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Financial development and economic growth in Ghana: Does the measure of financial development matter?

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Abstract

The aim of this paper is to investigate the long-run growth effects of financial development in Ghana. We find that the growth effect of financial development is sensitive to the choice of proxy. Both the credit to the private sector as ratios to GDP and total domestic credit are conducive for growth, while broad money stock to GDP ratio is not growth-inducing. The indexes created from principal component analysis confirmed the sensitivity of the effect to the choice of proxy. The findings here suggest that whether financial development is good or bad for growth depends on the indicator used to proxy for financial development.

JEL classification: E44; G2; O1; O4; O11

Keywords: Financial development; Economic growth; PCA; Cointegration; Ghana

1. Introduction

An important statistic for evaluating economic performance of any economy is its annual rate of real GDP growth. As a result, there are large number of studies that attempts to identify the main drivers of economic growth and the potential sources of growth differentials across space and time from both theory and empirical perspectives. The level of financial development has been identified as one of such drivers of growth. This notwithstanding, the evidence is not conclusive and the debate on whether financial development is the cause or the effect of the growth process is still on-going. Another source of dispute on this strand of the growth literature is the issue of appropriate or correct measure of financial development. This study aims to address these concerns in the literature using time series econometric techniques. The first dispute has been addressed by earlier researchers using variants of Granger causality tests, mostly confirming the finance-led-growth hypothesis. This paper therefore focuses on estimating the growth effects of a large number of indicators for financial development. This, we hope, will resolve the second source of dispute among researchers studying the growth-finance nexus.

The existing literature has identified many transmission channels through which financial development may impact economic growth via their effects on savings and investment behaviour. According to Levine (2004), financial development involves improvements in the (i) production of *ex ante* information about possible investments, (ii) monitoring of investments and implementation of corporate governance, (iii) trading, diversification, and management of risk, (iv) mobilization and pooling of savings, and (v) exchange of goods and services. Each of these financial functions may influence savings and investment decisions and hence economic growth. Since many market frictions exist and laws, regulations, and policies differ markedly across economies and over time, improvements along any single dimension may have different implications for resource allocation and welfare depending on the other frictions at play in the economy.

Notwithstanding the disputed empirical findings, the hypothesis that financial development is an important driver of growth is now popular among empirical growth researchers. The role that financial markets and financial intermediaries play in the growth process varies significantly, from country to country, depending on the level of political freedoms, rule of law and property rights

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protection. As opined by Aghion and Howitt (2009), people are willing to save more, and hence free-up resources to investors in a country with efficient and trustworthy banks than in a country where banks are likely to waste depositors' wealth through bad loans or even swindle them.

Financial institutions and markets also help by pooling risks as well as optimal allocation of risk and returns. For instance, by collecting savings from many people and investing them in a large diversified range of projects, a depository institution allows even small savers to take advantage of the law of large numbers and get a reasonably safe rate of return. Well-functioning financial institutions can also help to alleviate agency problems by monitoring investors and making sure that they are making productive use of their loans rather than spending them on private consumption or otherwise defrauding the ultimate lenders (Aghion and Howitt, 2009).

Although there is virtually no disagreement on whether financial development is good for growth from both exogenous and endogenous growth perspectives, there appears to be no agreed indicator for financial development. Since the channel of transmission, from financial development to growth depends on the measure of financial development used, many authors have reached different conclusions, depending on the indicator used to proxy for financial development. Furthermore, the relevance of each channel of transmission is country specific, due to differences in political, legal and other institutional differences across space and time. The implication of this is that country case studies that use large number of indicators for financial development have significant potential of increasing our understanding of the growth effects of financial development. This paper therefore proposes a time series approach to study the effects of financial development on economic growth in Ghana, using eight alternative proxy indicators for financial development.

Although there are many time series country-case-studies, such studies are based on one or two indicators of financial development. Our literature search also indicates that there is only one study on Ghana that focuses on the finance-led-growth hypothesis by Quartey and Prah (2008). Quartey and Prah (2008) examined a bivariate causal linkage between financial development and economic growth in Ghana using four alternative indicators of financial development: broad money to GDP ratio; domestic credit to GDP ratio; private credit to GDP ratio and private credit to domestic credit ratio. Also, in a study of finance–growth nexus in which Ghana is one of the units studied, Esso (2010) used the ratio of credit to private sector to GDP as the sole measure of financial development. We however believe, as others have argued in the literature, that no single financial indicator could adequately proxy for financial development in any given country. The level of financial development in a country should be considered as a composite index derived from a possible large set of proxies. This is the approach taken in this paper. In addition to estimating our models using one indicator at a time among a set of controls, we also derive four composite indexes using information from the individual proxy indicators by applying principal component analysis (PCA). To our knowledge, this is the first study on Ghana that uses large set of proxies as well as its application of PCA. Further, we refrain from bivariate causality analysis by controlling for other potential growth determinants. Thus the results reported herein are more convincing for the Ghanaian case than elsewhere in the literature.

The results indicate that the growth effect of financial development is sensitive to the choice of proxy used. For instance, using either the private sector credit to GDP ratio or the private sector credit as a ratio to total credit, we found positive and significant effect of financial development on growth. However, same cannot be said when one uses broad money supply to GDP ratio to proxy for financial development as the coefficient on this variable was found to be significantly negative. The indexes created from principal component analysis confirmed the sensitivity of the effect to the choice of proxy. This finding helps in understanding the conflicting results in the literature as many studies rely on single indicators hence unable to identify which financial sector variables have positive growth enhancing effects and which does not.

The rest of the paper is organized as follows. Section 2 presents an extensive review of the empirical literature on financial development and economic growth. Section 3 of the paper presents some stylized facts about the financial sector and economic performance in Ghana while section for deals with estimation techniques and data issues. The results and discussions thereof are presented in Section 5. Section 6 concludes the paper with summary of findings and some policy recommendations.

2. Literature review

Following the seminal work of Schumpeter (1911), and subsequent studies by Goldsmith (1969), McKinnon (1973) and Shaw (1973), the financial development – economic growth nexus has received extensive attention in economic research.

Schumpeter' (1911) view, often regarded as the first framework in analysing the finance-led growth hypothesis contend that a well-functioning financial system will spur technological innovations (growth) through efficient allocation of resource from unproductive to productive sectors. This argument is in the same vein as Patrick' (1966) *Supply-Leading Hypothesis*. Patrick (1966) contends that the development of a robust financial sector can spur economic growth. Thus, the creation of financial markets and their services well in advance of their demand will drive the non-financial (real) sector along the growth path, via the transfer of scarce resources from surplus spending units to deficit spending units according to the highest rates of return on investment.

In contrast to this finance-led growth postulations, Robinson (1952) and Patrick (1966) again offer a variant view. The growth-led finance (Robinson, 1952) and the demand-following (Patrick, 1966) hypotheses assert that an expanding economy (real sector) will culminate into a high demand for the services of the financial sector, and thus a developed financial sector is a corollary of the demands of the growing real sector of the economy.

Other notable contributions to the finance–growth literature are Goldsmith (1969), McKinnon (1973) and Shaw (1973).

Whereas Goldsmith (1969), for example, focuses on the nexus between financial development and the efficiency of investment, McKinnon (1973) and Shaw (1973) on the other hand emphasized the importance of financial liberalization in promoting domestic savings and hence investment. It is worth noting that the works of McKinnon (1973) and Shaw (1973) laid the foundations for the liberalization of the financial sector in many developing countries including Ghana, as part of the IMF/World Bank' Structural Adjustment Program (SAP).

It must be emphasized that though variant arguments have been advanced in the literature concerning the direction of causality between economic growth and financial development, they nonetheless converge to the point that there exist some significant positive relationship between them (Chee-Keong and Chan, 2011).

Empirically, a plethora of studies extant in the literature have investigated the relationship between financial depth and economic growth, albeit having mixed results on the impact and direction of causality. But generally, most studies based on cross-section and panel data affirm the fact that financial development exerts a positive influence on growth, even after accounting for other covariates of growth as well as the potential biases induced by simultaneity, omitted variables and unobserved country-specific effect on the finance–growth nexus (Khan, 2008; Gelb, 1989; Khan and Senhadji, 2000; King and Levine, 1993a, 1993b; Levine et al., 2000). Levine et al. (2000) for example in a study on 71 countries for the period 1960–1995 using indicators of financial development such as ratio of liquid liabilities to GDP, ratio of assets of deposit money banks to assets of deposit money banks plus central bank domestic assets and ratio of credit issued to private enterprises to nominal GDP, conclude on a positive nexus between financial development and economic growth in the countries investigated.

Kargbo and Adamu (2009) examined the relationship between financial development and economic growth in Sierra Leone for the period 1970–2008. Their results corroborate the finance-led growth hypothesis in Sierra Leone with financial development exerting a significant positive growth effect. More importantly they show that investment is an important conduit via which financial development feeds economic growth.

In Ghana, empirical studies on the finance–growth hypothesis are scanty except for the work of Quartey and Prah (2008) and Esso (2010). In their paper, Quartey and Prah (2008) show that there is some evidence in support of demand-following hypothesis, when growth of broad money to GDP ratio is used as a measure of financial development. However, there is no evidence to support either the supply-leading or demand-following hypotheses when growth in domestic credit to GDP ratio, private credit to GDP ratio, and private credit to domestic credit ratio are used as proxies for financial development. Finally, their findings reveal that there is no statistical evidence to support Patrick's stages of development hypothesis in Ghana.

In South Africa, Odhiambo (2009) examined the dynamic relationship between interest rate reforms, financial development and economic growth. The author concludes that the causal relationship between financial depth and economic growth exhibit a demand-following path.

However, emerging issue in the discussion in finance–growth literature is the issue of direction of causality between financial development and economic growth (Chee-Keong and Chan, 2011). As a result, myriads of theoretical and empirical studies have made attempts at delving deeper into the understanding of this relationship (Chee-Keong and Chan, 2011). For instance, Al-Yousif (2002) opines that most of the existing studies seem to over-emphasize the correlation between financial development and economic growth, while failing to acknowledge that the existence of a high correlation between two variables is a mere depiction of linear association rather than causality.

Wang (1999) also offers some criticisms by raising issues of mis-specification and possible endogeneity bias in most studies studying the finance–growth relationship. He argues that the use of an augmented production function approach results in misleading conclusions since a measure of financial development is also a component of the production function. Wang (1999) further argues that this approach assume economic growth as endogenous thereby testing only for causality running from financial development to economic growth while neglecting the possibility of a reverse or even bi-directional causality hence, resulting in model mis-specification problems.

Again, the findings of Demetriades and Hussein (1996) after examining various causality tests between financial development and economic growth for 16 developing countries reveal "considerable evidence of bi-directionality and some evidence of reverse causation". They therefore caution against accepting the generalization of finance leading growth and warn of the consequences of such biased findings in economic policy especially for developing countries. Similar criticism has been advanced by Neusser and Kugler (1998).

Another key criticism cited against the finance–growth theories is that the importance of financial development in spurring economic growth has been overemphasized and as Lucas (1988) puts it "the importance of financial matters is very badly overstressed". Such critics contend that the growth importance of financial sector is more pronounced in the developed economies with efficient well-functioning financial markets than for developing countries. However, Chee-Keong and Chan (2011) observe otherwise. In a review of literature on the finance–growth relationship, Chee-Keong and Chan (2011) conclude that "the development of theoretical models and the use of regressions in the investigation of finance–growth relationship have shown reliably that there is a positive long-run (short-run) relationship (causality) between financial development and economic growth. One of the results suggest that financial development is a crucial factor in promoting economic growth not only in developed countries, but also in developing countries".

3. Financial sector reforms and economic performance in Ghana

Ghana has over the last three decades transitioned from an interventionist to a liberalized financial sector policy regime with some remarkable turnaround from what existed before a comprehensive chain of reforms were initiated in 1988.

Financial sector development should imply efficient and effective financial resource mobilization and allocation to prioritized real sector development (Aryeetey et al., 2000). However, prior to the sector-wide reforms of the financial system, the sector had been characterized by financial shallowing and/or repression and therefore failed in effectively intermediating funds to growth-enhancing real sectors of the economy such as agriculture and manufacturing.

Deposit mobilization and credit allocation to various economic agents in Ghana were abysmal between 1960 and the mid-1980s. Critics of the pre-reform financial sector had likened it to the financial repression categorization of McKinnon (1973) and Shaw (1973). Central government controls and direct administrative manipulations in the financial sector resulted in an underdeveloped and inefficient financial system. Repressive financial policies in the form of interest rate ceilings retarded growth of private investment, discouraged savings culture and inhibited financial deepening and hence growth of the economy. State-owned banks – Ghana Commercial Bank (1953), Agricultural Development Bank (1965), Bank for Housing and Construction (1973), National Investment Bank (1963) – supervised by the Bank of Ghana (1957), were directed to channel credit to "unproductive sectors" of the economy by combining a policy mix of interest rates and selective credit controls and ceilings (Aryeetey et al., 2000).

It had become clear at the beginning of the 1980s that financial sector policies implemented in the 1960s through to 1970s had failed to mobilize resources for economic growth and had also left a very shallow financial system with no room for improved deepening of the sector. The negative repressive policies were evident in the trend performance of indicators of financial depth such as money supply (M2-to-GDP ratio) which had plummeted from 24% in 1977 to a low 12% in 1984. Negative real interest rates also prevailed under the regime of direct controls given nominal interest and inflation rates. Other indicators over the same period had recorded persistent declines as share of GDP as follows: demand deposits (11.6–4.6%), savings and time deposits (7.1–2.6%) and domestic credit (38.8–15.6%) (Aryeetey et al., 2000). The overall impact on economic growth of the failed financial policies has been well documented (Aryeetey et al., 2000; Bawumia, 2010). Real GDP growth only managed an average 3.04% between 1961 and 1970 and a disappointing 0.52% over the period 1971–1980 (see Table 1 and Fig. 1 for trends).

The launch and implementation of Financial Sector Adjustment Program (FINSAP) in 1988 was part of a comprehensive macroeconomic reform program (economic reform program – ERP) of the World Bank (WB) and International Monetary Fund (IMF) with the liberalization and restructuring of the financial sector. Distressed banks (seven) were restructured and their non-performing assets cleaned up to restore profitability and viability in the banking system. Other policy tools under the program included right price setting, structural reform initiation (including fiscal and monetary operations) and some degree of privatization (including banks), abolishing of directed credit and credit controls, development of money and capital markets (culminating in the establishment of the Ghana Stock Exchange in 1990), improvements in the regulatory and supervisory framework (Bawumia, 2010). A successor program to FINSAP is the Financial Sector Strategic Plan (FINSSP) largely implemented from 2001 with almost similar objectives but the latter sought to consolidate gains made under FINSAP and further deepen the sector with improved financial service delivery (Bawumia, 2010).

Results from both FINSAP and FINSSP have impacted positively to a significant extent on the banking and financial system over the years under implementation. The banking system has seen a significant increase in the number of banks from 10 banks in 1988 with 405 branches to 27 banks in 2009 (with majority foreign investor ownership) and 696 branches. Total banking system assets have grown from 0.31% of GDP in 1993 to 0.66% by 2008, reflecting a more vibrant banking sector. Asset concentration and quality, capital adequacy, savings mobilization (deposits) and sectoral credit allocation, interest liberalization and financial deepening indicators have shown marked improvements following the FINSAP and FINSSP. Even though banking system liabilities seem to have improved, non-performing loans (NPLs) is still a major concern. Credit to the private sector in particular has outpaced credit to the public sector for at least a decade. With an average rate of 3.12% (1981–1990), private-sector credit stands at 15.71% in 2010 (Bawumia, 2010).

Data on key indicators used for financial deepening shows significant deepening of the financial sector over the past decade following the financial sector reforms. Broad money supply to GDP ratio (M2+/GDP) rose from 16.50% between 1981 and

Table 1
Economic growth and indicators of financial deepening (in percent).

Indicators	1961–1970	1971–1980	1981–1990	1991–2000	2001–2005	2006	2007	2008	2009	2010
Real GDP growth	3.04	0.52	2.28	4.30	5.04	6.40	6.46	8.43	3.99	8.01
Real GDP per capita growth	0.47	−1.76	−0.77	1.64	2.52	3.85	3.92	5.86	1.55	5.50
Private-sector credit/GDP	7.72	5.89	3.12	7.39	13.05	11.09	14.49	15.88	15.54	15.71
Private-sector credit/total credit	38.95	20.22	14.74	30.15	41.54	52.57	63.37	56.92	54.52	54.60
Broad money/GDP	20.44	24.58	16.50	21.68	31.05	22.62	24.91	26.71	27.96	29.79
Narrow money/broad money	78.05	70.04	75.05	55.83	52.38	49.52	51.11	47.16	40.65	46.74
Currency/*M*2+	41.00	35.21	39.33	30.86	28.82	24.10	22.58	20.64	20.35	21.26
Currency/GDP	8.38	8.65	6.45	6.76	8.93	5.45	5.62	5.51	5.69	6.34
Total bank deposit liabilities/GDP	7.51	7.92	4.16	5.15	7.36	5.75	7.04	7.08	5.67	7.60
Total credit/GDP	22.26	29.11	21.57	23.59	31.78	21.10	22.86	27.90	28.51	28.78

Sources: Bank of Ghana Statistical Bulletins (various issues); World Development Indicators (2011); International Financial Statistics CD-ROM (December, 2011) and authors' construct.

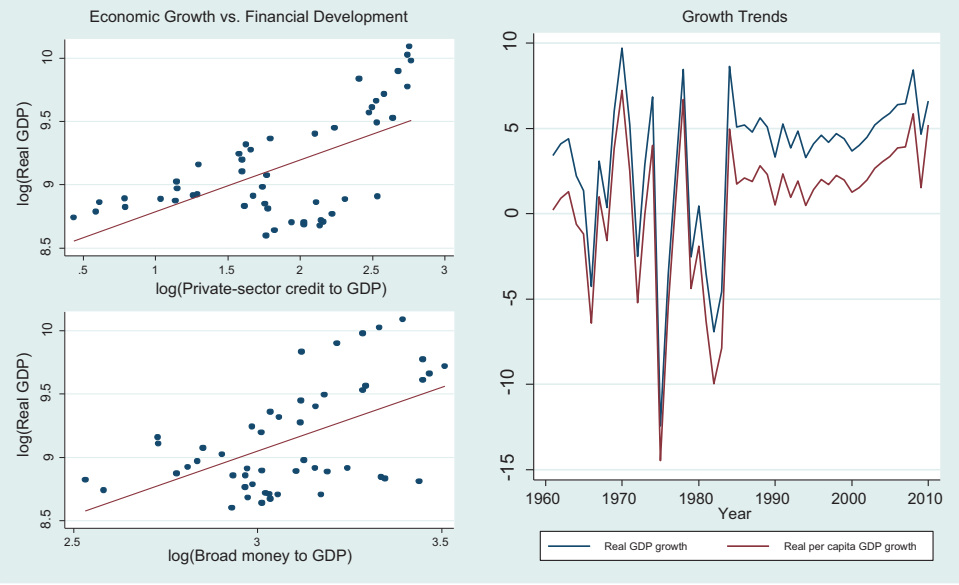

Fig. 1. Economic growth vs. financial development and growth trends.

1990 to 31.5% (2001–2005) and 29.79% in 2010. Other financial deepening indicators have also shown some marginal improvements over the past three decades especially periods following the post-reform of the financial sector (Table 1). Real interest rates on the other hand did not immediately turn positive following FINSAP and FINSSP. For example, real savings rates averaged −10% between 1988 and 2000 and -8.8% between 2000 and 2008. Real bank lending rates on the other hand turned positive registering 9.1% in 1989 to 22% in 2000 and 9.1% between 2001 and 2008 (Bawumia, 2010). The large interest rate spreads (i.e. difference between lending and deposit rates) is however a major source of concern to stakeholders. Economic growth rates on the other hand have been impressive following the ERP, FINSAP and FINSSP (Table 1). The foregoing discussion suffices to conclude that even though significant improvements in the financial sector have been made following the FINSAP and FINSSP, further policy commitment is desirable to further deepen the financial system.

4. Model specification, data and methodology

4.1. Model specification and data

Following from our review of the finance–growth literature, the empirical specification to capture the impact of financial development on growth in this study is based on the endogenous growth model ($Y = AK_t$) where real aggregate output growth is a function of total factor productivity, real aggregate capital stock (a composite of human and physical capital), savings rate and the efficiency of financial intermediation (see Rebelo, 1991; Pagano, 1993; Jalil and Feridun, 2011). Following Jalil and Feridun (2011), Khan (2008) and others, we posit the following empirical model:

$$Y_t = \alpha_0 + \alpha_1 Z_t + \alpha_2 FD_t + \alpha_3 DPR_t + \alpha_4 FLDum_t + \mu_t \quad (1)$$

where Y is real output (proxied by real GDP); Z denotes a vector of control variables of growth including L – the labour force/employment level; K – capital stock (proxied by real gross fixed capital formation to GDP ratio); GE – real gross government expenditure (proxied by general government final consumption expenditure to GDP ratio); *Open* – the level of trade openness of the economy (proxied by the ratio of the sum of exports and imports to GDP ratio); and *Infl* denoting CPI inflation; FD denotes a vector of proxies for financial development comprising private-sector credit/GDP (CPS/Y); private-sector credit/total domestic credit (CPS/DC); broad money/GDP ($M2+/Y$); narrow money/broad money ($M1/M2+$); currency/broad money ($Cu/M2+$); currency/GDP (Cu/Y); total domestic credit/GDP (DC/Y) and Total bank deposit liabilities/GDP (Dep/Y). DPR denotes real deposit interest rate (proxied by the 3-month time deposit rate and calculated as the difference between the nominal deposit rate and the annualized rate of inflation, %); and $FLDum$ represents a dummy for financial liberalization policy implementation which assumes the value 1 for the period 1988–2010 (period for the launch and implementation FINSAP and FINSSP; and zero before 1988 (1961–1987)); and μ_t is an error term. All variables are in natural logarithm except DPR and FLDum.

In terms of a priori expectations, the growth literature predicts a positive relationship between real output, financial depth and the real interest rate (King and Levine, 1993a). The complementarity hypothesis between money and capital explains the same nexus between real output and financial depth (McKinnon, 1973). According to Shaw (1973), financial intermediation enhances investment with resultant increase in the level of output. A positive real interest rate deepens financial intermediation through increased volume and value of savings which induces real output growth through increased productivity of capital (Khan, 2008). The expected relationship between real output and the control variables of growth follow from the growth literature and also an empirical issue.

Annual time series data is used for this study spanning the period 1961–2010, capturing both the pre- and post- economic reform and structural adjustment program periods for Ghana. Data were obtained from several sources including the Bank of Ghana Statistical Bulletins (various issues), World Development Indicators (2011 and 2012) and International Financial Statistics (2011, December CD-ROM).

4.2. Methodology

The present study utilizes the autoregressive distributed lag model (ARDL) of Pesaran et al. (2001) which is applicable irrespective of the order of integration of the underlying variables ($I(0)$ and/or $I(1)$) provided absence of $I(2)$s are guaranteed which could invalidate the procedure. To examine the existence of a long-run relationship between real GDP, financial development, real deposit rate and other control variables of growth in the economy, the bounds test of cointegration within the ARDL framework is employed. The ARDL model involves estimating the following model:

$$\Delta Y_i = \beta_0 + \sum_{i=1}^{m} \Psi \, \Delta Y_{t-i} + \sum_{i=1}^{m} \phi \, \Delta Z_{t-i} + \sum_{i=1}^{m} \varphi \, \Delta FD_{t-i} + \sum_{i=1}^{m} \eta \, \Delta DPR_{t-i} + \delta_1 Y_{t-1} + \delta_2 Z_{t-1} + \delta_3 FD_{t-1} + \delta_4 DPR_{t-1} + \varepsilon_t \quad (2)$$

where all variables are as previously defined, β_0 is the drift component, Δ denotes difference operator and ε_t is the white noise error term.

The next step of the ARDL bounds test procedure is to test for a long-run relationship among the variables using an F-statistic. The procedure specifies the null hypothesis in Eq. (2) as $H_0 : \delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$ implying nonexistence of a long-run relationship and an alternative hypothesis (i.e. existence of cointegration) of $H_1 : \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq 0$. The normalized growth model is represented as $F_Y(Y|Z, FD, DPR)$. The calculated F-statistics compared with two sets of critical (5% and 10%) values estimated by Pesaran et al. (2001) which is decomposed into lower critical bounds ($I(0)$) and upper critical value bounds ($I(1)$) leads to the appropriate conclusion regarding cointegration. If the calculated F-stat exceeds the upper critical value, the null hypothesis of no cointegration is rejected independent of the order of integration of the series, otherwise we accept the null. Optimal lag length for our estimated long-run growth model is selected on the basis of the Akaike Information Criterion (AIC).

5. Empirical results

This section presents and discusses the empirical results of the paper. The analysis of the paper follows the following sequential steps. First, we used principal component analysis to reduce the dimension of the financial development indicators into four sub-component indexes. This is of much relevance since none of the eight indicators can solely serve as an adequate proxy for financial development. Moreover, the high correlation among these indicators coupled with the relative small size of our sample will not allow inclusion of more than one proxy indicator for financial development in a single equation. By using the principal component analysis, we are able to extract much of the information in all the indicators, while at the same time avoiding the potential multicolinearity problem of including more than one proxy in a given equation. The second step of the analysis involves the investigation of the time series properties of the individual series that we study in this paper, using appropriate unit root tests. The third step involves testing for the existence of cointegration among the variables. We do this using the ARDL bounds test approach to cointegration analysis.

5.1. Principal component analysis

In order to test the robustness of our estimates based on the eight alternative proxies for financial development, we create four sub-indexes from these proxies using the method of principal components. The results of principal components from which the four indexes for financial development are created are presented in Table 2. The four indexes created from the first four principal components explain about 95% of the total variance in the original data. Thus, we have been able to reduce the dimension of the financial development indicators by half while preserving 95% of the information in the data. Further, the sub-indexes created are orthogonal to each other and thus have zero correlations among themselves. This allows for the inclusion of all the four indexes in a single equation. The index from the first principal component, *FDIndex1*, explains about 47% of the total variance in the data. Using scoring coefficient of 0.3 or higher to determine the significance of factor score, the first principal components could be thought of as representing the variables *M2+/Y*, *CPS/Y*, *DC/Y*, *CPS/DC*, *Cu/M2+* and *M1/M2+*. The scoring coefficient on two indicators in this component, *DEP/Y* and *Cu/Y* are far lower than 0.3 and are thus treated as not significant. The second, third and the fourth indexes, denoted *FDIndex2*, *FDIndex3* and *FDIndex4*, explains about 26%, 13.7% and 8% respectively of the total variance in the data. By the above criteria, *FDIndex2* is a composite index representing the following variables, *DEP/Y*, *Cu/M2+*, *Cu/Y* and *M1/M2+*; *FDIndex3* is a composite index representing *DC/Y* and *CPS/DC*; and *FDIndex4* is an index representing the variables *DEP/Y*, *Cu/M2+* and *Cu/Y* (see Fig. 2 for the nexus between economic growth and each of the generated financial development index).

5.2. Results of unit root tests

The results of the unit root test are presented in Table 3. The results indicate that the variables considered in this paper, including the sub-indexes created from principal component analysis are a mixture of stationary $I(0)$ and nonstationary $I(1)$ variables. Variables such as the log of real GDP, currency as a ratio to GDP, total bank deposit liabilities as a ratio to GDP, the real deposit

Table 2
Principal component analysis.

Principal component	Eigenvalues	Proportion (%)	Cumulative (%)
1	3.763	0.470	0.470
2	2.078	0.256	0.730
3	1.096	0.137	0.867
4	0.649	0.081	0.948
5	0.350	0.044	0.992
6	0.035	0.004	0.996
7	0.020	0.003	0.999
8	0.010	0.001	1.000

Component variable	Scoring coefficients							
	1	2	3	4	5	6	7	8
M2+/Y	0.447	0.286	−0.076	0.034	−0.412	0.409	0.452	0.413
CPS/Y	0.470	−0.088	0.199	0.237	0.438	−0.028	0.486	−0.497
DC/Y	0.308	0.273	−0.578	0.116	0.565	−0.026	−0.297	0.275
CPS/DC	0.330	−0.154	0.678	0.192	0.135	0.097	−0.444	0.382
DEP/Y	0.229	0.435	0.253	−0.714	0.062	−0.423	0.027	0.007
Cu/M2+	−0.390	0.338	0.200	0.445	0.150	−0.444	0.365	0.378
Cu/Y	0.063	0.641	0.085	0.371	−0.300	0.044	−0.367	−0.466
M1/M2+	−0.409	0.313	0.222	−0.216	0.432	0.666	0.082	−0.033

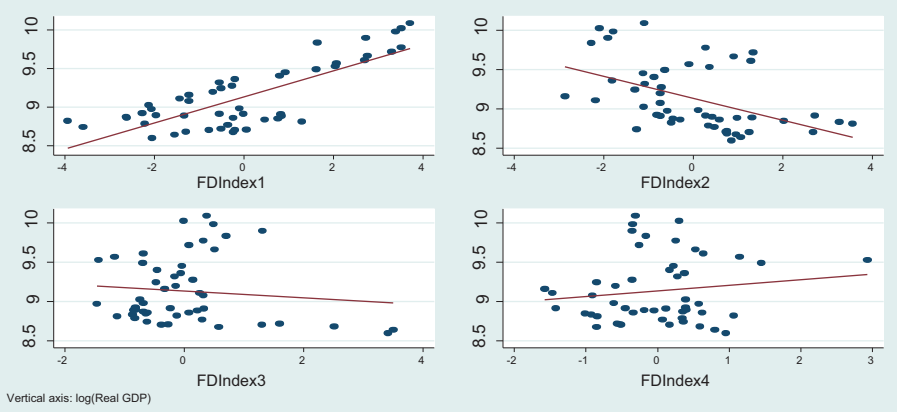

Fig. 2. Economic growth vs. indexes of financial development.

rate and the indexes created from the 2nd and the 4th principal components appear to be stationary at the levels, when no trend terms are included in the regressions. However, an inclusion of a trend term in the unit root test regression renders all these series non-stationary. The remaining series are non-stationary at the levels (log levels) both with and without trend term. However, all the variables proved to be stationary in their first differences as the unit root null is rejected at 5% or lower when the test is conducted without a trend term. When trend is included in the unit root test on the first differences of the series, variables such as the log of the labour force, private sector credit to GDP ratio and the log of the consumer price index appear to be non-stationary at their respective first differences. All other series retained their stationary status in first differences, when the test is augmented with a trend term. This notwithstanding, there is no sufficient evidence against treating the variables as a mixture of $I(1)$ and $I(0)$ series. This supports our choice of estimator which allows for inclusion of both $I(1)$ and $I(0)$ regressors in the same equation.

To ascertain the presence of structural break(s) in the variables, we complement the AD test with the Zivot and Andrews (Zivot and Andrews, 1992) test which identifies with structural break at an unknown point. The ZA test identified structural break in the trend of real GDP in 1984. We then model this break by constructing a shift dummy taking the value zero (0) before the breakpoint (i.e. 0 for 1961–1983) and one (1) at the breakpoint and beyond (i.e. 1 for 1984–2010). The 1984 breakpoint identified corresponds to the year immediately following the implementation of the ERP policies which resulted in a significant shift in real GDP growth from -4.56% (1983) to 8.64% (1984).

The evidence on the unit root test above indicates that most of the variables are not stationary at the levels. This has both economic and statistical implications. The economic implication of non-stationarity is that shocks to the variables will have permanent effect. This further implies the absence of mean reversion. The statistical implication of non-stationarity is that there is likelihood of the ordinary least squares estimator producing spurious

Table 3
Unit root test.

Variable	ADF		ZA		
	Intercept	Intercept and trend	Break in intercept	Break in trend	Break in both
Ln(*Y*)	2.417	0.003	−3.701*** (1975)	−3.487*** (1984)	−4.422*** (1981)
Ln(*L*)	−3.161**	−2.173	−4.143*** (1972)	−3.025*** (1977)	−3.478(1973)
Ln(*K*)	−1.599	−2.258	−3.043* (1972)	−3.136* (1979)	−4.476*** (1984)
Ln(*GE*/*Y*)	−1.323	−4.478***	−5.168** (2002)	−4.889* (1994)	−4.983** (1977)
Ln(*Open*)	−1.502	−2.039	−3.048(1975)	−2.992(1981)	−3.479** (1986)
Ln(*CPS*/*Y*)	−0.832	−1.185	−3.566*** (1973)	−3.848*** (1982)	−4.446** (1978)
Ln(*DC*/*Y*)	−3.526**	−3.309*	−4.141** (1979)	−3.576(1992)	−4.076*** (1997)
Ln(*CPS*/*DC*)	−1.322	−1.833	−3.981*** (1973)	−3.978*** (1981)	−4.098(1978)
Ln(*DEP*/*Y*)	−2.457	−2.446	−4.480*** (1979)	−3.491** (1986)	−4.432*** (1979)
Ln(*Cu*/*M*2+)	−1.478	−2.350	−3.588** (1976)	−3.508** (1985)	3.472(1989)
Ln(*M*2+/*Y*)	−1.825	−2.036	−4.029*** (1979)	−3.019** (1985)	−3.958*** (1979)
Ln(*Cu*/*Y*)	−2.840*	−2.976	−3.603* (1994)	−3.118(1990)	−3.717** (1999)
Ln(*M*1/*M*2+)	−0.793	−2.063	−3.716*** (1991)	−3.248*** (1985)	−4.006*** (1991)
Ln(*CPI*)	−0.877	−1.847	−4.121*** (1977)	−2.868** (1996)	−3.081*** (1977)
DPR	−2.460	−2.653	−4.037** (1975)	−3.641** (1978)	−5.001*** (1984)
FDIndex1	−0.578	−1.117	−4.340*** (1978)	−3.478*** (1984)	−4.646*** (1978)
FDIndex2	−2.470	−3.031	−3.577* (1980)	−3.164(1991)	−3.683*** (1979)
FDIndex3	−3.649***	−3.160	−3.811** (2002)	−3.647** (1975)	−3.609(1977)
FDIndex4	−3.036**	−3.922**	−3.444(1994)	−3.298(2002)	−3.985** (1999)

* Rejection of null hypothesis of unit root at the 10% level.
** Rejection of null hypothesis of unit root at the 5% level.
*** Rejection of null hypothesis of unit root at the 1% level.

results, except in a special case where the series are cointegrated and the regressors are strictly exogenous. It is hard to meet the strict exogeneity requirement in most applied settings; hence we need an estimator that will treat both endogenous and non-stationarity problems in the regressors. This informed our choice of the ARDL approach for estimation, which does not impose strict exogeneity assumption and allows for both stationary and non-stationary regressors.

5.3. Results of cointegration test

The results of the cointegration test based on the ARDL bounds test approach are presented in Table 4. In all the models, the log of real GDP is the dependent variable.

Based on the eight proxy indicators, we tested for cointegration on eight alternative specifications using one indicator of financial development at a time. However, we found cointegration in only three out of the eight models. These are the first three models presented in Table 4 with *CPSY*, *CPSD* and $M2 + Y$ respectively as a measure for financial development. Using the individual indicators, we found cointegration when credit to private sector to GDP ratio (*CPS*/*Y*), credit to private sector as a ratio to total domestic credit (*CPS*/*DC*) and broad money supply to GDP ratio (*M*2+/*Y*) are used to proxy for financial development. In the last three models, we used the financial development indexes created from principal components analysis. Since these indexes are orthogonal to each other, all four indexes are allowed in an equation. An important thing to point out here is that in the last three specifications, we made some variations in the control set to ensure that we have sufficient degrees of freedom. In model 4, real deposit rate (DPR) was excluded while in model five, inflation (CPI) was dropped. In model six, both the DPR and the CPI are dropped from the equation. Depending on the number of variables in a given model, we have different critical values. Models 1–3 have the same number of regressors and hence have common critical values for the test statistics. Also models 4–5 have the same number of regressors and therefore have common critical values for the test statistics. The statistics for model 6 are also given in Table 4. In all the six alternatives specifications reported in Table 4 the null hypothesis of no cointegration is rejected at least at the 90% confidence band. There is thus a cointegration between real GDP and its driving forces in all the six alternative specifications reported in Table 4. We thus proceed to the estimation of the long-run growth effects of our measures of financial development after controlling for some other key growth determinants.

The results of our estimation of the long-run effects of financial development on economic growth in Ghana are presented in Table 5. The specifications in Table 5 are the same as the specifications described in Table 4. In models (1a)–(2a), all the proxy measures for financial development have positive and statistically significant coefficients. Specifically, the coefficient of ln(*CPS*/*Y*) in model 1 is 0.3031 which is significant at the 5% level. The coefficient of ln(*CPS*/*DC*) is 0.245 which is statistically significant at 1% level. However, in model (3a) where the ratio of broad money supply to GDP is used as the proxy for financial development, the effect was negative and marginally significant. An important fact worth mentioning here is that not only are the estimated coefficients in these three specifications statistically significant, but are also economically significant given the size of the parameter estimates. In model 1a for instance, a one percentage point rise in the credit to the private sector as a ratio to GDP causes the real GDP to increase by 0.30%. In model (2a), an increase in the ratio of private sector

Table 4
Results of bounds test for cointegration.

	F-Stat.**	Critical values			
		95% bound		90% bound	
		I(0)	*I*(1)	*I*(0)	*I*(1)
Model without structural break		2.53	3.89	2.16	3.37
(1a) $F_Y(Y\backslash L, K, GE, Open, CPSY, CPI, DPR)$	5.15				
(2a) $F_Y(Y\backslash L, K, GE, Open, CPSDC, CPI, DPR)$	6.05				
(3a) $F_Y(Y\backslash L, K, GE, Open, M2+Y, CPI, DPR)$	5.06				
		2.42	3.80	2.07	3.34
(4a) $F_Y(Y\backslash L, K, GE, Open, CPI, FDIndex1, FDIndex2, FDIndex3, FDIndex4)$	5.09				
(5a) $F_Y(Y\backslash L, K, GE, Open, DPR, FDIndex1, FDIndex2, FDIndex3, FDIndex4)$	4.01				
		2.52	3.87	2.15	3.35
(6a) $F_Y(Y\backslash L, K, GE, Open, FDIndex1, FDIndex2, FDIndex3, FDIndex4)$	5.05				
Model with structural break		2.53	3.89	2.16	3.37
(1b) $F_Y(Y\backslash L, K, GE, Open, CPSY, CPI, DPR)$	5.76				
(2b) $F_Y(Y\backslash L, K, GE, Open, CPSDC, CPI, DPR)$	8.17				
(3b) $F_Y(Y\backslash L, K, GE, Open, M2+Y, CPI, DPR)$	3.92	2.44	3.83	2.08	3.34
(4b) $F_Y(Y\backslash L, K, Open, CPI, FDIndex1, FDIndex2, FDIndex3, FDIndex4)$	6.70				
(5b) $F_Y(Y\backslash L, K, Open, DPR, FDIndex1, FDIndex2, FDIndex3, FDIndex4)$	10.06	2.53	3.89	2.16	3.37
(6b) $F_Y(Y\backslash L, K, Open, FDIndex1, FDIndex2, FDIndex3, FDIndex4)$	4.17				

** Rejection of null hypothesis of no cointegration at the 5% significance level.

Table 5
Financial development and economic growth without structural break.

Variable	(1a)	(2a)	(3a)	(4a)	(5a)	(6a)
Constant	−3.190	−5.988	−12.659	−11.524	3.858	3.718
	(−1.236)	(−5.14)***	(−5.21) ***	(−6.61)***	(6.51)***	(6.80)***
Ln(*L*)	1.541	1.760	2.550	2.1795	0.558	0.589
	(5.34)***	(11.37)***	(7.91)***	(10.97)***	(4.41)***	(5.10)***
Ln(*K*)	0.235	−0.004	0.209	−0.153	−0.158	−0.135
	(2.59)**	(−0.07)	(2.33)**	(−3.70)***	(−1.54)	(−1.45)
Ln(*GE*)	−0.112	0.124	0.084	0.272	0.095	0.093
	(−0.99)	(2.07)*	(0.81)	(4.69)***	(1.16)	(1.23)
Ln(*Open*)	−0.369	−0.143	0.101	0.133	0.119	0.075
	(−3.17)***	(−2.87)**	(0.719)	(3.60)***	(1.19)	(0.93)
Ln(*CPS*/*Y*)	0.270					
	(2.870)**					
Ln(*CPS*/*DC*)		0.231				
		(4.99)***				
Ln(*M2*+/*Y*)			−0.526			
			(−1.95)*			
Ln(*CPI*)	−0.064	−0.111	−0.176	−0.171		
	(−1.90)*	(−7.67)***	(−5.52)***	(−9.06)***		
DPR	−0.0041	−0.001	−0.012		−0.009	
	(−1.79)*	(−0.50)	(−2.62)**		(−0.98)	
FDIndex1				−0.006	0.089	0.086
				(−0.53)	(8.05)***	(8.38)***
FDIndex2				−0.017	−0.073	−0.063
				(−2.69)**	(−3.78)***	(−4.20)***
FDIndex3				0.086	0.062	0.060
				(7.86)***	(2.74)**	(2.82)***
FDIndex4				0.006	0.025	0.024
				(1.15)	(1.44)	(1.44)
FLDum	0.138	0.038	−0.069			
	(1.83)*	(1.10)	(−0.72)			

Values in parenthesis are *t*-statistics.
* Significance at the 10% level.
** Significance at the 5% level.
*** Significance at the 1% level.

Table 6
Financial development and economic growth with structural break.

Variable	(1b)	(2b)	(3b)	(4b)	(5b)	(6b)
Constant	−3.918	−5.492	−14.654	−0.916	11.745	7.704
	(−1.50)	(−6.08)***	(−4.49)***	(−0.27)	(3.53)***	(2.34)**
Ln(*L*)	1.554	1.679	2.811	1.211	−0.244	0.285
	(5.28)***	(14.12)***	(7.02)***	(3.17)**	(−0.64)	(0.832)
Ln(*K*)	0.222	−0.005	0.215	−0.059	−0.015	0.190
	(2.95)***	(−0.12)	(2.65)**	(−1.32)	(−0.20)	(1.06)
Ln(*GE*)	−0.016	0.144	0.086			
	(−0.16)	(2.58)**	(0.87)			
Ln(*Open*)	−0.339	−0.121	0.176	−0.080	−0.205	−0.400
	(−3.29)***	(−3.81)***	(1.17)	(−1.34)	(−2.13)*	(−1.73)
Ln(*CPS*/*Y*)	0.246					
	(2.38)**					
Ln(*CPS*/*DC*)		0.230				
		(5.92)***				
Ln(*M2+*/*Y*)			−0.693			
			(−2.31)**			
Ln(*CPI*)	−0.079	−0.099	−0.193	−0.084		
	(−2.41)**	(−7.79)***	(−4.07)***	(−2.55)**		
DPR	0.004	−0.002	−0.014		−0.005	
	(0.26)	(−1.05)	(−2.85)***		(−3.11)**	
FDIndex1				0.104	0.235	0.165
				(3.50)***	(4.13)***	(3.08)***
FDIndex2				−0.048	−0.105	−0.066
				(−4.69)***	(−4.80)***	(−2.65)**
FDIndex3				0.096	0.131	0.068
				(8.15)***	(3.5929)***	(2.72)**
FDIndex4				0.055	0.117	0.068
				(4.18)***	(3.10)**	(1.6217)
Shift dummy	0.149	−0.032	−0.190	0.304	0.676	0.342
	(1.13)	(−0.77)	(−1.39)	(3.16)**	(2.31)**	(1.22)

Values in parenthesis are *t*-statistics.
* Significance at the 10% level.
** Significance at the 5% level.
*** Significance at the 1% level.

credit to total credit causes real GDP to increase by 0.24% while in model (3a) an increase broad money supply as a ratio to GDP causes real GDP to fall by 0.488%. The magnitudes of these effects are quite strong and indicate the relative importance in the developments of the financial sector to real GDP growth.

Using the indexes created from the principal components analysis, the coefficient on the index created from the first principal component has negative but insignificant coefficient in model (4a). However, the coefficient on this variable in models (5a) and (6a) is positive and statistically significant. The semi-elasticity coefficient on this index in models (5a) and (6a) is 0.09 and 0.09 respectively. This means that a percentage change in this financial development index causes real GDP to change by 0.09% and 0.086% in model 5 and 6 respectively.

The index created from the second principal components recorded a negative and statistically significant coefficient in models 4a–6a. The estimated semi-elasticity on this index in models (4a), (5a) and (6a) are −0.02, −0.07 and −0.06 respectively. This finding suggests that a percentage increase in this index causes real GDP to fall by 0.02% (according to model 4), 0.07% (according to model 5) and 0.06% (by model 6). Similarly, the index created from the third principal component has positive and statistically significant coefficient in models (4a), (5a) and (6a). The estimated coefficients are 0.09, 0.06 and 0.06 in models (4a), (5a) and (6a) respectively. Thus, a percentage increase in this index causes real GDP to increase by 0.09%, 0.06% and 0.06% according to models (4a), (5a) and (6a) respectively. This suggests that the combined effects of domestic credit to GDP ratio and credit to private sector to domestic credit ratio exert a significant positive growth impact. The coefficient on the on the index created from the fourth principal component is positive in models (4a)–(6a). However, none of the coefficients on this index is statistically significant.

Among the control variables, the labour force proved to be a robust determinant of long-run economic growth in Ghana. The coefficient on this variable is positive and statistically significant in all the six alternative specifications. In models (1a)–(4a), the coefficient on the log of the labour force is larger than one violating the range that neoclassical growth model predicts. The implication of this is that there are no diminishing returns to labour. In models (5a) and (6a) however, the coefficient of labour was in the neoclassical range. Specifically, in model (5a), the estimated output elasticity with respect to labour is 0.558 and 0.589 in model (6a). This suggests that a one percent change in the labour force causes real GDP to increase by 0.56% and 0.59% according to models (5a) and (6a) respectively. The other control

variables do not appear to be robust determinants of growth in Ghana. The coefficient on the capital stock for instance is sensitive to the specification of the growth function. In models (1a) and (3a), the coefficient on the log of the capital stock is positive and statistically significant at the 5% level. However in the remaining 4 models, the coefficient on the log of the capital stock was estimated to be negative, though it was found to be significant in only model (4a).

Trade openness and government consumption expenditure also appear not to be robust determinants of growth as their coefficients alternate signs as the specification is changed. Inflation on the other hand has strong negative impact on growth. In models (1a)–(4a), the coefficient of this variable remained negative and statistically significant. The estimated elasticity on inflation is economically significant in all the four cases, given the size of the estimated effect. The real rate on deposits also has a negative coefficient in all the specifications in which it appeared. However, it recorded statistically significant coefficient in models (2a) and (3a) only. These results suggest that increasing macroeconomic uncertainty imposes a limiting constraint to growth. Finally, government expenditure recorded a significant positive effect on growth in two of the six models (2a and 4a).

As can be seen from the unit root results presented in Table 3, the ZA test for unit roots indicated that almost all the series are stationary processes with breaks in their respective means or trends or both. In particular, the break in the dependent variable requires special treatment. We account for this using a shift dummy. The results for this exercise are reported in the lower panel of Table 4 (for cointegration test) and corresponding long run estimates in Table 6.These are numbered as models 1b–6b, with the difference in specification being the inclusion of a shift dummy. The null hypotheses of no cointegration were rejected in all six specifications, which is consistent with our findings from the models without controlling for break in the dependent variable.

The results from Table 6 are not significantly different from the results presented in Table 5. All the financial development indicators maintained their signs and statistical significance as in Table 6, with marginal improvements in the magnitude of the effects. The coefficient on the shift dummy was found to be statistically significant in models (4b) and (5b) only. The results from Tables 5 and 6 indicate that our estimates are consistent and robust.

6. Conclusion and policy implications

The aim of this paper is to investigate the long-run growth effects of financial development in Ghana. The analysis was based on eight alternative proxy indicators for financial development. Since all eight indicators cannot enter a single equation due to high correlation among them and small nature of our sample, we used principal component analysis to reduce the dimension of the measures of financial development from eight to four while retaining approximately 95% of the total variance in the data. The results indicate that the growth effect of financial development is sensitive to the choice of proxy used. For instance using either the private sector credit to GDP ratio or the private sector credit as a ratio to total credit, we found positive and statistically (and economically) significant effect of financial development on growth. However, same cannot be said when one uses broad money supply to GDP ratio to proxy for financial development as the coefficient on this variable was found to be significantly (both statistically and economically) negative. The indexes created from principal component analysis confirmed the sensitivity of the effect to the choice of proxy. This finding helps in understanding the conflicting results in the literature as many studies rely on single indicators hence unable to identify which financial sector variables have positive growth enhancing effects and which does not. Accounting for structural break in the model did not significantly change the results implying robustness of our estimates.

Following from our key findings, we recommend caution in the choice of financial development indicators as policy instruments in the design and implementation of growth policies. On the basis of the evidence, policies that improve access to affordable credit by the private sector, including small and medium enterprises (SMEs), would spur the needed innovation, expansion in plant capacity in agriculture, industry and manufacturing to generate desired employment levels, household incomes and overall growth of the economy. Further, our results also indicate that expansionary fiscal and monetary policies resulting in excess money supply could be inimical to growth. Thus, any monetary expansion through say public sector emoluments must be accompanied by productivity improvement to generate the needed growth-enhancing effects on the economy. Finally, government should reduce macroeconomic uncertainty by taming inflation towards growth-enhancing targets while promoting policies to reduce high lending rates on credit.

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