



# Bank competition, financial innovations and economic growth in Ghana

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## Abstract

**Purpose** – This paper takes the finance-growth nexus further by looking at the relationship between bank competition, financial innovations and economic growth in Ghana. The purpose of this paper is to find the causality among bank competition, financial innovations and economic growth in Ghana.

**Design/methodology/approach** – The relationship between bank competition, financial innovations and economic growth was established through the framework of the endogenous growth model. In addition, the paper employed the bound testing ARDL cointegration procedures to enable us to establish both short-run and long-run relationship between bank competition, financial innovations and economic growth. Granger causality test were also estimated to determine the direction of causality.

**Findings** – The results showed that, in the long run, bank competition is positively related to economic growth while financial innovation is negatively related to economic growth. In the short run, bank competition is negatively related to economic growth. By the same token, financial innovation is positively related to economic growth in the short run. In terms of causality, the results showed that there is unidirectional Granger causality from bank competition to economic growth. However, there is bidirectional Granger causality between financial innovation and economic growth.

**Practical implications** – The study therefore, recommends for more regulations toward a more competitive banking system with more innovative products tailored toward mobilization of savings and investment to growth induced sectors of the economy.

**Originality/value** – This paper provides a time series perspective to the finance-growth nexus and highlights the potential contribution of effective banking development to the economic welfare of the Ghanaian citizens.

**Keywords** Causality, Cointegration, Bank competition, Endogenous growth, Financial innovations

**Paper type** Research paper

## 1. Introduction

McKinnon (1973) and Shaw (1973) long ago advocated for a free unregulated financial markets in order to promote economic growth. Following their exposition, seminal work by King and Levine (1993) opened the floodgate for an empirical works to be conducted on the finance-growth nexus. By extending the work of Barro (1991) with financial development indicators such as the ratio of credit to the private sector or the ratio of liquid liabilities to the real growth of per capita gross domestic product (GDP), they established a strong significant positive linkage between financial development and economic growth for a cross-section of 80 countries between the period 1960 and 1989. Since then, numerous studies, both at the cross-country level and single country levels have augmented the positive finance-growth relationship. Elsewhere, Christopoulos and Tsionas (2004), Ghirmay (2004) and Abu-Bader and Abu-Qarn (2005) confirm the



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strong linkage between finance and growth. Similarly, in Ghana, empirical studies after the structural adjustment programme (SAP) affirm some level of linkage between financial development and economic growth. For example, Quartey and Prah (2008), Eso (2010), Frimpong and Adam (2010) and Adenutsi (2011) back the assertion that finance leads to real economic growth in a liberalized financial environment.

However, recent evidence by Rousseau and Wachtel indicated that the robust positive significant relationship between financial variables and economic growth is dwindling. By using almost the same data set used by King and Levine (1993). Rousseau *et al.* concluded that the finance and growth linkage is not as strong as it used to be. This finding re-affirms the position of Lucas (1988) and Robinson (1952). A generation ago, Lucas (1988) commented that the role of finance in growth is “over-stressed” while a half a century ago, Robinson (1952) asserted that “where enterprise leads, finance follows” – meaning it is rather economic growth that pulls financial development and not the other way round. These therefore, call for further investigation into the finance-growth nexus.

Besides, Ghana’s banking system has experienced interesting developments in the past two decades. Some recent developments in the banking system include, the Banking (Amendment) Act 2007, Act 738 which introduced three types of banking licenses: general banking license (for universal and off-shore banking), class 1 banking license (for universal banking ) and class 2 banking license ( for off-shore banking). Legislations also include, the Credit Reporting Act 2007 (Act 746) as well as the Anti-Money Laundering Act, 2007 (Act 749), introduced to check money laundering.

In order to bring banking to forefront of the move toward middle income status, the BoG has increase the minimum capital requirement of banks from Ghana Cedis 7 million to a Ghana Cedis 60 million. All Ghanaian owned banks are expected to have Ghana Cedis 25 million by the end or 2010, and eventually, the Ghana Cedis 60 million mark by 2012. Their foreign counterparts are expected to meet the new threshold by the end of 2009. This is expected to boost the banks’ contractual capability given the oil-production state of Ghana.

In August, 2006 the BoG abolished the 15 percent secondary reserve requirements of the banks. Together with the reduction of governments overall domestic debt-to-GDP from 29 percent (2002) to 10.1 percent (2006) and reduction in the prime rate 24.5 percent (2002) to 12.5 percent (2006). Also, the banks were allowed to have more money for private sector which freed up significant liquidity for lending to businesses. According to the Ghana Banking Survey (2007), the national reconstruction levy, which ranged between 2.5 and 5 percent of profit before tax, was abolished. Some other recent improvements in the banking industry include the introduction of the nationwide payment system, e-zwitch and the Automated Cheque codeline, have also been introduced clearing system. Finally, in June 2007 the BoG introduced the new Ghana Cedi to replace the old one among others, to facilitate easier transaction. Furthermore, following the introduction of the guideline on branchless banking, three companies, Scancom Ltd, Afric Express Gh. Ltd and e-transact Gh. Ltd have linked up with some DMBs to come up with money product services such as money transfers, cash deposits, cash withdrawal, balance enquiry, credit top-up, utility bill payments and purchase of airline tickets, mobile phone banking, etc. This is to take advantage of increasing use of mobile phones to improve service provision.

The total number of DMBs as of 2010 is 26. This is made up of 13 Ghanaian owned and 13 foreign owned banks. These banks have fulfilled the requirement of Ghana Cedis 7 million for universal banking business under class 1 Banking license. This has

blurred the conventional classifications of banks under commercial, development, merchant, etc., banking as all banks can now provide any banking regardless of whether a bank is a universal bank or a commercial bank or development bank. All DMBs are now universal banks offering universal services. The banks have taken advantage of these developments and are introducing new services especially those which are ICT oriented. All these are expected to bring competitions and innovations in the banking sector.

Competition and innovations in the banking sector have indeed increased over the period. According to Hinson *et al.* (2006), one area that has seen fierce competition in the banking industry is the area of product development. New products such as international funds transfer, school fees loan, negotiable certificate of deposit, car loans, consumer/hire purchase loan, travellers' cheque, etc., have been developed. Another development that has occurred over the last decade is computerization and networking of branches. Some of the banks have a nationwide network while others have reached an advanced stage of networking all their branches. Banks operations and information processing have vastly increased (Abor, 2005).

Automated teller machines (ATMs) have become common, giving clients the freedom to transact business at their own convenience. Personal computer banking, telephone banking, internet banking, branchless banking, SMS banking, etc., have been introduced. Banks are extending their branch networks. The banking sector landscape can be said to be evolving, competitive and promising in terms of savings mobilization, development financing and service delivery (Abor, 2005; Hinson *et al.*, 2006). These are driven by the improvement in telecommunication networks and advancement in computer technology in Ghana. If these innovations are tailored towards savings mobilizations which are channelled to productive sectors, economic growth would occur.

This paper takes the finance-growth nexus further by examining the relationship between bank competition, financial innovations and economic growth. The paper also explores the causality between bank competition and economic growth on one hand and the causality between financial innovations and economic growth on the other hand. In the sections that follow, we present review of related literature. Section 3 presents the description of the theoretical and empirical model specification as well as the source of data and the description of the variables in the model specification. Section 4 provides the empirical results and their discussions. Finally, Section 5 provides the conclusion and recommendations.

## 2. Literature review

Financial innovations affect economic growth through enhanced efficiency of banks to provide services to their clients and also through allocating credits to productive entrepreneurs.

### 2.1 Financial innovations and economic growth

Schumpeter (1934) defined economic innovation as follows: The introduction of a new good; the introduction of a new method of production; the opening of a new market; the conquest of a new source of supply of raw materials or half-manufactured goods; and the carrying out of the new organization of any industry. Schumpeter also viewed innovation in macro sense as the creation of new economic system that replaces and makes obsolete the old economic systems almost as soon as they are produced.

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Innovation is normally linked to creativity, newness, novelty and invention. But Afuah (1998) tried to distinguish innovation and invention, by stating that innovation is the creation of new products and (processes), termed invention that have been commercialize. According to Tufano (2003), “financial innovation is the act of creating and then popularizing new financial instruments as well as new financial technologies, institutions and markets.” He explained further the taxonomy of financial innovations by stating that, the “innovations” are sometimes divided into product or process innovation, with product innovations exemplified by new derivative contracts, new corporate securities or new forms of pooled investment products, and process improvements typified by new means of distributing securities, processing transactions or pricing transactions.

Financial Innovation is also associated with the development of new financial instruments, the creation of new corporate structures, the formation of new financial institutions, the development of new accounting and financial reporting techniques (Michalopoulos *et al.*, 2009). Accordingly, Michalopoulos *et al.* (2009) measure financial innovation as the growth of financial development (using the growth rate of the ratio of bank credit to the private sector to GDP as a proxy for financial innovation). However, the fact still remains that, nothing under the sun is completely new, therefore financial innovations can be an adaptation or modification of existing products and processes that will ensure efficiency and hence profitability.

Thus, financial innovation is the use of new financial instruments, technological and market knowledge to offer a new product service to customers. The new product or service should cost less and/or its attributes should improve so that the innovating firm enjoys more profit than before. The product could be an improvement over a previous one or it can be that the product has never existed before. The new product is the creation of a new technology (Afuah, 1998).

According to Merton (1992), there are six functions of innovation, namely, moving funds across time and space; the pooling of funds; managing risk; extracting information to support decision making; addressing moral hazard and asymmetric information problems; and facilitating the sale of purchase of goods and services through a payment system. For finance to perform these functions effectively there should not be any institutional, political and regulatory impediment to financial innovations (Michalopoulos *et al.*, 2009). At best, government incentives such as tax subsidies should be tailored toward promoting financial innovations (Miller, 1992/2001).

Schumpeter (1939) provided an explanation of how economic growth occurs through innovations. He believed that, drivers of economic growth are the profit-oriented entrepreneurs. In their quest to make more profit, they continuously developed new products. This innovation permitted them to enjoy temporary monopoly profit. However, other firms realizing how profitable these entrepreneurs were, entered the market to compete away some of the profit. The resulting competition encouraged businesses to source new technology which both enhanced their efficiency and aided them to produce more new products. However, since entrepreneurs could not always fund these projects, they resorted to financiers (banks) to source finance. The banks in their quest to reduce risk screened out bad entrepreneurs and gave funds to only the good ones. This in a way ensured efficient allocation of resources into productive areas. Efficient allocation of productive resource brought economic development. If this continued for an extended period of time, society would be better off. Unlike the neoclassical interventions, there would be nothing like the equilibrium growth rate since that would never occur because

of a phenomenon he terms “creative destruction.” That is, because new forms of innovations potentially cannibalized existing processes and products, entrepreneurs would not stop innovating for equilibrium state of growth to be realized. In a way, a profit-oriented entrepreneurs influenced economic development by developing and diffusing innovation.

Commenting on the Schumpeter’s theory, Screpanti and Zamagni (2005) stated that, it was the greater productivity of innovative investments that explained the rate of interest, which was for the bank, the selling price of credit and also the cost of finance for the entrepreneur. Therefore, interest rate is a monetary variable and its existence depends on the entrepreneur’s ability to make profit and therefore his ability to pay that rate. They stressed that, this explained why Schumpeter viewed the rate of interest as zero when the economy is in equilibrium.

Similarly, Aghion and Howitt (1992) viewed the link between technological progress and growth through research and developments (R&D) conducted by firms to create innovations. They stressed that, every innovation gives rise to the production of new type of intermediate goods which in turn produces a final product more efficiently. Therefore, individuals and firms have the incentive to invest in research because they perceive a monopoly rents through the legal protection they hope to receive. Thus, in the absent of laws and regulations that protect innovators, firm would not undertake research and create innovations. However, those rent are rendered fruitless by a superior innovation which makes the old products obsolete almost as soon as they are launched. In effect, the level of innovativeness of firms depends on their market power and the extent to which (legal) institutional mechanisms are put in place to protect innovators.

Thus, the role of banks and other financiers in channelling innovations into growth are twofold. First, banks screen and sponsor potentially viable innovative projects, while living out likely risky projects. Banks can choose to monitor the actions of entrepreneurs and managers of firms to ensure that they do not engage in adverse activities that puts investment of shareholder in jeopardy (King and Levine, 1993; Levine, 1997). Alternatively, the banks themselves can be innovators by introducing new banking products that will help them serve their customers better, mitigate the effects of changes in macroeconomic variables such as inflation and interest rates and above all enjoy a monopoly rents at least in the short run. The second point forms the arguments in King and Levine (1993), Levine (1997), Rousseau (1998) and Michalopoulos *et al.* (2009).

Rousseau (1998) modeled the innovations in the US financial sector around intermediaries’ ability to monitor loan recipients in order to limit credit liability. Ostensibly, an intermediary’s capacity to reduce credit risk through innovation will earn her temporary rent by lowering rates and motivating borrowers with low risk of default to come and subscribe for loans. The innovators will continue to enjoy this rent until other banks adopt the improvement. When more banks adopt the new monitoring system for an extended period of time, competition for loanable funds occur which raises the deposit rate. More deposits channel funds to projects of high prospects. This ensures that only good quality projects are financed. Second, the link between loan-deposit spread and financial deepening is enhanced.

However, unlike Schumpeter (1934), Rousseau (1998) appeared to posit that innovations do not only emanate from banks in their quest to reduce credit risk through monitoring, but also bank innovations affect financial depth and not directly economic growth. In a related argument, King and Levine (1993), Levine (1997) and

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Demirgüç-Kunt and Levine (2008) posit that, the financial system (through its ability to mobilize savings, evaluate projects, manage risk, monitor managers, and facilitate transactions) fosters technological innovations and stimulates growth. Thus, the Schumpeterian perspectives recognize the ability of banks and other financial institutions to impress upon corporate executives reduce risk, put the interest of shareholders at heart, and put savings into good use as well as reducing transaction costs and ensuring efficiency.

Michalopoulos *et al.* (2009) developed a model which sought to explain the finance-growth relationship more effectively through financial innovations other than the existing financial development and growth models. In a model referred to as the dynamic model of financial innovation and endogenous growth, financial innovation is seen as reflecting the decisions of profit maximizing agents. As in the Schumpeterian endogenous growth model, entrepreneurs earn monopoly profits by inventing better products. The role of financiers such as banks is to screen out “good” entrepreneurs from “bad” entrepreneurs. Additionally, financiers themselves engage in costly, risky and profitable process of innovation because they come up with more effective processes of screening entrepreneurs. However, previous screening processes become less effective as technology advances. In view of this, unless financiers continue to innovate, technological innovations cease to exit. Since technological innovation has a bearing on economic growth, it follows that economic growth will be inhibited should financiers stop innovating.

Thus, financial innovation works perfectly in promoting economic development through its enhancing effect on the efficiency of total factor productivity (TFP) thereby assisting in reducing costs and enhancing profitability. Additional financial innovations, through technological innovations aid banks to mobilize and channel saving into productive sector of the economy to enrich economic growth. The theoretical perspectives of the link between financial innovations and economic growth view innovations as avenue for profit seeking entrepreneurs to make more profit, as a result of being the creators of innovative product. It has also been emphasis that, innovations are to make firms more efficient and that any calculated attempt to inhibit financial innovations will retard growth (Michalopoulos *et al.*, 2009).

Empirically, Dynan *et al.* (2006) employ a variety of simple empirical techniques to determine links between the observed moderation in economic activity and the influence of financial innovation on consumer spending, housing investment, and business fixed investment. They suggested that, financial innovation should be added to the list of likely contributors to the mid-1980s stabilization in the USA. More specifically, Hao and Hunter (1997) found that financial innovations have direct impact on economic growth. They examine the impact of measures of a country’s financial deepness, in terms of second stage financial innovations, on a country’s rate of economic growth. From the cross-country econometric results they found that financial development (e.g. as measured by the presence of an organized financial futures market – a second stage innovation) is positively correlated to enhanced economic growth.

Similarly, Valverde *et al.* (2007), found a positive relationship between product and service innovations and regional GDP, investment and gross savings. This was expected because diffusions of innovations reflected in non-traditional products or new technological services bring benefits to both consumers of these innovative products and the banks which introduce them. Consumers benefit because it helps them allocate their savings toward these products, while the benefit that accrue to the banks arise from the possibility for them to diversify their sources of income so that they can afford

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lower interest margins. According to Michalopoulos *et al.* (2009), while technological and financial innovation reflect the profit maximizing decisions of individuals; institutions, laws, regulations and policies that impede financial innovations slow technological change and economic growth. Employing the growth rate of the ratio of bank credit to the private sector to GDP (the growth rate of financial development) and an endogenous growth equation, they found that, countries that encourage financial innovations would accelerate the rate at which their economy converges to the growth rate of the technological leader. Using, the USA as a yardstick of the technological leader, they suggest that attempt to impede financial innovation would inhibit economic growth.

In Ghana, Mannah-Blankson and Belye (2004) employed cointegration techniques and found that financial innovation is positively related to the demand for money. More recently, Ansong *et al.* (2011) applied the Johansen's cointegration techniques to investigate the existence of long-run relationship between financial innovations and savings. Using both perceptual index and the ratio of broad money (M2) over narrow money (M1) as proxies for financial innovations, they found that there exist long run relationship between financial innovations and savings. However, in the short run, the effect of financial innovations on savings is negative.

### *2.2 Bank market structure and economic growth*

The function of the banking system includes screening and allocation of credits to highly productive entrepreneurs. The ability of banks to perform this function effectively depends on the market structure of the banking industry. However, theorists of banks' market structure are divided as to which type of market structure would make the banking system more efficient in allocating credit to firms to improve capital accumulation and hence growth. Cetorelli (2001) presented these opposing views and concluded that, an oligopolistic banking market will present a fair balance between enhancing credit allocation and achieving banks' efficiency because of the trade-off between credit allocation and efficiency than the extremes of monopolistic and perfect competitive banking market. Such a balance should be the one that channels available credit to growth-oriented sectors.

According to Petersen and Rajan (1995), banks would maintain credit relationships with unknown entrepreneurs only if they could enjoy some market power within the industry, thus enabling them to strategize to partake in the profits of those entrepreneurs later. Banks enjoying market power would initially charge lower rates to attract more entrepreneurs to establish long-run relationships with them. When these entrepreneurs are successful, market power banks would be in a position to charge higher rates to extract some of the profits. For banks to provide credit to relatively unknown firms in a competitive environment, they must satisfy themselves that they would be able to create long-term relationships with successful entrepreneurs.

However, it is more likely that successful entrepreneurs would seek cheaper credits in the competitive market, thereby increasing the risk of lenders. Competitive banking environment would therefore screen out bad entrepreneurs and provide credit to potentially viable entrepreneurs, or alternatively, high-risk firms would have to pay high premium for credit to indemnify the risk involved in allocating credit to them. Therefore, a monopolistic banking environment would allocate credits more effectively and efficiently than a competitive environment.

On the other hand, Guzman (2000) contended that, there is a negative relationship between market power and economic growth. Guzman compared two similar economies,

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one with monopolistic bank and the other with competitive banking sector and concluded that the former has an inhibiting effect on capital accumulation. This is because the monopolist banker rations credit conditions than his competitive counterpart. Credit ration reduces excessive monitoring and improves the efficiency of the market power banking system. This flows from the fact that loan rates are higher with the monopolistic banks which increases the likelihood of higher default. According to Cetorelli (2001), eventually market power banks would have to incur higher cost to monitor entrepreneurs thereby reallocating resources for lending.

Shaffer (1998) explored how competitive banking environment could be harmful to banks' screening process. According to Shaffer (1998), as the number of banks increases the possibilities of bad credits abounds. It follows that, such credits are unlikely to be translated into capital accumulation for growth to occur. Similarly, as the number of banks expands, banks do not have the incentive to screen entrepreneur because screening is time consuming and entrepreneurs would not wait to be screened if alternative source of credits are available. Banks would therefore, grant credit "any how" in a haste not to lose out potential profitable transaction (Dell'Ariccia, 2000). Alternatively, if banks perceive screening and collateralization as substitutes then they will be content with asking entrepreneurs to produce collateral for credit instead of the rudiments of extensive screening of entrepreneurs to avoid risk (Manove *et al.*, 2000).

According to Cetorelli (2001), the effect of banking market structure on economic growth emanates from two angles. First, fewer number of banks reduces the amount of credit available to entrepreneurs. Second, fewer number of banks increases the incentive of to screen and make available larger proportion of funds to high quality entrepreneurs efficiently. There is a tradeoff between the size of the credit market and the efficiency with which banks allocate credit. The size and efficiency of the credit market affect economic growth by determining the returns to capital accumulation, which translate into savings.

Cetorelli (2001) stressed that, the market structure that enhances the balance between the size and efficiency of the credit market to achieve the steady state income per capita is oligopolistic market rather than the extremes of monopoly and perfect competition.

Thus, it is a certainty that market structure has impacts on economic growth through credit allocation which translates into capital accumulation. Banks also impress upon entrepreneurs to engage in economically viable projects through their monitoring and screening process. But, the market structure that maximizes the balance of both credit ration and efficiency is that of oligopolistic competition, where contestability is high. This assertion is however, subject to empirical confirmation.

Thus far, theoretical underpinnings of the effect of bank competition on economic growth conclude that both the extremes of monopoly and perfect competition impact upon economic growth negatively (Cetorelli and Gambera, 2001; Cetorelli, 2001). For example, Guzman (2000) argues that bank market power reduces equilibrium credit, thereby generating a negative effect on economic growth. On the other hand, Petersen and Rajan (1995) show that banks with market power can lend to even informational opaque entrepreneurs thereby lowering credit rations associated with competitive banking.

Empirical evidence on the positive role of a concentrated banking structure and economic growth abounds. Berger *et al.* (2004), employed data from both the developed and developing countries and found that greater market shares and efficiency ranks of



small, private, domestically owned banks are associated with greater economic performance, and that the marginal benefits of higher shares are greater when these banks are more efficient. It follows that, more competitive banking system breeds efficiency in financial intermediation, which can be more encouraging on economic development, should the necessary regulatory mechanisms put in place.

According to Boyd *et al.* (2009), competition in banking is a tool to fight bank failure. They first developed a model in which banking competition has positive effects on both loans and assets, but ambiguous effect on loan-to-asset ratio. However, by employing these predictions empirically on samples 2,500 US banks in 2003 and a panel data set of about 2,600 banks in 134 non-industrialized countries for the period 1993-2002, they found that on both cases, that bank competition is negatively related to bank failure. When competition is high, the probability of bank failure is low. They stressed that several measures of loan losses employed responded negatively with measures of bank competition. Bank competition, therefore promotes bank stability, increasing the willingness of banks to lend more. If the willingness of banks to lend more extended to even little known entrepreneurs, more credits would go to these entrepreneurs. Credit ration would reduce under such competitive environment. This stands contrary to the theoretical underpinnings that competitive banking increases credit ration to relatively unknown entrepreneur, thereby imposes negative effect on investments and growth (Petersen and Rajan, 1995).

Similarly, Clougherty (2009) suggested that budgetary commitment to anti-trust institutions encourages improved economic growth. Anti-trust institutions fight collusions and any attempts to stifle competition. By implication, if the government commits more resources to sustain competition in all sectors, economic growth would be enhanced.

Investigating the relationship between banking market structure and economic growth, DeGuevara and Joaquin Maudos (2007) provided evidence that supports Petersen and Rajan (1995) proposition that banks with some market power have incentives to establish long lasting relationships with the borrowers to overcome informational problems and facilitating access to credit, reducing financial constraints. In their study, they used data set on manufacturing industry-level growth rates and banking market concentration for US States for the period 1899-1929. It was found that, bank market concentrations have positive effect on the growth of the manufacturing sector in the early years of the twentieth century. In addition, they found that increased branch banking and more banks per capita improves growth of industries that rely on banks for external finance. They stressed that, bank entry regulations have independence effects on the growth of the manufacturing industries. These suggest that the impact of bank market structure on economic growth through the growth of industries is ambiguous.

In Ghana, Aryeetey (2001), found that the country's financial reforms resulted in interest rate liberalization, the removal of credit ceilings and other quantitative controls restructuring and recapitalization of banks, privatization of state owned banks, regulation and supervision, development of monetary and capital markets and support for informal finance and microfinance. This means that the financial liberalization in the 1980s brought some kind of efficiency within the banking sector. However, unstable economic circumstances like inflation, high interest rates, etc., have bedevilled the growth of the banking sector. Naturally, the influx of more banks into the Ghanaian banking system will increase competition. In addition inflation and interest rates volatility as well as increased regulations in the past decade should breed financial innovations. However, studies linking these development in the banking

system of Ghana to economic growth appears limited to the best of the researchers' knowledge.

Using panel data Buchs and Mathiesen (2008) concluded that the Ghanaian banking system is uncompetitive in structure, thereby hampering financial intermediation. This development is explained by factors such as, bank size, persistent needs of the government for funds from the banks, high investment cost on telecommunication in Ghana, barriers to competition on interest revenue and losses on the loan portfolio. Similar evidence was found by Aboagye *et al.* (2008). In their search for answers to the degree of market power of the Ghanaian banking system, they analyzed the banking system using the Lerner Index and concluded that there is some degree of market power in the Ghana's banking system. Among the factors that justify this development include, bank size, banks' cost efficiency, macroeconomic environment and time. But, these studies did not link the uncompetitive nature of the banking sector with economic growth.

### 3. Model specification

The neoclassical growth model postulates that economic growth is a function of technological progress in the long run (Solow, 1956). With this assertion no room is given to other factors that may influence growth, for example, financial development. Specifically, the neoclassical perspective stipulated that in the absence of transaction cost, financial development does not influence economic growth. Beyond the neoclassical proposition are the arguments by two economists: McKinnon (1973) and Shaw (1973) who advocated for an unhindered more liberalized financial system, which would lead to more growth.

In the same token, the endogenous growth literature also predicts a positive relationship between financial depth, financial innovation real income, investment and real interest rate (King and Levine, 1993). Well-developed financial markets promote investment and growth by channelling financial resources to the most productive uses. Similarly, the likes of Petersen and Rajan (1995), Guzman (2000) and Cetorelli (2001) stipulate that market structure of all forms reinforce economic growth. Based on these theoretical postulations, we considered an algebraic representation of the simplest endogenous growth model – the “AK” model by Rebelo (1991) which assumed that labor is maximized. The assumption of maximized labor is in place because Ghana does not have shortage of labor (Frimpong and Adam, 2010). Hence we state that:

$$Y_t = AK_t^{\gamma_1} \varphi^{\varepsilon_t} \quad (1)$$

where  $Y$  denotes the aggregate output at time  $t$ ,  $K$  is the capital stock at time  $t$ ,  $\varphi$  represents natural log and  $\varepsilon_t$  is an error term while  $A$  denotes TFP. The TFP captures growth in output due to other factors other than increase in physical input (capital) in the growth model. Given that TFP is endogenously determined, the endogenous growth literature suggests that bank competition and financial innovations affect economic growth not only through capital accumulation but also through the TFP channel. This channel also suggests that an efficient financial system affects growth by facilitating the adoption of modern technology to boost development of the knowledge and technology-intensive industries. Such financial system should be unhindered to promote financial innovations and bank competition and ultimately economic growth. The endogenous growth model thus offers flexible platform for a large number of factor to affect economic growth through the TFP.

In this study, we assumed that the efficiency factor is augmented by human capital accumulation (HCA) (Romer, 1986, 1990; Mankiw *et al.*, 1992; Barro and Lee, 2010), financial deepening (FDM) (King and Levine, 1993; Levine, 1997; Michalopoulos *et al.*, 2009), government expenditure (GEX), bank competition (HHI) (Guzman, 2000) financial innovation (FIN) (Michalopoulos *et al.*, 2009) and the economic reforms (DER). Inflation (INF) is assumed to be detrimental to economic growth as formally shown below:

$$A = f(FDM, GEX, HHI, FIN) = HCA^{\gamma_2} FDM^{\gamma_3} GEX^{\gamma_4} HHI^{\gamma_5} FIN^{\gamma_6} \quad (2)$$

By substituting (2) into (1), we obtain:

$$Y_t = K_t^{\gamma_1} HCA_t^{\gamma_2} FDM_t^{\gamma_3} GEX_t^{\gamma_4} HHI_t^{\gamma_5} FIN_t^{\gamma_6} \varphi^{\varepsilon_t} \quad (3)$$

In order to meet our objectives of establishing the relationship between bank competition and financial innovations on one hand and economic growth on the other hand, we found natural logarithms to Equation (3) and estimated a log-linear model of the following form:

$$\begin{aligned} \ln GDP_t = & \gamma_0 + \gamma_1 \ln PKA_t + \gamma_2 \ln HCA_t + \gamma_3 \ln FDM_t + \gamma_4 \ln GEX_t + \gamma_5 \ln HHI_t \\ & + \gamma_6 \ln FIN_t + \varepsilon_t \end{aligned} \quad (4)$$

where  $\ln$  denotes natural logarithm,  $GDP$  is economic growth,  $PKA$  is physical capital accumulation,  $HCA$  is human capital accumulation,  $FDM$  is financial deepening,  $GEX$  is government expenditure,  $HHI$  is bank competition  $FIN$  is financial innovations. The coefficients  $\gamma_0$ ,  $\gamma_1$ ,  $\gamma_2$ ,  $\gamma_3$ ,  $\gamma_4$ ,  $\gamma_5$ , and  $\gamma_6$  are the elasticities of their respective variables,  $\gamma_0$  is the constant component,  $t$  denotes time and  $\varepsilon$  is the error term. We expect that these coefficients would be positive.

The paper employed both descriptive and quantitative analysis. Charts such as graphs and tables were employed to aid in the descriptive analysis. Unit root tests were carried out on all variables to ascertain their order of integration. These annual observations were decomposed into quarter series using Goldstein and Khan (1976) interpolation procedure (see also Frimpong and Adam, 2010; Adenutsi, 2011). Finally, bounds testing cointegration approach recently popularized by Pesaran *et al.* (2001) was applied to the quarterly series another annual series from 1990 to 2009 to analyze both the short- and long-run relationship between financial innovations and economic growth. Finally, we applied the Granger causality test on the observations to determine causality among bank competition, financial innovations and economic growth. Estimations were carried out using Microfit 4.1 designed by Pesaran and Pesaran (2001).

### 3.1 Sources of data

The study employed secondary annual time series data from 1990 to 2009. These were decomposed into quarterly data by employing the interpolation procedure developed and popularized by Goldstein and Khan (1976). The choice of the data coverage was informed by the difficulty encountered in gathering annual bank specific data such as market shares of banks from 1970 to 1989. Eventually, the researcher resorted to carry out the study after FINSAP from 1990 to 2009. The bank specific data on bank market share were drawn from the supervisory division of the bank of Ghana, pricewaterhousecooper (PWC) and Ghana Association of Bankers' (GAB) annual banking survey, as well as Ziorklui (2001) which tabulated market share of the banks

from 1990 to 1997. The rest of the series were drawn from the BoG and World Development Indicators (online edition, 2011). Table I provides a summary of data source and measurements of the variables involved.

#### 4. Empirical results

In order to test for the stationarity of the variable we applied ADF test to all the variables in levels and in first difference. The results of both tests presented in Table II concludes that all variables are I(1) except LHCA which is I(0). With these results, we went to estimate the ARDL bound test.

Table II shows that with the exception of human capital accumulation (LHCA) which is I(0) all other variables are I(1). Since the ARDL cointegration technique allows for estimation of both I(1) and I(0) variables, all variable were included in the estimation. All the annual series were I(1).

Table III shows the results of the bound testing for cointegration. The calculated *F*-statistics exceeded both the upper and lower critical values provided in Pesaran *et al.* (2001). This rejects the null hypothesis of no cointegration and accepts the alternate hypothesis of cointegration relations. This means again that there exit long-run relationship among the variables. The bounded testing results indicated that that the short run level estimates could be carried out. Table IV presents the results of the short run estimates.

Table IV presents the results of the level relationships. As expected, capital accumulation (LPKA), share of government expenditure (LGEX), financial innovations

Variables	Measurement	Data sources
GDP	Growth rate of GDP/capita	World Development Indicators
PKA	Stock of GFCF and Investment/GDP	Calculated from flow of GFCF (World Development Indicators)
HCA	Average age of educational attainment of 15 +	Barro-Lee (2010) Educational attainment index
GEX	The share of government expenditure to GDP	World Development Indicators
FDM	The ratio of bank credit to the private sector to GDP and M2/GDP	World Development Indicators
HHI	Natural log of the HHI	Calculated from the financial statements of the banks (BoG)
FIN	The growth of the ratio of bank credit to the private sector to GDP	Calculated based on WDI figures

**Table I.**  
Variable measurement and data sources

Var.	Levels (trend and intercept)			Var.	First difference (trend and intercept)		
	ADF-statistic	Lag	IO		ADF-statistic	Lag	IO
GDP	1.058336 (0.9275)	11	DGDP	4.392125 (0.004)***	4	I(1)	
LPKA	-0.730222 (0.9659)	11	DLPKA	-232.6884 (0.000)***	2	I(1)	
LHCA	-4.338388 (0.0052)	11	-	-	-	I(0)	
FDM	-1.772938 (0.7057)	11	DFDM	-4.781264 (0.001)***	4	I(1)	
LGEX	-1.059355 (0.9275)	11	DLGEX	-3.7920 (0.004)***	4	I(1)	
LHHI	-2.020389 (0.5788)	11	DLHHI	-4.465476 (0.003)***	4	I(1)	
LFIN	-1.796390 (0.6946)	11	DLFIN	-4.463299 (0.003)	4	I(1)	

**Note:** \*\*\*Significant *p*-value at 1 percent level

**Table II.**  
Results of the unit root test

(LFIN) and the intercept (C) are positively and significantly related to economic growth in the in the short run. On the other hand, human capital (LHCA), financial deepening (LFDm), bank competition (LHHI) and the time trend (TTT) are negatively related to economic growth in the short run. But, government expenditure, financial deepening and the time trend are not significant in explaining economic growth.

The error correction representation in Table V showed a significant error term (ECM) at the 1 percent level which has the required negative sign and indicates the speed of adjustment toward the long run is 100 percent. This means there is a perfect adjustment to long run equilibrium anytime there is shock in the short run.

Other dynamics in the error correction model include a significant positive relation between the first, second and third lags of economic growth with current growth level. This means that previous growth levels are robust in explaining current growth levels. Similarly, the first, second and third lags of the first difference of bank competition are significantly positively related to economic growth. This means that previous level of competition in the banking system improve economic growth in the long run. Table V also shows that physical capital, human capital and financial deepening are not important in explaining economic growth in the long run. But, the lag of the first difference of physical capital is indirectly related to growth in the long run. Finally, there is a negative relation between the lags of first difference of financial innovation and economic growth which implies that previous level of financial innovation is not directly related to economic growth in the long run.

The existence of the long-run relationships call for an investigation into the extent of causality between the independent and dependent variables. Accordingly, we estimated Granger causality test. Table VI shows the Granger causality results of Equations (3) and (4) based on the maximum lag selection of 4 since the series are

Critical Value Bounds of the <i>F</i> -Statistics: unrestricted intercept and unrestricted trend case						
<i>k</i>	0.050 level		0.025 level		0.010 level	
6	I(0) 2.87	I(1) 4.00	I(0) 3.19	I(1) 4.38	I(0) 3.60	I(1) 4.90
Calculated <i>F</i> -statistic: F(LGDP/LPKA,LHCA,LFDm,LGEX,LHHI,LFIN) = 34.1971***						

**Table III.**  
Bound test for  
Cointegration results

**Note:** *k* is the number of regressors. \*\*\*Statistical significant at 1 percent level  
**Source:** Critical values were obtained from Pesaran *et al.* (2001, pp. 301)

Dependent variable is LGDP			
Regressor	Coefficient	SE	T-ratio[Prob]
<i>67 Observations used for estimation from 5 to 71</i>			
LPKA	2.4351	0.6883	3.5381[0.001]
LHCA	-0.8707	0.4144	-2.1011[0.042]
LFDm	-0.0107	0.0163	-0.6572[0.515]
LGEX	0.2673	0.5587	0.4784[0.635]
LHHI	-2.4893	0.5371	-4.6346[0.000]
LFIN	0.0588	0.0290	2.0310[0.049]
C	6.0563	1.2654	4.7859[0.000]
TTT	-0.0038	0.0033	-1.1333[0.264]

**Table IV.**  
Estimated short run  
coefficients using the  
ARDL approach

**Note:** ARDL (4,2,2,0,3,4,4) selected based on Akaike information criterion

Dependent variable is DLGDP			
Regressor	Coefficient	SE	T-ratio[Prob]
<i>67 Observations used for estimation from 5 to 71</i>			
DLGDP(-1) <sup>a</sup>	0.3356	0.1426	2.3541[0.023]
DLGDP(-2)	0.3266	0.1210	2.6991[0.010]
DLGDP(-3)	0.2642	0.1272	2.0762[0.044]
DLPKA	0.9122	0.7279	1.2533[0.217]
DLPKA(-1)	-1.8540	0.7263	-2.5528[0.014]
DHCA	0.2254	0.3357	0.6715[0.505]
DHCA(-1)	0.5307	0.3179	1.6690[0.102]
DFDM	-0.0107	0.0158	-0.6780[0.501]
DLGEX	2.8644	0.7898	3.6270[0.001]
DLGEX(-1)	0.9006	0.6180	1.4574[0.152]
DLGEX(-2)	1.5230	0.7215	2.1108[0.040]
DLHHI	-0.1755	0.5199	-0.3376[0.737]
DLHHI(-1)	2.0254	0.5738	3.5297[0.001]
DLHHI(-2)	2.0132	0.5212	3.8626[0.000]
DLHHI(-3)	1.4166	0.4039	3.5073[0.001]
DLFIN	-0.0472	0.0282	-1.6727[0.101]
DLFIN(-1)	-0.1125	0.0348	-3.2351[0.002]
DLFIN(-2)	-0.0995	0.0309	-3.2212[0.002]
DLFIN(-3)	-0.12531	0.0324	-3.8704[0.000]
DC	6.0580	1.2951	4.6777[0.000]
DTTT	-0.0038	0.0032	-1.1922[0.239]
ECM(-1)	-1.0003	0.1573	-6.3589[0.000]
ECM = LGDP - 2.4351LPKA + 0.87067HCA + 0.010720FDM - 0.26730LGEX + 2.4893LHHI - 0.058846LFIN - 6.0563C + 0.0037764TTT			
R <sup>2</sup>	0.9516	$\bar{R}^2$	0.9202
SE of regression	0.0884	F-stat. F( 21, 45)	37.4587[0.000]
Mean of dependent variable	0.0094	SD of dependent variable	0.31298
Residual sum of squares	0.3128	Equation Log-likelihood	84.7181
Akaike Info. criterion	57.7181	Schwarz Bayesian Criterion	27.9548
DW-statistic	1.7975		

**Notes:** ARDL (4,2,2,0,3,4,4) selected based on Akaike information criterion. <sup>a</sup>DX, the first difference or the change of the variable X

**Table V.**  
Error correction  
representation for the  
selected ARDL model

quarterly. The table shows rejection of the null hypotheses that LPKA, FDM, LHHI and FIN do not Granger cause LGDP. This means there is evidence of causality moving from these endogenous variables to LGDP. Our variables of interest LHHI and FIN cause LGDP. In the same token, the null hypothesis that LGDP does not cause FIN was rejected at lags 4. This means economic growth causes financial innovations. There is therefore bidirectional causality between economic growth and financial innovations. Similarly, financial development causes financial innovations just as financial innovations cause financial development. There is however, unidirectional causality from bank competition to economic growth; financial development to economic growth; bank competition to financial development; and bank competition to financial innovations.

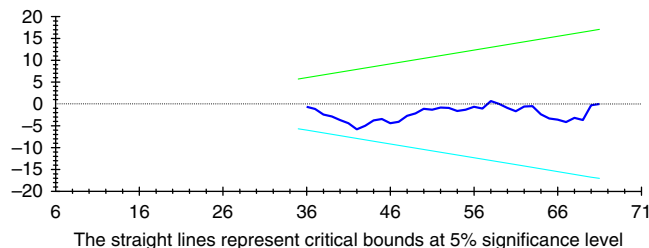
#### 4.1 Results of the robust test

Pesaran *et al.* (2001) advocated for diagnostic and stability tests. The results of the diagnostic tests of the underlying ARDL equation are presented in Appendix D.

Null hypothesis	Lags	Obs	F-Statistic	Probability
LPKA does not Granger Cause GDP	4	68	12.2380	0.00000
LGDP does not Granger Cause LNPKA			1.64919	0.17399
FDM does not Granger Cause GDP	4	68	4.29133	0.00409
LGDP does not Granger Cause FDM			0.85727	0.49497
LGEX does not Granger Cause GDP	4	68	9.46177	0.00000
LGDP does not Granger Cause LGEX			4.55135	0.00285
LHHI does not Granger Cause GDP	4	68	12.4450	0.00000
LGDP does not Granger Cause LHHI			0.12566	0.97263
FIN does not Granger Cause GDP	4	68	13.2873	0.00000
LGDP does not Granger Cause FIN			2.99548	0.02558
LHHI does not Granger Cause FDM	4	68	19.2294	0.00000
FDM does not Granger Cause LHHI			1.04315	0.39277
FIN does not Granger Cause FDM	4	68	26.8612	0.00000
FDM does not Granger Cause FIN			3.21631	0.01866
LHHI does not Granger Cause LGEX	4	68	12.4459	0.00000
LGEX does not Granger Cause LHHI			0.96756	0.43215
FIN does not Granger Cause LGEX	4	68	2.56142	0.04766
LGEX does not Granger Cause FIN			9.27251	0.00000
FIN does not Granger Cause LHHI	4	68	1.42444	0.23712
LHHI does not Granger Cause FIN			10.6994	0.00000

**Table VI.**  
Granger causality  
test results

The diagnostic test show the ARDL model passes the serial correlation, functional form misspecification and error non-normality tests. The diagnostic test, however, failed the hetescedasticity test at the 5 percent level. According to Fosu and Magnus (2006) this is normally the case since the time series underlying the ARDL estimation comprise both I(0) and I(1) variables. Therefore, we tested for stability of the short run model using the CUSUM and CUSUMQ test. Figures 1 and 2 provide both tests. Both tests show that the error correction model is stable since the recursive residual falls within the 5 percent critical bounds. The stability tests and other diagnostic tests



**Figure 1.**  
The plot of cumulative  
sum (CUSUM) of  
recursive residuals

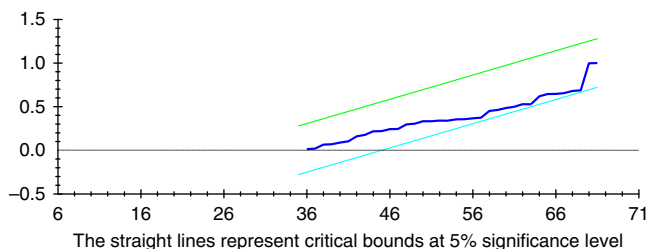
show that the bound testing cointegration approach offers strong results with regard to the quarterly observations (Table VII).

### 5. Conclusion and recommendations

This paper looked at the relationship between bank competition, financial innovations and economic growth in Ghana. The paper also aimed at finding the causality among bank competition, financial innovations and economic growth in Ghana. As expected, the positive and statistically significant results LPKA confirms the theoretical proposition that capital stock contributes positively to real economic growth. This means that, in the long run increases in investment in physical capital has the potential of stimulating growth in Ghana. Similar conclusions were drawn by Aryeetey and Fosu (2005) and Fosu and Magnus (2006) about Ghana. This means that savings which are translated into investments lead to economic growth in Ghana.

Human capital is unexpectedly negatively related to economic growth. This does not reinforced the theoretical proposition and empirical results in Romer (1986, 1990), Lucas (1988) and Mankiw *et al.* (1992). Human capital affects economic growth indirectly by enhancing other factors such as technology that increases productivity.

Financial deepening is negatively related to economic growth in the short run in most of the estimations. When the share of broad money to GDP was employed the results also show negative short run relationship with economic growth. This result is consistent with that of Adenutsi (2011) who employed the share of commercial bank credit to the private sector as a proportion of total commercial bank credit as a measure of financial deepening. Using quarterly observations between 1987 and 2007 and Johansen cointegration approach, Adenutsi (2011) found that financial development is detrimental to endogenous economic growth in Ghana. This means that the level of financial development does not lead to economic growth in Ghana directly.



Source: Quarterly ARDL Estimation, 1991:1-2008:4

Figure 2. The plot of cumulative sum of squares (CUSUMQ) of recursive residuals

Test statistics	LM version	F version
A:Serial correlation CHSQ(-1) <sup>a</sup>	1.5354[0.215]	F(1,39) = 0.91471[0.345]
B:Functional form CHSQ(-1)	3.0411[0.081]	F(1, 39) = 1.8544[0.181]
C:Normality CHSQ(-2)	0.14742[0.929]	na
D:Heteroscedasticity CHSQ(-1)	4.5946[0.032]	F(1, 65) = 4.7856[0.032]

Notes: <sup>a</sup>Lagrange multiplier test of residual serial correlation; Ramsey's RESET test using the square of the fitted values; based on a test of skewness and kurtosis of residuals; based on the regression of squared residuals on squared fitted values

Table VII. Diagnostic tests



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Dritsakis *et al.* (2004), Al Awad and Harb (2005), Chang (2005), Quartey and Prah (2008), Ezzo (2010) and Frimpong and Adam (2010), however, found long run association between financial development and economic growth. However, such discrepancies in results of the same study context may be due to differences in the sample size and modelling approach (Ezzo, 2010).

In the long run financial deepening is negatively related to economic growth. This is not surprising given the difficulties firms go through before they can access credit in Ghana. Firms pay much more interests on credit they obtained in Ghana, even in the wake of falling BoG policy rates. According to Buchs and Mathiesen (2008), difficulties that the private sector encounter before accessing credits can be attributed to the dominant participation of the government in the credit market which is stifling competition.

The degree of bank competition showed a positive effect on economic growth in the long run. This means that the increasing competitive nature of the banking system in Ghana is very important in explaining economic growth. However, in the short run, bank competition is negatively related to economic growth. According to the Buchs and Mathiesen (2008) (who employed the PR statistics) and Aboagye *et al.* (2008) (who used the Lerner's index) the Ghanaian banking system showed glimpses of market power. Buchs and Mathiesen (2008) in particular attributed the development partly to the active participation of the government in the credit market in the short run. The banks found it less risky to allocate credit to the government than to the more productive private sector. This reinforced the argument in Guzman (2000) that monopolistic banking systems do not allocate credits to most productive system for growth to occur.

Elsewhere, Guzman (2000) compared two identical banking systems, one competitive and the other monopolistic, and concluded that the system with more market power suppress capital accumulation because such systems ration credit and charges more on loans than competitive banking environment. Interests on loans in Ghana is high despite continues attempts by the BoG to bring the policy rates down during the past years. The banks are even not responsive to the periodic publication of the interest they charge on loans to customers instituted by the central bank. This is indeed stifling growth as the present work shows. Red lights for possible area for prudent supervision have been shown by these findings that regulations should be tailored to mobilization of savings toward investment and growth.

Conversely, financial innovation is positively related to economic growth in the short run. This means that, the revolution of technological innovations spearheaded by application of information and communication technology have strengthened the efficiency of the banks to mobilize savings and allocate them to productive areas in the short run. However, in the long run, financial innovation is negative effect on economic growth. According to Ansong *et al.* (2011) the negative relations between financial innovations and economic growth can be attributed to the nature of innovative products in the banks. They stressed that most of the innovative products available in Ghana encourages more withdrawals than deposits.

It must be emphasized that, according to Aboagye and Gungal (2000) the level coefficients depict short-run relationships and the error correction representation coefficients represent long-run relationships. They based their arguments on the fact that the error correction term depicts the adjustments toward long-term economic growth. Therefore, it is incorrect to specify the error correction model as a representation of short run relationships. This assertion particularly underlies the economic definition of the long run as the period of time where all factors of production are subject to change.

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This study follows Aboagye and Gungal (2000) and specifies the level coefficients as short run coefficients and the error correction representation coefficients as depicting the long-run relationships.

This paper, based on the empirical evidence, recommends the following:

- The study sends signal to policy makers on some aspect of the development in the banking system they must pay attention to. In order to improve the welfare of the citizenry the government must assist smaller banks to be at the footing where they can effectively compete with the larger ones to ensure effective mobilization and allocation of credit to productive areas.
- Second, institutional bottlenecks that impede the financial system from developing effectively such as inadequate access to information should be minimized. The positive effects of banking development on economic growth shows that if other financial institutions such as insurance companies are given the enabling environment, in the forms of regulation and legal protection, to operate effectively, their activities would induced more growth.
- Banks which are innovating should be given the necessary legal protection to enable them to innovate more for growth. The legal protection would enable them to enjoy an extended period of rents which would stimulate other innovations. However, financial innovation should be tailored to encourage more savings than withdrawals.
- Education on financial activities should be of paramount concern by policy makers. Such literacy program must first debunk the negative assertions people have about savings in the banks before soliciting their interest in financial activities. Most people in the informal sector do not enjoy the use of electronic facilities that banks provide because they either do not know how to use them or they find them cumbersome.
- The banks must reduce their participation in the government bonds market because doing so reduces the amount of credits that they could possibly channel to the private sector especially, to the small and medium scale enterprises (which forms about 90 percent of businesses in Ghana) to ensure growth. Stated differently, the government must reduce its participation in bank credit market to bring more competition into the banking system.
- Finally, regulations in the banking system should concentrate on promoting efficient and healthy competition as well as promoting financial innovation. Such regulations should maximize the tradeoff between promoting competition that would increase credit allocation to productive areas and the need to reduce bank failure due to competition.

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