firm and per capita values[13]. We also assume that the stock of capital, K_t at any point in time is made of both physical and human capital. We let the aggregate level of output produced in the economy at time t, θ_t to follow a linear function of the aggregate capital stock (K_t) as follows:

$$Q_t = \lambda K_t \qquad (15)$$

Where λ , the approximate state of technology or the rate of transformation of capital input into output. We assume further that, even though each of the N firms in the economy faces a constant returns to scale technology, productivity is however an increasing function of the stock of capital K_t. On the basis of this assumption, we assume that each firm's output is given as follows:

$$q_t = \Omega K_t^{\beta} \qquad (16)$$

Where q_t is firm-specific output, K_t is firm-specific capital stock and Ω is a parameter that responds to the capital stock $\Omega = \lambda K_t^{1-\beta}$ according to In this framework, we further assume that the stock of physical capital depreciate at the rate of π per period. Thus, gross investment, which is defined as the rate of growth of the capita stock (after adjusting for capital depreciation) is given as:

$$I_t = K_{t+1} - (1-\pi) K_t \qquad (17)$$

Assuming a closed economy with no government intervention, a necessary condition for capital market equilibrium dictates that gross savings (S) equal gross investment. However, since a proportion of savings $(1-\alpha)$ leaks from the process of financial intermediation, capital market equilibrium requires that $I_t = \alpha S$. Hence $1-\alpha+\alpha = 1$

From the aggregate production function in equation (25), the growth rate of output in period t +1 is given as:

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[12]Notice that equilibrium growth rates will increase as labor's share in output $(1-\theta)$ increases (with Φ held fixed) , as capital becomes "easier" to produce (higher values of R, with Φ held fixed), or as Φ increases (with R , θ and ψ held fixed), so that a greater fraction of savings is invested in the accumulation of productive capital.

[13]That is, we assume that the marginal product of the firm is exactly equal to the wage rate.

$$g_{t+1} = \left(Y_{t+1} \big/ Y_t \right) - 1 = \left(K_{t+1} \big/ K_t \right) - 1 \quad (18)$$

By re-arranging equation (17), we have $I_t = K_{t+1} - (1-\pi) K_t$ Thus, by substituting for $K_{t+1} = I_t + (1-\pi) K_t$ in equation (18) above, we have;

$$g_{t+1} = \frac{I_t + K_t - \pi K_t - K_t}{K_t} = \frac{I_t}{K_t} - \pi \quad (19)$$

Again, re-arranging equation (15), we have $K_t = \frac{Q}{\lambda}$ now, by substituting for K_t in equation (19) above, the growth of output at time t+1 becomes:

$$g_{t+1} = \frac{\lambda \alpha S}{Q} - \pi \quad (20)$$

By invoking the capital market equilibrium condition that $I_t = \lambda S_t$ then equation (20) reduces to:

$$g_{t+1} = \lambda \alpha \left(\frac{S}{Q} \right) - \pi \quad (21)$$

The steady state solution can then be deduced from equations (30) and (31) to obtain:

$$g_t = \lambda \left(\frac{I}{Q} \right) - \pi = \lambda \alpha \beta - \pi \quad (22)$$

Where $\beta = \frac{S}{Q}$ (i.e the saving rate) . In the context of the endogenous growth framework (Pagano, 1993; and King and Levine; 1993a), equation (22) predicts that financial intermediation affects growth by either raising α or accelerating the social productivity of capital λ ; or it can influence the saving rate β . There are several ways in which financial intermediation can affect real growth of output. As noted by Bencivenga and Smith (1991), the first way is to raise the volume of investment and the second is to improve on the volume and structure of savings. Fry (1988) agrees that these are the ways financial intermediation affects real growth of output. Again, Greenwood and Jovanovic (1990) and King and Levine (1993a) argue that financial intermediation is likely to affect growth by improving the efficiency of investment through project selection, innovation and entrepreneurship growth. This last point is the emphasis laid in recent endogenous growth models.

3.1 Estimation Techniques

This section is intended to provide an estimation approach that is cable of capturing the impact of financial intermediation on economic growth using data from a cross-section of 10 West Africa countries.

Equation 22 above forms the basis for estimating the relationship between per capita income growth and our measures of financial intermediation.

Given the increasing empirical evidence in support of the positive role of financial sector development in the growth process, we therefore modify equation (22) above by factoring in financial factors into the growth equation. Thus, by controlling for non-financial factors that influence long run growth[14], we generalize the specification of a growth equation that accounts for the effects of financial development.

According to Barro (1989a), the growth of real GDP is considered to depend on several variables. For the purpose of our study, the relationship between finance and growth can be augmented from the Barro-growth regression of financial development variables which takes the form thus;

$$G = \alpha + \lambda_i \left[F_{i,t} \right] + \beta_i \left[C_{i,t} \right] + \theta_i + \varepsilon_{i,t} \qquad (23)$$

Hence,

$$\text{Growth of output} = \alpha + \lambda_i \text{ [finance set]} + \beta_i \text{ [conditioning set]} + \theta_i + \varepsilon_{i,t} \qquad (24)$$

Where, λ_i is a measure of the relative effect of the set of financial development variables, β_i is a measure of the relative impact of the set of control variables. θ_i is the country specific effect that is unobserved and $\varepsilon_{i,t}$ is the error term and α is the constant or autonomous term.

As noted in equation 24 above, if the unobserved country-specific effects, θ_i, are uncorrelated with the explanatory variables of the model (i.e if θ_i is orthogonal to all the explanatory variables) then we can apply the pooled OLS estimator to fit our model. However, when there is a strong correlation between the unobserved individual component, θ_i and the repressors of the model, the pooled OLS estimator is biased and inefficient.

In this situation, the fixed effects model is a suitable candidate for carrying out estimations of the model's parameters. If the standard random effects assumptions hold but the model does not actually contain an unobserved effect, the pooled OLS is efficient and all the associated pooled OLS statistics are asymptotically valid. To test for the absence of unobserved effect, we employ a simple AR(1) test for serial correlation. This test is appropriate because the idiosyncratic errors are serially uncorrelated under the null $H_0 : \sigma_\theta^2 = 0$, given that the explanatory variables are exogenous. The detection of serial correlation amongst the idiosyncratic errors thus validates the presence of unobserved effect. In many applications, however, the whole point of using panel data is to allow for the unobserved effects, θ_i, to be arbitrarily correlated with the set of explanatory variables, thus necessitating the application of a fixed effects estimation procedure.

[14] The traditionally based neoclassical theory of growth has been focusing only on physical capita and labour inputs as the principal determinants of growth

In this study, the choice between the fixed effects and random effects model for the levels estimation will be based on the Hausman specification test. A large value of the Hausman test statistic leads to the rejection of the null hypothesis that the individual-specific effects are uncorrelated with the regressors and to the conclusion that fixed effects are present. It also discusses the estimation procedure in the context of panel evidence with the fixed effects, random effects, and dynamic models estimates by the application of the Hausman test to determine the choice of selection between the fixed effects model versus the random effects model of sample countries; the test is performed in level equation.

Furthermore, we apply the Sargan test to examine the dynamic growth effect model to capture the relative impact of the independent variables on growth and are and it is performed in difference equation. Robust tests are then discussed to determine whether the base equation is different from the instrument (new regression equation) taking into account the coefficients and significance level. In order to determine the time series property of the data, the Augmented Dickey Fuller (ADF) and the Philip-Perron tests are performed.

Finally, the Granger Casualty a test is applied to determine the direction of causation among the financial intermediation variables and growth in per capita, the Johansen co-integration is also applied to determine whether long run equilibrium link existsbetween financial intermediation variables and growth.

3.2 Model Specification

The indicators of financial development are many and are thus difficult to be captured, as financial development entails both banking and money market (Bond, Stock Market Capital market) developments, and as such it is too generic in nature (Pagano, 1993). To this end, to evaluate the link between financial development and growth, one must look at the specific financial markets concerned and or interest. It could be either bank-based or market-based, and both forms of financial markets may have different effects on growth. Most West African Countries financial system is still underdeveloped with very little presence of capital market and as such the financial system in these countries is largely done in the banking system than financial market based. Furthermore, the rudimentary pace of capital market and limiting paucity of data-base in the African region, such as the capital market development indicators are virtually not available.

Therefore, this study uses four measures of banking financial intermediation indicators. These include; broad money (M2), quasi liquidity liabilities (M3), domestic credit to the private sector by banks (CPB) and interest rate spread (IRS).

The overall financial depth of the financial system- broad money, (measures as a percentage of GDP. i.e $\frac{M_2}{GDP}$), the extent of financial intermediation- quasi-liquidity liabilities in an economy, (measured as a percentage of GDP , i.e $\frac{M_3}{GDP}$). The third measure is domestic credit to the private sector by banks (measured as the relative degree to which credit is allocated for productive investments by banks as a percentage of GDP) and the fourth measure is the interest rate spread in an economy, computed as the difference between the lending rate and deposit rate (measures the degree of competitiveness in the banking sector). The control variables are inflation, measured as the annual consumer price index, investment measured as the gross capital formation in an economy and gross national savings as a share of GDP (measured as gross national income less total consumption, plus net transfers)

From equation24 above, the regression model is therefore specified with the income per capita (PCI) as the dependent variable, measured as GDP on an annual basis adjusted by the annual population.

The explanatory variables comprise both the banking financial sector indicators and the control variables. We specify our model for this study in a more explicit form thus;

$$\ln(\text{PCI})_{it} = (\beta_{i0} + \beta_{1it}) + \beta_{2i}\ln\left(M_2\right)_{it} + \beta_{3i}\ln\left(M_3\right)_{it} + \beta_{4i}\ln\left(CPB\right)_{it} + \beta_{5i}\ln\left(IRS\right)_{it} + \beta_{6i}\ln\left(INF\right)_{it} + \beta_{7i}\ln\left(INV\right)_{it} + \beta_{8i}\ln(\text{GNS})_{it} + \varepsilon_{it} \quad (25)$$

Table 1: Expected signs of the coefficients of the specified growth equation

Variable	Variable Description	Expected Sign of coefficient	Data Source
M_2	Financial depth of the financial system	±	IFS-Data Base
M_3	Extent of financial intermediation in an economy	+	IFS-Data Base
CPB	Domestic credit to the private sector by Banks	±	IFS-Data Base
IRS	Interest rate spread	±	World Bank Data Base
INF	Inflation	-	World Bank Data Base
INV	Gross investment	+	World Bank Data Base
GNS	Gross national savings	+	WDI Data Base

(IFS)= International Financial Statistics, WDI=World Development Indicators, M2, M3, CPB, INV and GNS are in percentage of GDP

4.0 Presentation of Results

4.1 Summary Statistics

We collected data from a panel of 10 West Africa (WA) countries during the period 1985 to 2012, from the (World Bank Data Base, 2013), prior to estimating the panel regression. We first, report the summary statistics in table 2.

Table 2: Summary Statistics for the 10 SSA countries

Variables	PCI	M2	M3	CPB	IRS	INF	INV	GNS
Mean	1,017.24	33.54	13.36	18.24	12.83	18.90	3.11	10.81
Maximum	1561.15	157.62	102.21	108.22	5.15	186.25	28.41	75.43
Minimum	267.13	0.15	0.20	0.29	0.23	-13.51	-15.52	-28.31
Std. Dev	2508.74	15.12	10.33	17.32	6.92	25.47	4.65	16.48
Correlation Matrix								
PCI	1.000							
M2	0.054	1.000						
M3	0.202	0.462	1.000					
CPB	0.158	0.482	0.388	1.000				
IRS	-0.052	-0.058	-0.158	-0.321	1.000			
INF	-0.201	-0.012	0.015	-0.120	0.055	1.000		
INV	0.244	-0.073	-0.082	-0.176	0.055	-0.030	1.000	
GNS	0.464	0.098	0.267	0.359	-0.394	-0.033	0.185	1.000

Note : where PCI is income per capita, M2 is overall financial depth, M3 is the level of financial intermediation, CPB is the supply of credit to the private sector by banks, IRS is the interest rate spread, INF is inflation, INV is investment (measured as the Gross fixed capital formation) and GNS is gross national savings.

The summary statistics for the 10 West Africa countries as reported in Table 2 above, which comprises; Sierra Leone, Ivory Coast, Senegal, Ghana, Nigeria, Mali, The Gambia, Liberia, Burkina Faso, and Cameroon, revealed an averaged income per capita of $ 1,071.24 over the period.

Financial depth (broad money) and the level of financial intermediation (liquid liabilities) averaged around 33.54% and 13.36% of GDP respectively, lower than the average value of financial depth. This may implies low level of financial intermediation by the formal financial system. This manifest that, significant proportion of financial assets are held outside the formal banking system for this group of countries.

The supply of credit to the private sector by the banking system averaged around 18.24%. This result reveals that credit supply is low, and thus, reflects the underdeveloped nature of the financial intermediaries in the West Africa Region. The interest rate spread and inflation averaged around 12.83% and 18.90% respectively over the sample period. It can be observed therefore, that inflation (18.90%) reported double digit, this clearly indicate some elements of macroeconomic instability in the sample of WA countries. Furthermore, the interest rate is relatively high (12.83%), and thus, indicate low competitiveness in the banking system. Investment (measured as the gross fixed capital formation) and Gross national savings averaged around 3.11% and 10.81% respectively. This indicates low level of savings and investment in WA region.

Therefore, it can be observed that high proportion of income is spent on consumption rather than saving mobilization for productive investments. This situation, may impact negatively on long run economic growth in the region. From the result of the correlation matrix in the lower part of table 2, we observed a positive relationship between per capita income and financial depth, financial intermediation, credit supply, investment and gross savings, even though weak. On the contrary, the correlation between per capita income and interest rate, inflation is negative over the sample period. The correlation matrix in the low segment in table 2 above indicates no presence of multicollnearity as the correlation among the explanatory variable are fairly low. (There is no correlation value among the variables exceeding 0.7)

4.2 Presentation of Panel Regression Results

The Hausman specification test is applied to select the choice between the fixed effect (FE) model and the random effect (RE) model in computing the level equations. The dynamic effect (DE) model in which the variables are in first difference is used in estimating the parameters, through the Arellano-Bond (1991) approach of the Stata command "Xtabond". We run the regression for the entire sample of 10 West Africa (WA) countries to assess the general picture for WA region.

The results from the Hausman specification tests as reported in the lower part of table 3 below continues to reveal that the country specific individual unobserved effects are uncorrelated with the explanatory variables. Thus, suggesting that the fixed effects model is better preferred to the random effects model in the levels regression equation estimates. Therefore, for the levels estimates, we based our discussions of findings on the fixed effects estimates. For the dynamic model, the results from the Sargan tests as shown in the lower portion of table 3, indicate that the instruments are valid in all the dynamic panel regressions. Finally, the test for second order serial correlation shows no severe problem of serial correlation in the residuals from the dynamic panel regressions.

Table 3: Panel Regression Result for the Sample of 10 WA Countries

Variable	FE	RE	DE
Cons	6.8212 (8.43)*	4.0513(5.86)*	----------.
PCI(-1)	----------	----------	0.2352 (3.79)*
M2	0.136 1 (2.12)**	0.0921 (1.43)	0.1524 (2.20)**
M3	0.0762 (2.35)**	0.0412 (2.13)**	0.0513 (2.31)**
CPB	-0.0531 (-2.01)**	-0.0291 (-0.84)	-0.0801 (-2.09)**
IRS	-0.1283 (-3.21)*	-0.1363 (-3.31)*	-0.0825 (-2.05)**
INF	-0.0551 (-4.51)*	-0.0562 (-4.47)*	-0.0376 (-3.42)*
INV	0.0032 (-1.90)***	0.0065 (-1.95)***	0.0032 (-1.92)***
GNS	0.0114 (1.97)**	0.0143 (-1.99)**	0.0443 (2.17)**
No. of Obs	203	203	203
R-squared	0.543	0.536	----------
F-Statistics	F(8, 173)=18.14(0.00)	Wald Chi2(8)=74.32(0.000)	----------
Hausman Test	Chi2(8)=29.56 (0.000)		----------
Test for second order serial correlation	----------	----------	H_0: No autocorrelation : Z=-3.46 (0.000)
Sargan Test	----------	----------	Chi2(27)= 56.2 (0.634)

Note: where the variables are expressed in log form and t –values are reported in parenthesis. The variables entering the Dynamic model are in first difference and their coefficients are interpreted as growth elasticity's. Both the fixed effects and random effects models are in levels. The dynamic model is based on the Arellano-Bond Estimation procedure. (*), (**), and (***) means significant at 1%, 5% and 10% respectively.

In this part, our discussion is based on the results obtained regarding the parameters estimates from the dynamic model which actually captures the relative impact of the independent variables on the growth of income per capita. The rationale for doing so is that, both the fixed effect model and the random effects model only reflect the level effects rather than the growth effect on per capita income. Given that, the variables are expressed in log from, it implies that the parameter estimates from the dynamic regression are interpreted as elasticity coefficients. From the panel regression reported in table 3 above, it can be seen that the coefficient of the variable representing financial depth- broad money and financial intermediation enters the growth model with a positive sign and significant at 5% level for the sample of 10 WA countries.

Taking the relative impact into account, the result form the dynamic panel regression model reveals that a 10% increase in financial depth-broad money and financial intermediation will on average increase the growth rate of income per capita by approximately 2.35% and 1.52% in the region. This result therefore, implies that financial deepening and financial intermediation induce growth in the WA region. This result also lends support to the studies by (Odedokun, 1996) and Spears (1992), who find that aggregate measures of financial intermediation have positive and statistically significant effects on the growth rate of real per capita income.

In contrast, however, the coefficient of the variable representing credit supply to the private by banks (CPB) enter the dynamic growth model with a negative sign and significant at the 5% level for the sample of WA countries. The negative sign indicates that credit supply to the private sector retards growth in income per capita in the WA region. In terms of relative effects, the results from the dynamic model indicate that, a 10.0% expansion in credit supply to the private sector reduces growth per capita by a margin of approximately 0.08% in the region. This result may not be surprising because, in the absence of proper monitoring mechanisms as well as efficient controls on the use of formal credits, borrowers may skew to risky investment projects with high delinquency. This therefore, clearly manifest that financial institutions specifically banks, can influence growth via credit, if proper and effective monitoring mechanism are instituted on credit for use by borrowers productively and thus reduce the probability of loan default.

The coefficient representing interest rate spread (IRS) enters the dynamic growth model with a negative sign and significant at the 5% level. In terms of relative effects, the results from the dynamic panel regression indicate that, a 10.0% increase in interest rate spread reduce growth by a margin of approximately 0.825% for the sample of WA. This negative relationship between interest rate spread and growth may not be surprising, because, a high spread margin between the lending and deposit rates may raise the cost of capital, which in turn negatively affect investment returns. Therefore, higher lending rates stimulate risky behavior amongst potential investors, thereby increasing the chance of loan defaults. Thus, implicit in this situation is that high interest rate spread reduces the quality of investment and hence growth. Furthermore, higher interest rate spread margin may potentially divert borrowers from formal banking and other financial institutions to the curb markets where long term investment credit facilities are limited. This implies that investment potential that are relevant for long term growth, can be severely affected negatively and thus adversely affected long term growth.

The coefficient of the inflation variable representing (INF) is negative and significant at the 1% for the sample of WA countries. In terms of relative impact, the results show that, a 10.0% increase in inflation reduces growth in the region by approximately 0.37%. This therefore implies that, high rates of inflation adversely affect growth. These results are not surprising because, economic development is unlikely to occur unless policies produce a stable macroeconomic environment in which inflation remains reasonably low. This finding is consistent with those of (Fielding and Mizen, 1987) who contend that higher inflation has a negative impact on output because it introduces distortions to the efficient allocation of resources. Since the effective cost of capital increases with inflation. Thus, inflation above certain levels affects growth negatively as indicative of the results from this study.

The coefficients of the variable representing gross investment enters the dynamic growth equation with a positive sign and statistically significant for the sample of WA countries. In terms of the relative impact from the dynamic equation, expansion in gross investment by 10% will on average increase growth in per capita income by 0.03% for the entire sample of SSA countries. It can therefore be observed that, investment in the region and the various income grouping is good for growth. This result lends support to the study by (Streeten, 1973) who contended that investment is highly likely to contribute to public revenues through the returns on public investment such as road infrastructure, payment of corporations' taxes to government and other productive inventories. This, therefore, provides the enabling climate to boost employment opportunities, promotion of private sector led growth which may ultimately impact positive on economic growth.

The coefficient of the variable representing gross national savings (GNS) enters the growth dynamic model with a positive sign and significant at the 5.0% level. Taking the relative effect into account, the result from the dynamic model indicates that, a 10% expansion in savings promotes growth in per capita income by a margin of about 0.44% in the region. This result indicates that gross national savings are very important in promoting growth in the WA region. This is somehow expected, financial intermediaries are likely to be more liquid and highly efficient in the allocation of resources if gross national savings mobilization is high. If savings is low, the lower the availability of financial resources to be mobilized for productive investment. Therefore, countries with high rates of gross national savings are highly inclined to grow under favorable macroeconomic climate.

4.3. Robustness Checks for Panel Regression Estimates

In order to ascertain the relative stability of our regression estimates we carry out robustness checks by introducing new explanatory variable-credit supply by the financial sector denoted as (CPFS) in the base regressions. The exercise entails comparing the new parameters obtained by introducing a new explanatory variable in the new model to the original estimates of the base regression. The logic is that if the parameter estimates from the new regression does not change much in terms of the signs and level of significance from those of the base regression. We therefore consider the estimates from the base regression robust. The results of the robustness checks are reported in Table 4. The results from the robustness checks reveal that the coefficients of all the variables in our base regressions fail to vary significantly from those of the new estimates, therefore, implying that the parameter estimates from our panel regressions are robust.

Table 4: Robustness Checks for Panel Regression Estimates

Variable	FE		RE		DE	
	(Model1)	(Model 2)	(Model1)	(Model 2)	(Model 1)	(Model 2)
Cons	6.8212	7.2713	4.0513	4.4531	--------	---------
	(8.43)*	(9.83)*	(5.86)*	(6.04)*		
PCI (-1)	-------	--------	-------	----------	0.2352	0.2452
					(3.79)*	(3.88)*
M2	0.1361	0.1432	0.0921	0.1086	0.1524	0.1682
	(2.12)**	(2.05)**	(1.43)	(1.52)	(2.20)**	(2.29)**
M3	0.0762	0.0876	0.0412	0.0473	0.0513	0.0463
	(2.35)**	(2.39)**	(2.13)**	(1.99)**	(2.31)**	(2.39)**
CPB	-0.0531	-0.0612	-0.0291	-0.0382	-0.0801	-0.0724
	(-2.01)**	(-2.09)**	(-0.84)	(-0.98)	(-2.09)**	(-1.99)**
IRS	-0.1283	-0.1153	-0.1363	-0.1271	-0.0852	-0.0786
	(-3.21)*	(-3.05)*	(-3.31)*	(-3.13)*	(-2.05)**	(-1.98)**
INF	-0.0551	-0.0731	-0.0562	-0.0786	-0.0376	-0.0425
	(-4.51)*	(-4.56)*	(-4.47)*	(-4.81)*	(-3.42)*	(-3.68)*
INV	0.0032	0.0062	0.0065	0.0045	0.0032	0.0057
	(-1.90)***	(-1.93)***	(-1.95)***	(1. 90)***	(-1.92)***	(-1.94)***
GNS	0.0114	0.0161	0.0143	0.0123	0.0443	0.0461
	(1.97)**	(-1.99)**	(-1.99)**	(1.96)**	(2.17)**	(2.22)**
CPFS(new	--------	0.0634	--------	0.0561	---------	0.0793
instrument)	(-2.09)**		(-2.02)**		(-2.36)**	
No. of Obs	203203		203203		203203	
R-squared	0.543	0.586	0.536	0.634	----------	--------
F-Statistics	18.14	20.26	74.32	89.34	----------	---------
Hausman Test	29.56	30.13 29.56	30.13	---------	--------	
Sargan Test	--------	-------	--------	--------	56.2	38.4

Note: Equation (1) is the base regression while equation (2) is the new regression whose parameter estimates we compare with the base equation; t –values are reported in parenthesis. The dynamic model is based on the Arellano-Bond Estimation procedure. (*), (**), and (***) means significant at 1%, 5% and 10% respectively.

4.4 Results of the Unit Root Test

We collected data on per capita income on the four financial variables[15] from a sample of 7 West Africa countries, comprising; Burkina Faso, Ivory Coast, Ghana, Mali, Nigeria, Senegal and Sierra Leone, with complete data between 1975 and 2013. Data for this period is only available from seven West Africa countries. Prior to conduct the Granger causality test, we first investigate the times series properties of the data by testing for stationary using the Augmented Dickey-Fuller (ADF) and the Philips-Peron (PP) class of unit root tests.

This is because panel data framework comprises both the time effect and cross sectional effect. To this end, we check the time series properties for each country for the sample of 7 countries. The results from the unit root tests of stationary are reported in appendix A. As can be observed from appendix A, the results obtained from the unit root tests reveal that all the variables are stationary only after differencing once for both the ADF and Philips-Peron class of tests. The results thus, show that the variables are all integrated of the first order denoted as I (1).

[15] These include broad money as a ratio of GDP (use as a measure of overall financial depth), quasi-liquid liability as a ratio of GDP (use as a measure of the level of financial intermediation) , the supply of credit to the private sector by banks and Interest rate spread.

This is not surprising because, most macroeconomic processes are integrated of the first order. Given the fact that the variables have, the same order implies that the regression is not spurious, and thus, guarantees no spurious situation from the outcome of the Granger Causality tests.

4.5 Presentation of the Granger Causality Test

We implement the causality tests using the approach by Granger. In carrying out the Granger Causality tests, we relate per capita income (PCI) with each of the four financial intermediation variables to explore the existence of causal relationships between financial intermediation and per capita income for the sample of 7 countries mentioned above.

The results from the pair-wise Granger Causality tests are reported in appendix B. From the results of the pair wise Granger Causality test as shown in appendix B, the null hypothesis that, financial depth- broad money (M2) does not Granger Cause per capita income (PCI) is rejected in two countries; namely, Ivory Coast and Mali. This therefore indicates that, for this set of countries, broad money granger cause's growth. The results in appendix B also indicate a rejection of the null hypothesis that, PCI does not cause broad money in two countries; namely; Nigeria and Sierra Leone. Thus, this result implies that in this group of countries, PCI causes broad money. For the remaining countries, the results, as shown in appendix B indicates no clear flow of causation between financial deepening and PCI. This does not imply that financial sector does not affect income in this group of countries, but that, causation may arise from other aspects of the financial system other than the overall financial depth- broad money (M2).

In terms of the relationship between PCI and the extent of financial intermediation (M3), we also report the results of the pair wise Granger causality tests in appendix B. The results from the pair-wise Granger Causality test indicate a rejection of the null hypothesis that, financial intermediation (M3) does not Granger causes PCI growth in two countries; namely; Ivory Coast and Sierra Leone. This implies that in this group of countries, financial intermediation causes growth in PCI. The results further indicate a rejection of the null hypothesis that, PCI does not Granger causes financial intermediation in three countries; namely; Burkina Faso, Mali and Nigeria. In particular, the results indicate no clear flow of causation between the level of financial intermediation and per capita income for countries like; Ghana and Senegal.

With respect to the causation between PCI and credit supply to the private sector, we further, present the results of the pair-wise Granger causality test in appendix B. The results presented in appendix B rejects the null hypothesis that credit supply does not Granger Causes PCI for twocountries; namely; Burkina Faso and Sierra Leone. This therefore indicates that, credit supply to the private sector by banks causes PCI in this set of countries. For the remaining countries, the results also show no clear flow of causation between credit supply to the private sector and per capita income.

With respect to the causation between per capita income and interest rate spread, we finally present the results of the pair-wise Granger causality test in appendix B. The results presented in appendix B reject the null hypothesis that, interest rates spread does not Granger Causes per capita income for two countries; namely; Burkina Faso and Mali. This therefore indicates that, interest rate spread Granger causes per capita income in this set of countries. The results also show a rejection of the null hypothesis that per capita income does not Granger cause interest rate spread for three countries; namely; Ivory Coast, Nigeria and Sierra Leone. The result further shows no clear flow of causation for two countries namely, Ghana and Senegal. For the countries as discussed above, causation runs from financial intermediation to growth (uni- directional relationship). While for the other countries as also discussed above, causation runs from per capita income to financial intermediation (also uni-directional relationship). In general, the hypothesis that causality exist between financial intermediation and economic growth is supported.

4.6 Presentation of Johansen Co-integration

We implore the co-integration tests using the approach by Johansen (1988). The co-integration test entails determining the rank of the co-integrating vector which determines the number of valid independent equations that can be obtained from our variables of interest. A system with only one valid co-integrating vector implies a unilateral flow of causation amongst the variables entering into that equation, and therefore rules out, the possibility of a bilateral causation between the variables of interest.

From the results of the co-integration test presented in appendix C, a maximum of one co-integrating vectors is confirmed for the sample of 7 West Africa countries. This means that for this group of countries, one valid long-run equation can be derived from amongst the four financial indicators and PCI- (M2, M3, CPB, IRS, and PCI) used in the previous analysis. Thus, this indicates the possibility of a uni-directional causation between financial intermediation and economic growth. This result is consistent with the studies by (Jung, 1986), Demetriades and Hussein (1996) who find unilateral causality between financial development and economic growth in a number of developing countries.

Thus, going by the previous results of the Granger causality tests, it could be observed that for country like; Nigeria, growth in GDP does not enter as an endogenous variable in all the equations. Thus, for this country per capita income is an exogenous variable – implying that causation either flows from per capita income to any of the financial variables or amongst the financial variables themselves. This implies that for Nigeria, financial intermediation does not Granger cause growth in PCI. This country therefore, conforms to "demand-following" finance led –growth relationship.

The results from the co-integration tests further reveal that for countries like; Burkina Faso, Ivory Coast, Sierra Leone and Mali, causation flows from financial intermediation to per capita income, implying, conformity to "Supply-leading" relationship in this group of countries. This result is consistent with the works by Odedokun (1996) whose findings, strongly support the finance-led growth hypothesis. Finally, for Senegal and Ghana, the results reveal that causation only exists amongst the financial variables themselves.

In general, the link between financial intermediation and economic growth rule out the possibility of bi-directional relationship as evidenced by the results of the Johansen co-integration test with regards to the number of co-integrating vectors. The Johansen co-integration tests result confirms the Granger causality test results. Thus, test for co-integration by the Johansen approach is an alternative way of testing for causality.

5. Conclusions

The study empirically investigates the impact of financial intermediation on economic growth in West Africa countries from 1985 to 2013. Relevant data were collected from a cross-section of 10 West Africa countries in order to determine the relative impact of financial intermediation on growth.

The study reveals key findings that are summarize as follows: (i) broad money (M2) and the level of financial intermediation (M3) positively impact on growth of per capita income in the sample of WA countries over the period; (ii) credit supply to the private sector and interest rate spread negatively impact on growth in the region. To improve on the growth effects of credit to the private sector and promote financial intermediation in the region. Policy makers need to re-visit interest rate policies in an effort to ensure narrow spread between the lending and deposit rates; (iii) result from the dynamic panel indicates that inflation negatively affects growth in these WA countries, also, the result from the summary statistics reveals high inflation- double digit inflation, which may suggest some level of macroeconomic instability, and thus constrained the efficacy of the financial intermediation and hence economic growth in the region. Therefore, policies measures directed towards less much of money growth could possibly be of relevance in achieving low inflation and; (iv) the results from the causality tests reveal that, whilst causation flows from financial intermediation to per capita income, for countries Burkina Faso, Ivory Coast, Sierra Leone and Mali, implying, conformity to "Supply-leading" relationship in this group of countries.

For Nigeria, causality flows from per capita income to financial intermediation and therefore, conforms to "demand-following" finance led –growth relationship. Finally, for Senegal and Ghana, the results reveal that causation only exists amongst the financial variables themselves.

A major limitation that largely constrained the scope of this study is due to unavailability of data on some key financial markets variable, the also study adopts panel data approach which does not clearly account for specific country issues, and that generalization made based on panel results be imprecise (Levine and Zervos, 1996).

Therefore, necessary exercise is needed to conduct a country specific study on the effect of financial development on economic growth. Such study could be, assessing the impact of stock market's capitalization/development on economic growth to country specific. Despite these limitations, nonetheless, the findings are relevant to policy makers and development organizations that are helping out in the growth process of African economies.

References

Arellano, M., Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *Review of Economic Studies, 58,277- 297.*

Aryeetey, E., Senbet, L.W (2004). Recent Developments in African Financial Markets: Agenda for Further Research, *Journal of African Economies, 12(2):111-152.*

Athukorala, P. (1998). Interest Rates, Saving and Investment: Evidence from India, *Oxford Development Studies, 26(2): 153-169.*

Barro, R. J. (1989a). A Cross Country Study of Growth, Saving and Government: *National Bureau of Economic Research Working Paper No. 2955, USA.*

Bencivenga, V.R., Smith, B.D. (1991). Financial Intermediation and Endogenous Growth. *Review of Economic Studies, 58: 195-209.*

Bencivenga, V.R., Smith, B.D. (1992). Deficits, Inflation and the Banking System in Developing Countries: The Optimal Degree of Financial Repression. *Oxford Economic Papers, 44: 767-90.*

Boyd, J., Smith, B. (1998). The Evolution of Debt and Equity Markets in Economic *Development. Economic Theory, 12:519-560.*

De la Fuente, A., Domeneh, R. (2000). Human Capital in growth regression: How much difference does data quality make?*CEPR discussion paper no. 2466.*

Demetriades, P., Hussein, K. (1996). Does Financial Development Cause Economic Growth? Time Series Evidence from 16 Countries. *Journal of Development Economics, 51: 387-411*.

Diamond, D., Dybvig, P. (1983). Bank Runs, Deposit Insurance, and Liquidity. *Journal of Political Economy, 85:191-206.*

Diamond, D.W. (1984). Financial Intermediation and Delegated Monitoring. *The Review of Economic Studies, 51(3): 393-414.*

Dickey, D.A., Fuller, W.A. (1979). Distribution of the Estimators of Autoregressive Time Series with *a* Unit Root. *Journal of the American Statistical Association, 74(2): 427-31.*

Fielding, D., Mizen, P. (1997). Investment, Output and Interest Rate Policy when Capital is Mobile. *The Economic Journal, 107(441): 431- 440.*

Fritz, R.G. (1984).Time Series Evidence on the Causal Relationship between Financial Deepening and Economic Development. *Journal of Economic Development, 38(5): 91-112.*

Fry, M.J. (1998). Money, Interest and Banking in Economic Development. John Hopkins Studies in Development Studies Series. *JohnHopkins University Press, London.*

Gelbard, E., Pereira, L.S. (1999). Measuring Financial Development in Sub- Saharan Africa. International Monetary Fund Working Paper *99/105, Washington DC, 1999.*

Genotte, G., Pyle, D. (1991). Capital Controls and Bank Risk. *Journal of Banking and Finance, 15: 805-824.*

Goldsmith, R. (1969). Financial Structure and Development. *Yale University Press, New Haven, 1969.*

Granger, C.W. J. (1969) Investigating Causal Relations by Econometric Models and Cross-Spectral Methods. *Econometrical, 37(2): 13-15.*

Greenwood, J., Jovanovich, B. (1990). Financial Development, Growth and the Distribution of Income. *Journal of Political Economy, 98: 1076-1107*.

IFS-Data Base, 2013. Available online: www.ifs.org

Jung, W. S. (1986). Financial Development and Economic Growth: International Evidence. *Economic Development and Cultural Change, 34: 333-346.*

King, R.G., Levine, R. (1993a). Finance and Growth: Schumpeter Might Be Right. *Quarterly Journal of Economics, 108(3):717-38.*

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R. (2001). Government Ownership of Banks. *Journal of Finance, 57(1): 265-301.*

Lanyi, A. Saracoglu, R (1989). Interest rate policies in developing countries. *Occasional Papers 22, International Monetary Fund, 1989.*

Levine, R., Zervos, S. (1996). Stock Market Development and Long run Growth. *World Bank Economic Review, 10(2):323-339.*

Mankiw, N.G., Romer, D., Weil, D.(1992). A Contribution to the Empirics of Economic Growth. *Quarterly Journal of Economics, 152: 407 – 437*.

McKinnon, R.I. (1973). Money and Capital in Economic Development. *Brookings Institution Washington D.C,*

Ndikumana, L. (2000). Financial Determinants of Domestic Investment in Sub-Sahara Africa Evidence from Panel Data.*World Development, 28 (2):381 -400*.

Odedokun, M.O (1996). Alternative Econometric Approaches for Analyzing the Role of Financial Sector in Economic Growth: Time Series Evidence from LDCs. *Journal of Development Economics, 50: 119 -146.*

Pagano, M. (1993) "Financial Markets and Growth: An Overview". *European Economic Review, 37(2-3): 613-22.*

Patrick, H. (1966). Financial Development and Economic Growth in Under-Developed Countries. *Economic Development and Cultural Change, 14:174 - 189.*

Phillips, P.C.B., Perron, P. (1988). Testing for Unit Roots in Time Series Regression. *Biometrika,75: 335-46.*

Reinhart, C.M., Tokatlidis, I. (2003). Financial liberalization: the African experience. *Journal of African Economies Supplement 2, 12 (0):53-88.*

Robinson, J. (1952).The Rate of Interest and Other Essays. *London, 1952.*

Romer, P. M. (1989). Capital Accumulation inthe4 Theory of Long run Growth: In Modern Macroeconomics (ed. R. Barro*), Cambridge, HarvardUniversity Press.*

Romer, P.M. (1986). Increasing Returns and Long run Growth. *Journal of Political Economy, 94: 1002 -1037.*

Schumpeter, J.A. (1911). A Theory of Economic Development Cambridge, MA: *Harvard University Press.*

Schumpeter, J.A. (1969). The Theory of Economic Development. Oxford University Press.

Shaw, E.S. (1973). Financial Deepening in Economic Development. *Oxford University Press, New York.*

Singh, A. (1997). Stock Markets, Financial Liberalization and Economic Development. Economic *Journal, Royal Economic Society, 107(442):771–782.*

Spears, A. (1992). The Role of Financial Intermediation in Economic Growth in Sub-Sahara Africa. Canadian. *Journal of Development Studies, 13(3):361 - 380*.

Stiglitz, J.E., (1981). Weiss .A. Credit Rationing in Markets with Imperfect Information. *Oxford Review of Economic Policy, 5(4):55-68.*

Streeten, P. (1973). The Multinational Enterprise and the Theory of Development Policy. *World Development, 1: 1- 14.*

Warman, F., Thirlwall, A.P. (1994). Interest Rates, Saving, Investment and Growth in Mexico 1960-90: Tests of the Financial Liberalizations Hypothesis .*The Journal of Development Studies, 30(3):629-647.*

World Bank Data Base, 2013. Available online www.worldbank.org

World Bank. Adjustment in Africa (1994). Reforms, Results and the Road Ahead .World Bank Policy Research Report, World Bank, WashingtonDC.

Appendices

Appendix A: Result of the Unit Root Tests for Stationarity of (PCI, M2, M3, CPB and IRS)

Unit Root Test of Stationarity for PCI

Country	ADF – Test Critical Values: 1% = -4.2013, 5% = -3.4458 and10% = -3.2156		Philips Peron Test Critical Values : 1% = -4.2105 5% = -3.5213 and10% = -3.1878		Test Conclusion for Series
	In Levels	FirstDifference	In Levels	FirstDifference	
Burkina Faso	-1.9892	-3.3854*	-2.8283	-6.7657***	I(1)
Ivory Coast	-1.8968	-3.7370**	-1.6946	-5.2641***	I(1)
Ghana	-1.6020	-3.3692*	-1.5354	-4.5166***	I(1)
Mali	-1.6673	-3.6619 **	-1.6591	-5.4039***	I(1)
Nigeria	-1.8870	-3.5447**	-1.7308	-4.7421***	I(1)
Senegal	-1.6832	-4.5049***	-1.5939	-5.5014***	I(1)
Sierra Leone	-2.1736	-3.3766**	-1.9276	-4.2759***	I(1)

Unit Root Test of Stationarity for M2

Country	ADF – Test Critical Values : 1% = -4.2013, 5%=-3.4458and10% = -3.2156		Philips Peron Test Critical Values : 1% = -4.2105 5% =-3.5213 and 10% = -3.1878		Test Conclusion for series
	In Levels	First Difference	In Levels	First Difference	
Burkina Faso	-2.1164	-3.7712**	-1.9139	-5.7111***	I(1)
Ivory Coast	-1.6023	-3.3667*	-1.3124	-6.5990***	I(1)
Ghana	-2.143	-5.1717***	-2.2319	-5.5938***	I(1)
Mali	-2.6738	-4.6418***	-2.9635	-6.9621***	I(1)
Nigeria	-2.6852	-4.6403***	-2.9838	-6.9876***	I(1)
Senegal	-2.1249	-3.9339**	-2.2890	-6.4938***	I(1)
Sierra Leone	-2.5814	-3.9549**	-2.2994	-5.2104***	I(1)

Unit Root Test of Stationarity for M3

Country	ADF – Test Critical Values : 1% = -4.2013, 5% = -3.4458 and 10% = -3.21564		Philips Peron Test Critical Values : 1% = -4.2105 5% =-3.5213and10%= -3.1878		Test Conclusion for Series
	In Levels	FirstDifference	In Levels	FirstDifference	
Burkina Faso	-1.4834	-3.7554**	-1.4852	-7.6367***	I(1)
Ivory Coast	-0.8256	-3.5865**	-0.7316	-6.2480***	I(1)
Ghana	-1.8464	-4.2582***	-1.7105	-5.6704***	I(1)
Mali	-2.6572	-5.5018***	-2.2868	-7.3430***	I(1)
Nigeria	-2.0408	-5.1058***	-2.2302	-6.6486***	I(1)
Senegal	-1.7646	-3.4078*	-1.7116	-4.7076***	I(1)
Sierra Leone	-2.6492	-5.2266***	-2.3072	-5.0558***	I(1)

Unit Root Test of Stationarity for CPB

Country	ADF – Test Critical Values: 1% = -4.2013, 5%=-3.4458and10%= 3.21564		Philips Peron Test Critical Values : 1% = -4.2105 5%= -3.5213 and 10% = -3.1878		Test Conclusion for Series
	In Levels	FirstDifference	In Levels	FirstDifference	
Burkina Faso	-2.3814	-3.9104**	-1.4074	-7.1537***	I(1)
Ivory Coast	-2.5012	-3.2233*	-1.9126	-5.2729***	I(1)
Ghana	-1.2730	-4.4156**	-1.2358	-5.0643***	I(1)
Mali	-1.0926	-5.7250***	-0.8190	-6.1739***	I(1)
Nigeria	-2.3268	-5.4332***	-1.9446	-5.1532***	I(1)
Senegal	-1.3776	-5.3362***	-1.0992	-5.3440***	I(1)
Sierra Leone	-0.7684	-3.2630*	-0.7764	-4.9636***	I(1)

Unit Root Test of Stationarity for IRS

Country	ADF – Test Critical Values : 1% = -4.2013, 5%=-3.4458and 10% = -3.21564		Philips Peron Test Critical Values: 1% = -4.2105 5%=-3.5213and10%= -3.1878		Test Conclusion for Series
	In Levels	FirstDifference	In Levels	FirstDifference	
Burkina Faso	-1.7045	-3.2648*	-2.7226	-6.7134***	I(1)
Ivory Coast	-1.2646	-3.4836**	-1.5904	-4.1702***	I(1)
Ghana	-1.5104	-3.3026*	-1.5116	-4.4110***	I(1)
Mali	-1.5737	-3.6568 **	-1.6212	-5.4027***	I(1)
Nigeria	-1.8643	-3.4490**	-1.7530	-4.6344***	I(1)
Senegal	-1.5841	-4.2027***	-1.5115	-5.5123***	I(1)
Sierra Leone	-2.0174	-3.3633**	-1.8836	-4.3432***	I(1)

Appendix B: Result of the Granger Causality Test (PCI, M2, M3, CPB and IRS)PCI Vs M2.

Country	Null Hypothesis	F-Statistics	P-Value	Conclusion
Burkina Faso	$H_{01:}$	1.2032	0.3154	No Causality
	H_{02}:	0.2939	0.7468	
Ivory Coast	$H_{01:}$	5. 5172	0.0076*	M2 ⟶ PCI
	H_{02}:	0.8758	0.4212	
Ghana	$H_{01:}$	0.0350	0.9632	
	H_{02}:	0.6558	0.5296	No Causality
Mali	$H_{01:}$	4.2478	0.0188**	M2 ⟶ PCI
	H_{02}:	1.7910	0.1764	
Nigeria	$H_{01:}$	0.4532	0.7108	
	H_{02}:	3.8432	0.0195**	PCI ⟶ M2
Senegal	$H_{01:}$	0.1526	0.2342	
	H_{02}:	0.2686	0.8435	No Causality
Sierra Leone	$H_{01:}$	1.9890	0.1350	
	H_{02}:	4.1418	0.0192**	PCI ⟶ M2

Note: Null Hypothesis**:** H_{01}**:** M2 does not Granger Cause PCI and H_{02}**:** PCI does not Granger ⟶ Cause M2. Where the notation; X Y means, variable X Granger Causes Y. (*), (**) and (***) means 1%, 5% and 10% significant level respectively.

PCI Vs M3

Country	Null Hypothesis	F-Statistics	P-Value	Conclusion
Burkina Faso	$H_{03:}$	0.4158	0.6638	
	H_{04}:	6.0448	0.0018*	PCI ⟶ M3
Ivory Coast	$H_{03:}$	2.6776	0.0880***	M3 ⟶ PCI
	H_{04}:	0.0160	0.9842	
Ghana	$H_{03:}$	0.4454	0.6424	
	H_{04}:	0.4482	0.6416	No Causality
Mali	$H_{03:}$	0.7250	0.5458	
	H_{04}:	11.250	0.00016*	PCI ⟶ M3
Nigeria	$H_{03:}$	0.2494	0.8618	
	H_{04}:	5.3870	0.0090*	PCI ⟶ M3
Senegal	$H_{03:}$	2.2198	0.1042	
	H_{04}:	0.2996	0.8272	No Causality
Sierra Leone	$H_{03:}$	12.9123	0.000034*	M3 ⟶ PCI
	H_{04}:	1.3288	0.2834	

Note : Null Hypothesis**;** H_{03}**:**M3 does not Granger Cause PCI, H_{04} **:**PCI does not Granger Cause M3. Where the notation; X ⟶ Y means, variable X Granger Causes Y. (*), (**) and (***) means 1%, 5% and 10% significant level respectively.

PCI Vs CPB

Country	Null Hypothesis	F-Statistics	P-Value	Conclusion
Burkina Faso	$H_{05:}$	3.8066	0.0358**	CPB ⟶ PCI
	H_{06}:	0.8352	0.4440	
Ivory Coast	$H_{05:}$	0.6374	0.5930	
	H_{06}:	1.6376	0.2062	No Causality
Ghana	$H_{05:}$	1.2522	0.2919	
	H_{06}:	0.5324	0.5958	No Causality
Mali	$H_{05:}$	0.3116	0.8158	
	H_{06}:	0.9050	0.4556	No Causality
Nigeria	$H_{05:}$	0.2112	0.8866	
	H_{06}:	1.6178	0.2052	No Causality
Senegal	$H_{05:}$	0.2890	0.8334	
	H_{06}:	2.0652	0.1226	No Causality
Sierra Leone	$H_{05:}$	15.1581	0.0000094*	CPB ⟶ PCI
	H_{06}:	2.2482	0.10520	

Note : Null Hypothesis**:** H_{05}**:**CPB does not Granger Cause PCI , and H_{06} **:**PCI does not Granger Cause CPB. Where the notation; X ⟶ Y means, variable X Granger Causes Y. (*), (**) and (***) means 1%, 5% and 10% significant level respectively.

PCI Vs IRS

Country	Null Hypothesis	F-Statistics	P-Value	Conclusion
Burkina Faso	$H_{07:}$	3.8586	0.0346**	IRS ⟶ PCI
	H_{08}:	0.2918	0.7489	
Ivory Coast	$H_{07:}$	1.2134	0.3141	PCI ⟶ IRS
	H_{08}:	4.6523	0.0192**	
Ghana	$H_{07:}$	0.0325	0.9632	
	H_{08}:	0.6538	0.5296	No Causality
Mali	$H_{07:}$	4.2448	0.0134**	IRS ⟶ PCI
	H_{08}:	1.7928	0.17141	
Nigeria	$H_{07:}$	0.4528	0.7127	
	H_{08}:	3.8432	0.0198**	PCI ⟶ IRS
Senegal	$H_{07:}$	0.1526	0.2342	No Causality
	H_{08}:	0.2649	0.8435	
Sierra Leone	$H_{07:}$	1.9849	0.1336	
	H_{08}:	4.1428	0.0192**	PCI ⟶ IRS

Note : Null Hypothesis**:** H_{01} **:**IRS does not Granger Cause PCI, and H_{02} **:** PCI does not Granger Cause IRS . Where the notation; X ⟶ Y means, variable X Granger Causes Y. (*), (**) and (***) means 1%, 5% and 10% significant level respectively.

Appendix F: Result of the Johannsen Co-integration test

Country	Johansen's Trace Statistics (TS) and 5% critical Values (CV)	Null Hypothesis for the rank				Maximum No. of Co-integrating Vectors
		r = 0	**r ≤ 1**	**r ≤ 2**	**r ≤ 3**	
Burkina	TS	55.06	18.04**	11.71	2.97	
Faso	CV	46.42	29.34	15.47	3.38	1
Ivory	TS	43.28**	21.32	9.38	3.28	
Coast	CV	46.42	29.34	15.47	3.38	1
Ghana	TS	37.92**	21.40	6.14	1.36	
	CV	46.42	29.34	15.47	3.38	1
Mali	TS	41.46	21.76**	7.82	0.02	
	CV	46.42	29.31	15.44	3.76	1
Nigeria	TS	56.48	17.56**	8.37	0.90	
	CV	46.42	29.34	25.47	3.38	1
Senegal	TS	48.39	17.92**	7.46	0.002	
	CV	46.42	29.34	15.47	3.76	1
Sierra	TS	55.72	26.76**	12.26	2.80	
Leone	CV	46.42	29.34	15.47	3.38	1

Note: where (**) means rejection of the null hypothesis at the 5% level of significance.Where TS is the trace Statistics and CV is the 5% Critical Value of the test.