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Financial liberalization, financial development and growth linkages in Sub-Saharan African countries

An empirical investigation

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Abstract

Purpose – The purpose of this paper is to use the recent development in unit root tests and cointegration as applied to panel data and dynamic time series, to estimate the relationship between financial liberalization, financial development and growth.

Design/methodology/approach – The paper assesses the dynamics of the relationship between financial development, financial liberalization and growth using the latest dynamic panel data framework and time series analyses comprising up to 15 Sub-Saharan African countries with annual observations over the period of 1976-2005. The research uses various measures of, or proxies for, financial intermediary development, including ratio of private sector credit and share of domestic credit to income.

Findings – The results obtained from a heterogenous panel investigation and time series methodology such as Granger causality, indicate a long-run equilibrium relationship between financial development and economic growth. This is consistent with the view that financial development can act as an "engine of growth" and plays a crucial role in the process of economic development. However, there is little evidence to support the hypothesis that financial liberalization directly "leads" growth.

Originality/value – Group mean panel fully modified ordinary least squares (FMOLS) and country-by-country time series investigations show evidence of causality running from financial development to growth. The analysis yielded limited evidence of financial liberalization Granger-causing economic growth. However, this is not to say that financial liberalization does not promote growth, as it could do so indirectly through fostering financial development.

Keywords Financial performance, Economic growth, Economic development, Economic reform, Sub Saharan Africa

Paper type Research paper

1. Introduction

The issue of the relationship between financial development and economic growth has seen an extensive amount of theoretical and empirical investigation in the recent years. However, there are a number of views as to the role of financial development in promoting economic growth. A considerable body of literature suggests a strong and positive link between finance and growth through a "supply leading" role (Rajan and Zingales, 1998; Fry, 1995, 1997; Berthelemy and Varoudakis, 1996; Kitchen, 1986;

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Goldsmith, 1969; McKinnon, 1973; Shaw, 1973). An alternative possible causal relation which is also consistent with this is "demand following" where growth in real output and other commercialization activities in different sectors create demand for different financial services (Patrick, 1966). Others have taken a more neutral position and argue that a financial system has a negligible role in determining the direction of economic progress and policy makers might easily ignore the need for strengthening such an institution (called the "casino hypothesis") (Kitchen, 1986; Newlyn and Avramides, 1977).

On the other hand, the mechanism through which financial liberalization generates a net positive effect remains less conclusive. It has been suggested that financial and other capital liberalization will directly encourage flows of funds from capital-rich economies to capital-poor economies (Mirdala, 2006). Financial liberalization also has an indirect effect on growth. By strengthening and fostering development of the domestic financial sector through imposing discipline on macroeconomic policies, it can lead to a more stable macroeconomic environment[1].

This paper has three objectives. One, it aims to explore the supported positive linkage between financial sector development and economic growth using a combination of panel data technique as well as an individual country approach using dynamic time series analyses. Two, it will also examine the relationship between financial liberalization and growth through a number of causality analyses[2]. A third aim is to investigate the indirect benefits of financial sector liberalization in which it can act as a catalyst for further financial market development.

This research will contribute to the existing body of the literature in a number of ways. First, this study seeks to add to the empirical literature on the financial system and growth by taking two favoured measures of financial development and over 20 years of a new financial liberalization index. Additionally, new panel data cointegration analysis and time-series techniques are applied while utilizing data from 15 Sub-Saharan African (SSA) countries. The use of an alternative proxy for financial development will help us to test the robustness of our findings. Second, the large strand of the empirical literature focusing on the relationship between financial development and economic growth concentrate on high- or middle-income developing countries and there is a relative absence of SSA countries in the sample of countries studied (Ghirmay, 2004). This paper provides evidence of causality by adopting the new panel cointegration and estimation methods along with dynamic time series techniques. The paper is structured as follows: Section 2 gives a brief literature review on financial liberalization and financial development. Section 3 discusses the applied econometric methodology, model specification and also outlines the data used. The empirical results are analysed in Section 4. Section 5 concludes with some policy implications.

2. Literature review and motivation

The role of finance in economic development is not a recent discovery and the literature on the importance of the financial system for economic growth[3] is voluminous (Kitchen, 1986; Goldsmith, 1969; McKinnon, 1973; Shaw, 1973). Some of the studies that have reported that it has a positive and significant effect include Levine (1997), Rajan and Zingales (1998), Demirguc-Kunt and Detragiache (1998), Berthelemy and Varoudakis (1996), King and Levine (1993a), Greenwood and Jovanovic (1990), Levine and Zervos (1998) and de Gregorio and Guidotti (1995)[4].

An area that has received a fair amount of attention in recent years is the role of financial and capital account liberalization in promoting growth. Ranciere *et al.* (2006), using data for 60 countries and both a linear regression and non-linear probit model specification over the period of 1980-2002, found that financial liberalization, through strengthening financial development, contributes to higher long-run growth. While decomposing the impact of financial and capital account liberalization into positive direct and negative indirect effects, they report that the direct growth gain outweighs the loss associated with more frequent financial crises. Similarly, in assessing the impact of international financial liberalization while using data for over 93 countries for the period 1975-1999, Bonfiglioli (2005) also provided strong evidence in favour of a positive effect of financial liberalization on economic growth. Similar findings were reported by Bekaert *et al.* (2005), Levine (2001) and Kaminsky and Reinhart (1999). As opposed to this, some studies have found that financial liberalization has a negative effect on growth (Bashar and Khan, 2007; Eichengreen and Leblang, 2003). Many others have also found mixed results or very little evidence to support a direct link of financial liberalization growth. For instance, while employing data from 117 developed and developing countries, Kraay (1998) found no significant relationship between indicators of openness and growth. Others include Edwards (2001), Grilli and Milesi-Ferretti (1995) and Warman and Thirwall (1995). It is clear from the literature that the evidence on the influence of financial liberalization on growth is not clear and the empirical result has not helped to resolve the extent to which the McKinnon and Shaw theory is relevant. Furthermore, many studies show such impact to be heterogeneous across countries at different stages of institutional reforms and macroeconomic conditions (Bonfiglioli, 2005).

Policy-wise, financial sector development has also been enhanced by reforms across many countries whereby financial liberalization remained a core element of policy reforms (Andersen and Tarp, 2003). In many transition and developing countries, there has been a significant and gradual reform of financial markets since the 1980s in order to remove distortions and establish an adequate macroeconomic environment for growth. Following an increase in market-related problems and other structural rigidity, the financial system in many SSA countries failed to effectively deliver any financial services (McDonald and Schumacher, 2007; Aryeetey and Senbet, 2004; Nissanke and Aryeetey, 1998, p. 67). The effect of financial liberalization-led reforms in SSA is still being debated (Babajide, 2008) while the evidence on their importance remains scarce. This paper aims to contribute to this dimension. Overall, the literature suggests that financial liberalization promotes financial development, and subsequently through deepening of the financial system, facilitates economic development (McDonald and Schumacher, 2007; Andersen and Tarp, 2003; Nissanke and Aryeetey, 1998, p. 69).

The process of financial liberalization could be classified into domestic and external liberalization. Domestic financial liberalization (market price liberalization) leads to improved resource allocation and higher resource mobilization through encouraging development of specialized instruments, increasing liquidity, and enhancing diversification opportunities and adoption of new technologies. On the negative side there could also be the possibility of outward capital flight or capital flight reversal. On the other hand, Laurenceson and Chai (2003) observe that external financial liberalization (EFL) has two important advantages. First, through access to foreign capital, it allows a country to invest more than its savings. Second, through a better

allocation strategy, it directs funds to those types of projects that offer the highest expected rate of return and thus increasing the efficiency of investment. Despite this, EFL could also lead to increased consumption, foreign debt and sharp fluctuation in the exchange rate.

The scarcity of long-time series on national account data (especially for developing countries) has been a major constraint impeding investigation on a finance-growth possible causal relationship, and cross-country studies have dominated the empirical literature in the past (Ang and McKibbin, 2005). Although the results from many studies support the view that financial sector development positively affects growth, it has been argued that evidence from cross-country studies "generates estimates of the average effects of financial development, while the relationship may vary considerably between countries" (The Department for International Development (DFID), 2004). This has led a number of researchers to re-examine the finance-growth relationship using a time-series approach on individual countries. An important advantage of this time series data is that "it can distinguish between different causal patterns in the countries studied" (Andersen and Tarp, 2003) while being contingent upon the institutional setting, nature and operation of financial institutions and individual policies pursued.

In recent years, two factors have also helped the application of time series investigation (Shan *et al.*, 2001). Developments in time series modelling framework, especially cointegration methodology and vector autoregression (VAR) models estimation techniques which are designed to test causality hypothesis, have enhanced the merits of a time series approach. Second, the emergence and development of endogenous models have provided the analytical framework to better study the effect of financial development and financial liberalization on growth (Ghirmay, 2004).

3. The econometric methodology

The existing empirical evidence establishes that although financial development (mainly in the form of financial integration) does generate some benefit in some emerging countries, the relationship is not always robust (Kose *et al.*, 2003; Luintel and Khan, 1999; Hermes, 1994). While the debate on the direction of the causality between financial development and economic performance (especially in less developed countries) remains, formally the relationship can be expressed as:

$$y_t = \beta_0 + \beta_1 FD_t + \beta_2 C_t + e_t \tag{1}$$

where y_t is the dependent variable (gross domestic product (GDP) per capita), FD_t equals financial development, C_t represents vector of other control variables and e_t is an error term with the usual classical properties. Given equation (1), the panel version can be written as:

$$y_{it} = \beta_{i0} + \beta_{1i} FD_{it} + \beta_{2i} C_{it} + \zeta_{it} \tag{2}$$

where i and t indicate cross-section units and time period, respectively. The implied growth equation of equation (1) is:

$$\Delta y_t = \beta_0 + \beta_1 \Delta FD_t + \beta_3 \Delta C_t + \eta_t \tag{3}$$

In general, when a common trend exists among variables, the causal relationship between two or more variables can be investigated using Granger causality

methodology[5]. Further, irrespective of the estimation approach, a dynamic version of equation (3) which includes a lagged-dependent variable (to incorporate the theoretical information on levels) and represents an error-correction model (ECM) can be formulated as:

$$\Delta y_t = \gamma_0 + \sum_{i=1}^{m} \gamma_{1i} \Delta y_{t-i} + \sum_{i=1}^{n} \gamma_{2i} \Delta FD_{t-i} + \sum_{i=1}^{n} \gamma_{3i} \Delta C_{t-i} - \alpha[y_{t-1} - (\pi_0 + \pi_1 FD_{t-1} + \pi_2 C_{t-1})] + v_t \quad (4)$$

where α is the speed of adjustment parameter, v_t is the random disturbance term and m and n represent the number of lags chosen considering the underlying data generating process (DGP). Importantly, the term in the square bracket is the error-correction term which corrects short-run deviations from the equilibrium level (stationary long-run solution). Given that all variables in equation (4) are I(1) processes, any of the standard cointegration techniques such as the Johansen maximum likelihood vector error-correction model (VECM), Engle-Granger two-step and FMOLS can be applied to estimate the corresponding error-correction model (Rao and Rao, 2005; Patterson, 2000; Hendry and Doornik, 1994; Granger, 1988). However, FMOLS also has other advantages. By allowing researchers to exploit information regarding common long-run relationships, the FMOLS technique:

- corrects for potential simultaneity bias among regressors; and
- accounts for any serial correlation in the residuals and endogeneity effects (Narayan and Sun, 2007; Mark and Sul, 2002; Pedroni, 1999).

Before estimations, a number of panel-based unit root tests can be carried out. Among different panel unit roots developed and used in the literature, the Im *et al.* (2003) method (the Im, Pesaran and Shin test (IPS)-*t*-test) is the most powerful in the sense that it allows for heterogeneity in the panel unit root analysis. On the other hand the Levin *et al.* (2002) (LLC) panel unit root tests for the existence of a common root in the panel. Considering a panel version of the augmented Dickey-Fuller (ADF) unit root tests, the IPS-test is of the following form:

$$\Delta y_{it} = A_i + \delta_i t + \theta y_{it-1} + \sum_{j=1}^{m} \pi_{ij} \Delta y_{it-j} + w_{it} \quad (5)$$

where $i = 1, 2, \ldots, N$; $t = 1, 2, \ldots, T$ represent the cross-section dimension and the time length in the ADF regression; and the error term (w_{it}) is assumed to be independent of i's and t's, normally distributed (white noise) but having cross-sectionally hetrogenous variance, σ_i^2. The null and alternative hypotheses are given as: H_0:$\theta = 0$ and H_1:$\theta < 0$ for at least some i's. On the other hand, a panel cointegration test is applied to check whether there exists a long-run equilibrium relationship in the system. Pedroni (1999, 2004) identifies a number of different statistics for the purpose of testing the null of no cointegration in panel data. These include four "within dimension" panel tests and three "between dimension" group mean panel tests which allow for heterogeneity of parameters across countries. The Pedroni methodology of testing cointegration is based on a regression such that:

$$e_{it} = \rho_i e_{t-1} + \varepsilon_{it} \quad (6)$$

where ρ is an autoregressive coefficient of the residuals across different members (ith cross-section in this case) and therefore testing the null and alternative hypothesis of no cointegration can be given as:

$$\begin{aligned} &H_0 = \rho_i = 1 \, vs \, H_1 = \rho_i = \rho < 1 \quad \text{and} \\ &H_0 = \rho_i = 1 \, vs \, H_1 = \rho_i < 1 \, for \, i = 1, 2 \ldots, N \ \ members \end{aligned} \tag{7}$$

for pooled within dimension and group means panel cointegration, respectively. Pedroni (1999, 2004) show that these tests have an asymptotically normal distribution such that:

$$\frac{X_{N,T} - \mu\sqrt{N}}{\sqrt{v}} \Rightarrow N(0,1) \tag{8}$$

where $X_{N,T}$ represents respective group/panel cointegration statistics and μ and v are the mean and variance of each test in this process. In this context, Pedroni's group-mean Panel v-statistics and Panel ρ-statistics, for example, can be calculated, respectively, as:

$$\begin{aligned} Z_v &= \left(\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{e}_{i,t-1} \right)^{-1} \quad \text{and} \\ Z_\rho &= \left(\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{e}_{i,t-1} \right)^{-1} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i} (\hat{e}_{i,t-1} \Delta \hat{e}_{i,t} - \hat{\lambda}_i) \end{aligned} \tag{9}$$

where $\hat{e}_{i,t-1}$ represents the residual vector of the estimation. Considering that the variables are cointegrated for each member of the panel, the group-mean panel FMOLS estimator is given by:

$$\begin{aligned} \hat{\beta}_{FD,GFM} &= N^{-1} \sum_{i=1}^{N} \left(\sum_{t=1}^{T} (FD_{it} - \overline{FD}_i)^2 \right)^{-1} \left(\sum_{t=1}^{T} (FD_{it} - FD_i)(y^*_{FD,it} - \hat{\gamma}_i T \right) \\ \hat{\beta}_{C,GFM} &= N^{-1} \sum_{i=1}^{N} \left(\sum_{t=1}^{T} (C_{it} - \bar{C}_i)^2 \right)^{-1} \left(\sum_{t=1}^{T} (C_{it} - C_i)\,(y^*_{C,it} - \hat{\gamma}_i T \right) \end{aligned} \tag{10}$$

where:

$$y^*_{FD,it} = (y_{it} - \bar{y}_i) - \frac{\hat{\Omega}_{21i}}{\hat{\Omega}_{22i}} (\Delta FD_{it});$$

and that:

$$\hat{\gamma}_i = \hat{\Gamma}_{21i} + \hat{\Omega}^{0}_{21i} - \frac{\hat{\Omega}_{21i}}{\hat{\Omega}_{22i}} (\hat{\Gamma}_{21i} + \hat{\Omega}^{0}_{22i})$$

is the serial correlation correction. Thus, the associated statistics are distributed N(0,1) as $T \rightarrow \infty$ and $N \rightarrow \infty$[6].

Data description

We perform the analysis of financial development, financial liberalization and growth using panel and time series data comprising up to 15 SSA countries with annual observations over the period of 1976-2005[7]. In assessing the relationship between financial development (deepening) and economic performance, the selection of variables to represent the efficiency and the level of financial development (level of financial services) in an economy has been a major issue. Owing to various reasons, from lack of valid and reliable data on a diversity of financial services catered in different financial systems, constructing a comparable measure of financial services for a broad cross-section of countries remains a difficult task (Levine *et al.*, 2000; Neusser and Kugler, 1998).

In many studies, researchers have used various measures of, or proxies for, the role of financial markets in explaining growth. Some of the most commonly used proxies of financial development are: widely available monetary aggregates such as M2 or M3 to income, ratio of banking deposit liabilities to income, domestic credit to private sectors to GDP and ratio of domestic credit to income (Beck, 2002; Luintel and Khan, 1999; Demetriades and Hussein, 1996; de Gregorio and Guidotti, 1995; King and Levine, 1993a, b). In this analysis, we will use the ratio of private credit to income (PCY) and the ratio of domestic credit to income (DOM) as proxies for financial development. Ghirmay (2004) iterates that private sector credit (value of credit by financial intermediaries to this sector) is an accurate measure of the functioning of financial development since it captures the quantity and quality of investment[8]. However, in the case of developing economies such as ours, PCY may have some shortcomings since it may exclude financial development that takes place outside the banking sector (Khan and Senhadji, 2003; Ghirmay, 2004; Levine, 1999). Thus, we also take an alternative measure of financial development which represents the domestic assets of the financial sector (DOM). The data source for these two variables is the International Monetary Fund (IMF) publication *International Financial Statistics*[9].

As is common in most time series investigations, the availability and quality of data at the required disaggregated level have posed a major challenge during the data analyses phase of our work. Although secondary data sources such as *International Financial Statistics* (IMF) and *World Development Indicators* (World Bank) provide some annual data on most of the SSA countries, there are frequent cases of missing observations as well as unreported data. Following a considerable work in sifting through the vast quantities of raw data on our target variables, the possible sample has substantially reduced. Our final sample consists of 15 SSA countries in which we could verify reliability and consistency in the database. Thus, this process has enhanced the overall quality of our data. Moreover, our sample countries include low-, medium- and high-income countries with varied growth experience.

We use the Chinn and Ito (2005) measure of financial openness as a proxy for financial liberalization. This index measures the degree of financial openness for a country at a certain time period which is constructed using binary variables based upon the IMF's *Report on Exchange Arrangements and Exchange Restrictions* (AREAER)[10]. GDP per capita (GDP) is taken from Penn World Tables (Mark 6.2), while level of monetization (M1) and government spending (GOV) are from secondary data sources of the *World Development Indicators* (World Bank). These variables are converted into real terms using a GDP deflator.

Following the literature such as World Bank (1989), Xu (2000), Al-Yousif (2002) and Al-Awad and Harb (2005), M1, inflation rate (Inf) (log difference of consumer price index (CPI)) and GOV (other control variables) are taken to capture the role of macroeconomic polices in stimulating economic growth and stability. In their study, Al-Awad and Harb (2005) utilized these indicators to control for macroeconomic stability supporting our choice of these variables. Their results also indicate that both these variables have had a significant influence on growth in their region of interest[11]. With the exception of the index and financial development indicators (PCY and DOM), all other series are expressed in log form to compress the measurement scale.

4. Estimation results

To explore the panel time series properties of the data, we use LLC and Im *et al.* (2003) (IPS) panel unit root tests. Following Im *et al.* (2003), we apply demeaning to both LLC and IPS by subtracting the cross-section means from the data. Table I reports the LLC and IPS unit root tests. With the exception of GOV, the null hypothesis of non-stationarity cannot be rejected for all series both by LLC and IPS tests for the levels. This null hypothesis is rejected at the 5 per cent level for the GOV series by IPS tests with the demeaned data and when the trend is included. On the other hand, the non-stationarity hypothesis is easily rejected at the 1 per cent level by the LLC and IPS tests for all series in their first-differences. For GOV variable, the null of a unit root is again investigated against the alternative of a stationary process using Breitung (2000) and Hadri (2000) procedures. Both the tests indicate that GOV level series for all the 15 SSA countries tend to be non-stationary. Further, when the same tests are repeated

			IPS		LCC	
Variables	Data type	Deterministic	Level	First difference	Level	First difference
PCY	Raw	Constant (C)	1.04	−9.18*	1.06	−9.11*
		C + trend	0.55	9.13*	−0.46	8.55*
	Demeaned	C + trend	1.77	8.55*	1.93	3.62*
DOM	Raw	Constant (C)	−0.09	−9.46*	−0.41	−9.23*
		C + trend	−0.04	−7.56*	−0.55	−7.51*
	Demeaned	C + trend	−0.03	−11.62*	−0.45	−12.01*
GDP	Raw	Constant (C)	−2.21	−9.87*	−3.82*	−8.35*
		C + trend	−1.38	−14.05*	−1.97	−13.36*
	Demeaned	C + trend	−1.56	−8.61*	−1.49	−7.31*
M1	Raw	Constant (C)	1.76	−9.47*	1.85	−7.65*
		C + trend	0.31	−8.29*	−0.97	−6.07*
	Demeaned	C + trend	−0.64	−14.84*	0.38	−12.63*
GOV	Raw	Constant (C)	−0.77	−12.17*	−0.56	−10.2*
		C + trend	−2.08	−9.87*	−0.57	−7.51*
	Demeaned	C + trend	−2.87**	−7.87*	−0.67	−13.31*
FLIB	Raw	Constant (C)	−1.57	−15.73	−0.32	−14.49
		C + trend	−1.53	−15.33	−2.45	−13.99
	Demeaned	C + trend	−1.72	−13.68	−2.15	−16.05
Inflation	Raw	Constant (C)	−1.23	−9.04	−0.94	−9.20
		C + trend	−1.79	−7.65	−1.89	−7.93
	Demeaned	C + trend	−1.91	−8.03	−1.58	−11.56

Note: Significance at: *1 and **5 per cent rejection levels

Table I.
Panel unit root tests (IPS and LCC)

at first differenced series, null hypothesis is rejected at the 5 per cent level for the Breitung test while Hadri test also show that GOV differenced series are stationary. Overall, on these evidence it seems sensible to suggests that income, GOV, monetization (M1) and financial development variables (PCY and DOM) are non-stationary and generated by an I(1) process[12].

Next, we use the Pedroni (1999) technique to analyse the cointegration relationship among the variables. Table II reports heterogenous panel cointegration test results. This is done for three different income equations. In the *FD1* equation, PCY, GDP, M1 and GOV variables are considered. In the second equation (*FD2*), DOM replaces PCY and in the third, financial liberalization index (FLIB) relaces PCY. In all three equations, five out of the seven Pedroni panel and group tests significantly reject the null of no cointegration. Evidence of no cointegration is found from the panel-*rho* tests. However, results from Monte Carlo simulations indicate that panel-*v* and panel-*rho* tend to underestimate the null rejection in the case of small N and T (Pedroni, 2004; Al-Awad and Harb, 2005). Thus, we conclude that cointegration cannot be ruled out on the whole and therefore proceed to estimate the cointegrating vectors.

Tables III-V give the FMOLS estimates of the three different models specified in the above section. The dependent variable is GDP per capita. The individual country and panel group mean estimators are reported. In the table, individual estimates and *t*-statistics for $H_0 : \beta_i = 0$ for all the countries and the panel are provided. More specifically, the panel group mean estimator allows for heterogenous long-run elasticities while permitting the test of the null $H_0 : \beta_i = \beta_0$vs $H_1 : \beta_i \neq \beta_0$ for all i so that the values of β_i are not constrained to be the same under H_1 among different i members of the panel.

In the first growth equation where financial development is proxied by private sector credit, seven out of the 15 countries show a positive relationship between the financial development indicator and economic growth. In five cases out of the seven, the null hypothesis is rejected at the 5 per cent significance level and the positive coefficient empirically supported. We should note here that due to the time span factor of our observations the country-specific estimation may be imprecise and respective long-run elasticities may vary[13]. In Table IV, where domestic credit to GDP (DOM) is used to proxy financial development, nine out 15 countries indicate a positive relationship. In seven out of these nine cases (Cameroon, Ghana, Kenya, Niger, South Africa, Rwanda and Zimbabwe) the relationship is statistically significant at least at the 10 per cent level.

Test	FD1	FD2	FLIB
Panel v-stat	2.366*	2.015*	−2.864*
Panel rho-stat	1.243	−1.930*	0.313
Panel pp-stat	−3.117*	−0.933	−2.632*
Panel ADF-stat	−1.789**	−1.895**	−1.775**
Group rho-stat	4.424*	2.228*	1.958*
Group pp-stat	−1.007	−3.307*	−2.001*
Group ADF-stat	−1.877**	−0.695	−0.422

Table II.
Panel cointegration test statistics

Notes: Significance at: *1 and **5 per cent rejection levels of the null hypothesis; FD1 and FD2 are growth-private credit and growth-domestic credit equations, respectively, while FLIB indicates the growth-financial liberalization equation

Country	PCY		M1		GOV	
CAR	−4.865*	(−2.971)	−0.001	(−0.003)	0.256	(0.698)
Cameroon	−0.508	(−0.135)	−0.151	(−0.469)	1.349*	(5.525)
Ghana	4.351*	(6.327)	−0.651*	(−4.478)	0.544*	(6.495)
Gambia	−0.022	(−1.121)	0.282**	(2.264)	−0.437**	(−2.198)
Kenya	1.661*	(3.549)	0.328***	(1.837)	0.479**	(2.084)
Lesotho	−0.593	(−1.451)	0.796*	(3.769)	0.366	(1.594)
Mauritius	−0.896**	(−2.703)	−0.223	(−1.188)	2.121*	(9.609)
Malawi	−0.536	(−0.375)	0.438	(1.809)	0.782*	(3.389)
Niger	5.576**	(2.306)	−0.239	(−1.301)	0.909*	(4.130)
Senegal	−3.888*	(−4.741)	0.075	(0.414)	1.749*	(6.237)
S/Leone	−9.008*	(−3.444)	0.221**	(2.148)	−0.161	(−1.123)
Togo	1.488	(1.324)	−0.171	(−1.127)	−0.245	(−1.084)
S/Africa	0.058	(1.133)	0.088	(1.053)	1.025*	(8.548)
Rwanda	4.182**	(2.701)	0.179	(0.302)	0.399	(1.526)
Zimbabwe	0.574**	(2.006)	−0.021	(−1.121)	0.632*	(3.974)
Panel	0.031**	(2.295)	0.105*	(3.599)	0.213*	(8.252)

Notes: Significance at: *1, **5 and ***10 per cent; figures in the parenthesis are *t*-statistics

Table III.
FMOLS regression for FD (private credit) and growth tests

Country	DOM		M1		GOV	
CAR	−2.215	(−1.625)	0.337	(0.932)	0.282	(0.611)
Cameroon	3.978*	(5.408)	0.421**	(2.566)	0.830*	(6.322)
Ghana	1.427*	(2.854)	−0.625**	(−2.341)	0.709*	(4.624)
Gambia	−0.731***	(−1.928)	0.402*	(3.484)	−0.095	(−0.439)
Kenya	1.029**	(2.192)	0.250	(1.117)	0.524	(1.666)
Lesotho	−0.351	(−1.474)	0.875*	(4.080)	0.151	(0.596)
Mauritius	−0.468*	(−2.841)	−0.256	(−1.594)	1.921*	(11.352)
Malawi	−0.565	(−1.187)	0.287	(1.175)	0.795*	(3.576)
Niger	4.371*	(11.067)	−0.027	(−0.541)	0.346*	(6.129)
Senegal	−1.953*	(−3.143)	−0.319	(−1.499)	1.712*	(4.798)
S/Leone	0.350	(1.404)	0.160	(1.1025)	−0.088	(−0.431)
Togo	0.375	(0.531)	−0.177	(−1.105)	−0.324	(−1.435)
S/Africa	0.129***	(1.737)	0.080	(1.157)	1.058*	(10.704)
Rwanda	2.703*	(3.252)	0.531	(1.232)	0.574**	(2.355)
Zimbabwe	0.599**	(2.216)	−0.021	(−1.165)	0.503*	(3.083)
Panel	0.579*	(4.741)	0.1	(2.221) **	0.593*	(13.817)

Notes: Significance at: *1, **5 and ***10 per cent; figures in the parenthesis are *t*-statistics

Table IV.
FMOLS regression for FD (domestic credit) and growth tests

In this aspect our finding provides support to the theoretical prediction and empirical studies on the finance-growth literature (Ghirmay, 2004; Calderon and Liu, 2003; Levine *et al.*, 2000; Benhabib and Spiegel, 2000; Luintel and Khan, 1999; Demetriades and Hussein, 1996; King and Levine, 1993a; among others). From Table III, we also observe a positive and significant relationship between the monetary aggregate variable (M1) and long-run economic growth.

Considering the limited power of individual tests given the time span of our observation, the panel estimates for both financial development equations are also reported. The two coefficients of financial development are estimated to be 0.03 (for ratio

Country	FLIB		M1		GOV	
CAR	−0.173	(−1.397)	0.347	(0.907)	0.328	(0.671)
Cameroon	−0.093	(−0.695)	−0.144	(−0.586)	1.198*	(3.984)
Ghana	0.005	(0.043)	0.043	(0.206)	0.449**	(2.643)
Gambia	0.077***	(1.833)	0.093	(0.644)	−0.098	(−0.501)
Kenya	0.003	(0.052)	0.085	(0.312)	0.939**	(2.567)
Lesotho	−0.024	(−0.145)	0.871*	(3.801)	0.275	(0.914)
Mauritius	−0.084	(−1.471)	−0.412***	(−1.970)	2.001*	(7.368)
Malawi	−0.136	(−0.582)	0.449 ***	(1.922)	0.830*	(3.501)
Niger	0.032	(0.428)	0.032	(0.198)	0.571*	(3.099)
Senegal	−0.284**	(−2.338)	−0.569**	(−2.056)	1.573*	(3.622)
S/Leone	0.245*	(3.407)	−0.003	(−0.034)	0.083	(0.567)
Togo	−0.304*	(−3.981)	−0.246**	(−2.518)	−0.060	(−0.423)
S/Africa	0.004	(0.125)	0.155***	(1.872)	1.052*	(8.729)
Rwanda	0.066	(0.177)	1.613**	(2.656)	0.058	(0.133)
Zimbabwe	0.227***	(1.976)	−0.025	(−1.208)	0.776*	(4.312)
Panel	−0.029	(−0.714)	0.152	(1.071)	0.665*	(10.635)

Notes: Significance at: *1, **5 and ***10 per cent; Figures in the parenthesis are *t*-statistics

Table V.
FMOLS regression for financial liberalization and growth tests

of private credit to income *PCY* equation) and 0.58 (for ratio of domestic credit to income *DOM* equation), respectively, and the null hypothesis is rejected at the 5 per cent significance level. Accordingly, higher levels of financial development lead to faster current and future rates of GDP per capita in SSA countries.

The relationship between financial liberalization and economic growth is tested and results summarized in Table V. Only in Gambia, Sierra Leone and Zimbabwe do we observe a positive and significant impact on growth. For the panel test, the coefficient is negative and insignificant. From the literature, there are a number of channels through which financial liberalization can influence growth. Financial liberalization may have a direct effect on growth through opening up financial markets to enhance across-boundary flow of funds and by encouraging competition, and thus increasing the amount of resources available for investment (Nazmi, 2005; Bekaert, 2005; Laeven, 2003; Levine, 1997; Fry, 1997). Ultimately, generating international competition for funds, thereby rewarding the most productive projects, may enhance growth rates. Moreover, being an integral part of financial sector development, financial liberalization may deepen the financial system and stimulate financial intermediation by improving risk management techniques, offering new financial instruments and services, inviting better managed foreign banks and increasing the possibility of risk diversification by financial institutions (Bekaert *et al.*, 2005). In this aspect, financial liberalization may have an indirect effect through financial development and thus generate higher rates of economic growth (Bonfiglioli, 2005; Klein and Olivei, 1999; Levine, 2001)[14]. On the other hand, variables of government expenditure and real money are positive and sometimes significant, in accordance with the predictions under Tables III and IV. The results indicate a very strong long-run connection between variables representing financial development and economic growth.

To further test the causality hypothesis between financial liberalization, financial development and growth, Table VI reports panel and pairwise Granger causality. For SSA countries:

Null hypothesis	*F*-test	*p*-value	EC_{t-1}	*p*-value
(a) Granger causality results				
PCY does not Granger cause GDP	3.846	0.010	0.003	0.496
GDP does not Granger cause PCY	0.673	0.511	−0.565	0.000
DOM does not Granger cause GDP	4.190	0.016	−0.044	0.453
GDP does not Granger cause DOM	1.598	0.204	0.036	0.429
FLIB does not Granger cause GDP	0.189	0.706	−0.036	0.467
GDP does not Granger cause FLIB	1.620	0.199	−0.057	0.008
		Obs.	*F-statistic*	*p-value*
(b) Pairwise Granger causality tests				
GDP does not Granger cause FLIB		420	2.47062	0.0858
FLIB does not Granger cause GDP			0.12606	0.8816
PCY does not Granger cause FLIB		315	1.53906	0.1335
FLIB does not Granger cause PCY			1.93470	0.0469
DOM does not Granger cause FLIB		315	1.54459	0.1317
FLIB does not Granger cause DOM			1.99780	0.0393
PCY does not Granger cause GDP		420	2.38470	0.0934
GDP does not Granger cause PCY			3.94173	0.0201
DOM does not Granger cause GDP		420	4.29426	0.0143
GDP does not Granger cause DOM			7.26184	0.0008

Note: We have also tried the test at various lags and the relationship remains robust

Table VI.
Panel data

- there is evidence of two-way causality from financial development to economic growth;
- the null hypothesis of Granger no-causality from financial liberalization to growth is not rejected, but the vice versa is rejected at least at the 10 per cent critical level; and
- the result suggests one-way causality between financial liberalization and financial development since the null hypothesis of no causality from financial liberalization to financial development is rejected at the 5 per cent critical level but not vice versa.

Overall, the result supports our previous argument that financial liberalization contributes to growth through its influence on financial market development and enhancing the role financial intermediation.

Previous studies have highlighted the dangers of statistical inference based on cross-sectional analysis (Shan and Morris, 2002; Arestis and Demetriades, 1997; Demetriades and Hussein, 1996). In particular, the inability of cross-sectional studies to examine causality in the Granger sense has been pointed out. Other advantages of the time series approach to testing causality include allowing the use of a dynamic specification in the sense of considering lagged variables. The literature has argued for the use of a VAR framework to tests causality in that:

- it permits a multivariable approach that is less prone to model selection uncertainties and functional selection bias; and
- these techniques in a multivariate model also minimise the risk of simultaneity bias (Shan *et al.*, 2001).

This section uses the cointegration and error-correction models (as specified under equation (11)) to test for a causal relationship while applying it in a multivariate framework.

Sensitivity analysis: effect of financial development depending on other economic characteristics

In this sub-section, we test sensitivity of our results by undertaking further regression analysis. We do this by altering the specification of our model and considering additional variables. One starting point could be breaking down our sample on the basis of the level of per capita income, i.e. into upper and lower income countries using World Bank definitions[15]. This exercise will be useful to examine whether the impact of financial development and that of financial liberalization will differ depending on the level of economic development (Rioja and Valev, 2004). We observe that according to the World Bank country groupings in 2005 only South Africa and Mauritius are classified as "upper-middle-income" economies. Owing to this limitation, we are unable to conduct a rigorous empirical exercise to examine this issue[16]. Our results under Tables III-VI have provided empirical evidence on the relationship between financial development and economic growth while assuming a linear relationship. However, growth effect of financial development may also depend on other economic characteristics such as income, institutional quality and macroeconomic environment. We focus on macroeconomic stability aspect here and seek to examine if SSA countries with higher inflation will benefit less from financial development compared to those with lower inflation. Following researchers such as Kemal *et al.* (2004), we hypothesized that the financial development effect is a function of say, for example, macroeconomic stability indicators such as inflation rate and GOV, i.e. from equation (2) $\beta'_{1i} = \beta_{1i} + \beta_{2i} Inf_{it}$. In this framework, we consider the interaction between financial development and the inflation rate and GOV variables, one at a time. The level of GDP per capita also acts as one of the control variables in all the regressions.

The estimation results are presented in Table VII. So far we have used M1 as one of our control variables; however, it is possible that the variable could also be a proxy for financial development. In all the regressions under Table VII, inflation replaces M1. Inflation is negative and significant indicating that it also depresses growth through making the financial system inefficient. Inflation is seen to exert the largest effect on PCY (our preferred measure of financial development which isolates bank credit to the private sector) relative to DOM. Our results are consistent with Keho (2009) and Barro (1997) who observe that permanent increases in the rate of inflation affect economic growth negatively through depressing financial development. Thus, from a policy perspective, we argue that nations in SSA region should aim to reduce high inflation and keep macroeconomic condition stable overtime for sustained economic growth. In the second and third regressions (Table VII) we introduce interactions of financial development and our indicators of macroeconomic environment (GOV and inflation rate, respectively). The interaction terms are negative and in most cases significant at the 5 per cent level. These results imply that financial sector development has detrimental effects on growth in an environment where macroeconomic instability is high. Kemal *et al.* (2004) also document empirical evidence to support our view.

Dependent →	PCY		DOM	
Regression 1				
FLIB	0.026*	(−4.345)	0.078**	(−4.409)
Inflation	−0.903***	(−1.959)	−0.188*	(−2.650)
Government spending	−0.134**	(−2.475)	−0.041	(−1.186)
Regression 2				
FLIB	0.001***	(1.885)	0.0074	(0.094)
Inflation	−0.913*	(−6.933)	−1.909*	(−8.140)
Government spending	−0.0042	(−1.016)	−0.041***	(−1.715)
Government spending × log (value of bank credit to the private sector)	−0.043**	(−2.452)		
Government spending × log (value of domestic credit by banks)			−6.9103	(−1.604)
Regression 3				
FLIB	0.008*	(2.635)	0.018	(0.492)
Inflation	−1.0165*	(−8.841)	−2.145*	(−9.762)
Government spending	−0.012	(−0.846)	−0.031	(−1.278)
Inflation rate × log (value of bank credit to the private sector)	−0.0428**	(−2.221)		
Inflation rate × log (value of domestic credit by banks)			−6.6386**	(−2.349)

Notes: Significance at: *1, **5 and ***10 per cent levels; a panel cointegration test was conducted for each equation to confirm the presence of cointegrating relations; statistical; values in brackets are *t*-statistics

Table VII.
Panel FMOLS estimates with inflation and interaction variables

Further time-series tests

For consistency with the previous section and economic theory, country-by-country Johansen cointegration tests are also implemented here[17]. The results of this exercise are reported in Table VIII. Both the trace and maximum eigenvalue tests almost unanimously point to the same conclusion. The results indicate that the null hypothesis of zero cointegrating vectors is rejected in favour of one cointegrating vector in the case of Ghana, Gambia, Kenya, Lesotho, Mauritius, Senegal, South Africa and Rwanda. The evidence also shows the existence of at least two cointegrating vectors for Central African Republic, Niger, Cameroon, Malawi and Zimbabwe. For Sierra Leone and Togo the null hypothesis $r = 0$ (no cointegration), $r \leq 1$, $r \leq 2$ and $r \leq 3$ cannot be rejected at any conventional level of significance in favour of alternative hypotheses $r = 1$, $r = 2$ and $r = 3$. As observable, there is considerable variation across countries for the results obtained from the above cointegration analysis. This can mainly be explained by structural and institutional differences. The first group of countries represent more integrated African countries that have trade and financial links among themselves. In this group also, the many forms of financial and macroeconomic reforms of the past decade have fostered financial innovation and trade integration to some extent. In the second group, lack of government commitment to market liberalization has either led to both a low level of financial and trade integration or have witnessed disintegration over time (Nissanke and Aryeetey, 1998). The third group is also characterized by low levels of economic transformation, low levels of economic development and serious institutional deficiencies and rule of law[18]. These results suggest the presence of a long-run equilibrium relationship among GDP per capita, financial development,

Country	Null vs alternative	Eigenvalue	Trace	Maximum eigenvalue
CAR	r = 0 r = 1	0.689	60.764*	32.742*
	r ≤ 1 r = 2	0.392	28.022**	13.925
	r ≤ 2 r = 3	0.349	14.097	12.007
Cameroon	r = 0 r = 1	0.591	58.597*	28.999*
	r ≤ 1 r = 2	0.553	33.598*	22.562*
	r ≤ 2 r = 3	0.249	11.036	8.008
Ghana	r = 0 r = 1	0.549	47.595*	22.266
	r ≤ 1 r = 2	0.444	23.329	16.46
	r ≤ 2 r = 3	0.126	6.869	3.776
Gambia	r = 0 r = 1	0.686	70.143*	32.420*
	r ≤ 1 r = 2	0.513	37.723	20.119
	r ≤ 2 r = 3	0.419	17.604	15.224
Kenya	r = 0 r = 1	0.667	51.072*	30.788*
	r ≤ 1 r = 2	0.312	20.284	10.471
	r ≤ 2 r = 3	0.222	9.813	7.027
Lesotho	r = 0 r = 1	0.630	65.636*	27.826
	r ≤ 1 r = 2	0.555	37.810	22.684
	r ≤ 2 r = 3	0.316	15.127	10.629
Mauritius	r = 0 r = 1	0.483	45.393*	18.447
	r ≤ 1 r = 2	0.369	22.947	12.903
	r ≤ 2 r = 3	0.301	10.044	10.019
Malawi	r = 0 r = 1	0.658	60.364*	30.020*
	r ≤ 1 r = 2	0.563	30.344*	23.177*
	r ≤ 2 r = 3	0.223	7.167	7.061
Niger	r = 0 r = 1	0.682	75.013*	32.050*
	r ≤ 1 r = 2	0.635	42.963*	28.232*
	r ≤ 2 r = 3	0.366	14.731	12.779
Senegal	r = 0 r = 1	0.564	49.164*	23.250
	r ≤ 1 r = 2	0.388	25.914	13.740
	r ≤ 2 r = 3	0.274	12.174	8.951
S/Leone	r = 0 r = 1	0.490	41.701	18.860
	r ≤ 1 r = 2	0.347	22.841	11.934
	r ≤ 2 r = 3	0.258	10.907	8.342
Togo	r = 0 r = 1	0.522	44.641	20.642
	r ≤ 1 r = 2	0.379	23.999	13.335
	r ≤ 2 r = 3	0.227	10.664	7.203
S/Africa	r = 0 r = 1	0.629	49.766*	27.745*
	r ≤ 1 r = 2	0.443	22.022	16.378
	r ≤ 2 r = 3	0.180	5.644	5.558
Rwanda	r = 0 r = 1	0.661	60.231*	30.282*
	r ≤ 1 r = 2	0.436	29.949	16.032
	r ≤ 2 r = 3	0.282	13.917	9.286
Zimbabwe	r = 0 r = 1	0.657	60.235*	29.968*
	r ≤ 1 r = 2	0.541	30.267*	21.832*
	r ≤ 2 r = 3	0.212	8.435	6.674

Note: Significance at: *5 and **10 per cent levels

Table VIII.
Johansen's maximum likelihood test for multiple cointegrating relationships

M1 and government expenditure in these countries. Given that the Granger non-causality is ruled out, the direction of Granger causality will be examined next using the VECM technique of the following form[19]:

$$\begin{aligned}\Delta GDP_t &= \lambda_A + \sum_{i=1}^{m} \gamma_{1i}\Delta GDP_{t-i} + \sum_{i=1}^{n} \gamma_{2i}\Delta FD_{t-i} \\ &\quad + \sum_{i=1}^{n} \gamma_{3i}\Delta M1_{t-i} \sum_{i=1}^{n} \gamma_{4i}\Delta GOV_{t-i} + \alpha EC_{t-1} + \omega_t \\ \Delta FD_t &= \lambda_B + \sum_{i=1}^{m} \delta_{1i}\Delta FD_{t-i} + \sum_{i=1}^{n} \delta_{2i}\Delta GDP_{t-i} \\ &\quad + \sum_{i=1}^{n} \delta_{3i}\Delta M1_{t-i} \sum_{i=1}^{n} \delta_{4i}\Delta GOV_{t-i} + \xi EC_{t-1} + \sigma_t\end{aligned} \tag{11}$$

where EC_{t-1} is the estimated residual from the cointegrating relationship. Using the four-variable VAR system, we perform causality tests for each country. There can be two different sources of causality. The first is the *F*-test (Wald-test) of explanatory variables (lagged dynamic terms) where non-rejection implies "*x* does not Granger-cause *y*" in the short-run. The second is the significance of lagged error-term, which implies a long-run causal relation as it contains long-run information of the variables. Test results of the VECM are presented in Table IX. Again in this section, the robustness of the relationship among financial development variables and growth is further checked using multivariate vector auto-regression while utilizing both the private sector credit (PCY) and domestic credit (DOM) proxies. The Granger-causality test rejects non-causality from financial development to real income growth in five countries (Central African Republic, Ghana, Malawi, South Africa and Zimbabwe) at least at the 10 per cent significance level[20]. But no feedback relationship from growth to financial development is observed in these countries. There is evidence of a strong exogeneity test of financial development causing growth, showing overall short- and long-run causality in Malawi, where the sum of the coefficient of the explanatory variable and the corresponding error-correction is significant at the 5 per cent level. Our results also show a feedback relationship (two-way Granger causality) between financial development and real GDP per capita growth from Cameroon, Gambia, Kenya, Niger and Rwanda. This finding lends support to the prediction of Grimmay (2004) for SSA countries who reported that financial development had a long-run causal effect on economic growth in eight of the 13 sample countries (where six of them were bi-directional). Similar results were reported for other countries by Luintel and Khan (1999) and Ang and McKibbin (2005). Other significant results include uni-directional causality from growth to financial development. For Senegal and Mauritius, Granger non-causality from economic growth to financial development can be rejected at the 5 per cent significance level, not the reverse. There is, however, no evidence of uni- or bi-directional causality between financial development and GDP per capita growth, either in the short- or long-run in Lesotho, Sierra Leone and Togo.

In general, these results confirm the importance of the role of a well-functioning financial sector and its contribution to the development process. It is well documented in the literature that a robust financial sector is essential in promoting economic development (King and Levine, 1993a; Luintel and Khan, 1999). Specific channels through which a modern financial sector might facilitate long-run growth include:

Country	Null hypothesis	*F*-test	*p*-value	EC_{t-1}	*p*-value
CAR	PCY → GDP	0.871	0.435	−0.746	0.043
	GDP → PCY	1.090	0.358	−0.183	0.186
Cameroon	PCY → GDP	0.048	0.854	−1.008	0.025
	GDP → PCY	1.510	0.248	−0.994	0.000
Ghana	PCY → GDP	0.749	0.487	−0.367	0.052
	GDP → PCY	0.102	0.903	−0.251	0.287
Gambia	PCY → GDP	0.924	0.415	−0.270	0.074
	GDP → PCY	1.071	0.364	−1.167	0.000
Kenya	PCY → GDP	3.984	0.052	−0.993	0.013
	GDP → PCY	0.725	0.498	−0.399	0.034
Lesotho	PCY → GDP	0.314	0.569	−0.070	0.617
	GDP → PCY	0.057	0.673	−0.090	0.734
Mauritius	PCY → GDP	0.161	0.853	0.031	0.802
	GDP → PCY	1.375	0.285	−0.488	0.025
Malawi	PCY → GDP	2.911	0.067	−0.165	0.047
	GDP → PCY	2.162	0.144	−0.317	0.118
Niger	PCY → GDP	2.910	0.081	−0.279	0.052
	GDP → PCY	0.751	0.486	−0.599	0.050
Senegal	PCY → GDP	0.762	0.481	−0.110	0.317
	GDP → PCY	0.069	0.934	−0.523	0.049
S/Leone	PCY → GDP	1.967	0.166	–	–
	GDP → PCY	0.252	0.780	–	–
Togo	PCY → GDP	0.290	0.751	–	–
	GDP → PCY	1.129	0.230	–	–
S/Africa	PCY → GDP	7.117	0.009	−0.232	0.186
	GDP → PCY	0.698	0.533	−0.116	0.331
Rwanda	PCY → GDP	1.044	0.372	−0.717	0.002
	GDP → PCY	3.066	0.066	0.034	0.708
Zimbabwe	PCY → GDP	0.102	0.904	−0.547	0.003
	GDP → PCY	1.465	0.257	−0.185	0.139

Table IX.
Granger causality results based on error-correction model

Notes: EC_{t-1} denotes the error-correction term; the *F*-test is the joint significance of the lagged coefficients of the independent variables; → means "does not Granger-cause"

enhancing the rate of capital accumulation (savings mobilization for investment); increasing the efficiency of investment; reducing information asymmetries and improving risk management; and allowing greater specialization and supporting continuous technological innovation (Levine, 1997). In line with these studies our research finding supports the view that "finance seems importantly to lead economic growth". The causality investigation show that ten out of the 15 SSA countries exhibited either two-way causality or a uni-directional Granger-causality running from financial development to growth. Our findings tend to agree with those of Andersen and Tarp (2003), Arestis and Demetriades (1997) and Demetriades and Hussein (1996) that may be country-specific, and that the use of time series, as opposed to cross-sectional data, is important in distinguishing different causal patterns.

Direct and indirect effects of financial liberalization on growth

Finally, we also investigate the effect of financial liberalization on financial development. In order to provide further insights into the dynamic relationship between financial

liberalization and economic growth, we also test for a causality relationship between the time series. The result of this exercise is summarized in Table X. For the individual countries, one-way causality, where the null hypothesis that "Granger non-causality from financial liberalization to growth" can be rejected at the 95 per cent significance level (mainly through the error-correction indicating a long-run causal effect), is observed only in the cases of Senegal and Togo. On the contrary, evidence that economic growth leads to financial liberalization can be seen for Kenya, Lesotho and South Africa. Importantly, our results clearly indicate that in the cases of Central African Republic, Mauritius, Malawi, Sierra Leone, Rwanda and Zimbabwe, neither financial liberalization causes growth nor economic growth causes financial liberalization. In line with our findings earlier, there is little evidence to suggest that financial liberalization affects economic growth directly and the different result for a few countries may be explained by discrepancies in the financial liberalization data within countries especially in Africa. On the other hand, Table XI focuses on the direction of causality between financial liberalization (FLIB) and financial development. Interestingly, one-way causality running from FLIB to financial

Country	Null hypothesis	*F*-test	*p*-value	EC_{t-1}	*p*-value
CAR	FLIB → GDP	2.268	0.132	−0.082	0.208
	GDP → FLIB	3.417	0.055	−0.488	0.011
Cameroon	FLIB → GDP	1.232	0.315	−0.111	0.229
	GDP → FLIB	1.160	0.336	−0.669	0.102
Ghana	FLIB → GDP	2.772	0.089	−0.035	0.685
	GDP → FLIB	1.736	0.205	−0.567	0.014
Gambia	FLIB → GDP	0.250	0.782	−0.313	0.095
	GDP → FLIB	0.534	0.595	−0.222	0.032
Kenya	FLIB → GDP	0.356	0.705	−0.099	0.401
	GDP → FLIB	5.044	0.013	−0.230	0.186
Lesotho	FLIB → GDP	1.672	0.216	0.075	0.612
	GDP → FLIB	1.144	0.341	−0.861	0.018
Mauritius	FLIB → GDP	1.415	0.267	–	–
	GDP → FLIB	1.217	0.407	–	–
Malawi	FLIB → GDP	1.274	0.263	−0.158	0.147
	GDP → FLIB	0.266	0.770	−0.469	0.167
Niger	FLIB → GDP	1.553	0.185	−0.243	0.041
	GDP → FLIB	2.046	0.158	−0.338	0.045
Senegal	FLIB → GDP	5.170	0.004	−0.276	0.008
	GDP → FLIB	0.989	0.391	−0.057	0.732
S/Leone	FLIB → GDP	1.796	0.193	–	–
	GDP → FLIB	1.231	0.314	–	–
Togo	FLIB → GDP	1.617	0.226	−0.524	0.036
	GDP → FLIB	0.317	0.733	−0.769	0.117
S/Africa	FLIB → GDP	0.412	0.668	−0.055	0.748
	GDP → FLIB	0.276	0.762	−0.404	0.026
Rwanda	FLIB → GDP	1.710	0.209	−0.094	0.806
	GDP → FLIB	0.311	0.737	−0.462	0.138
Zimbabwe	FLIB → GDP	0.263	0.774	−0.419	0.144
	GDP → FLIB	0.324	0.730	−0.381	0.165

Notes: EC_{t-1} denotes the error-correction term; the *F*-test is the joint significance of the lagged coefficients of the independent variables; → means "does not Granger-cause"

Table X.
Granger causality tests between financial liberalization and growth

	χ^2-statistics	FLIB → PCY	χ^2-statistics	PCY → FLIB	Causality
CAR	2.515	No	1.217	No	No
Cameroon	5.886*	Yes	1.083	No	One-way
Ghana	6.861*	Yes	6.104*	Yes	Two-way
Gambia	7.964*	Yes	2.841	No	One-way
Kenya	6.978*	Yes	3.238	No	One-way
Lesotho	7.180*	Yes	1.517	No	One-way
Mauritius	8.598*	Yes	2.843	No	One-way
Malawi	7.359*	Yes	0.362	No	One-way
Niger	5.781*	Yes	2.403	No	One-way
Senegal	7.923*	Yes	6.415*	Yes	Two-way
S/Leone	3.102	No	2.409	No	No
Togo	3.052	No	5.986*	Yes	One-way
S/Africa	10.812*	Yes	1.612	No	One-way
Rwanda	7.694*	Yes	1.065	No	One-way
Zimbabwe	3.142	No	6.945	Yes	One-way

Note: Significant at: *10 per cent level or better

Table XI.
Bi-variate causality analysis (direction of causality)

development cannot be rejected in ten countries while two-way causality is reported in Ghana and Senegal. This together with our results in Table X reinforces our previous argument that FLIB may indirectly "predict" economic growth. Overall results from time series data tend to support the view that financial liberalization influences economic development indirectly through fostering financial development.

5. Conclusion

In order to evaluate and investigate the role of financial liberalization and financial development in the process of economic development, we have presented panel and time series data analyses for SSA countries. Both the theoretical and empirical literature suggests that through playing the critical role in fostering savings mobilization, easing risk management, allocating capital to more productive uses and facilitating transactions, financial development stimulates growth. In this regard, financial sector underdevelopment can be a serious obstacle to long-term growth. Thus, a number of comprehensive financial reforms have taken place in SSA countries in the last decade and a half to address the problems of African financial markets and further encourage the financial system to deliver better financial services.

This paper has applied recent developments in non-stationary panel and time-series data analyses to explore the long-run relationship between the financial development, financial liberalization and economic growth for 15 SSA countries. While Pedroni's panel cointegration was employed, the use of cointegration/vector error-correction provides a more realistic dynamic representation of the relationship by incorporating an important feedback relationship that may exist between variables. While using two different proxies for financial development, the results of the panel unit root tests suggest that all of the series are non-stationary integrated variables. Further, evidence from cointegration implies that there is causality between variables considered in the study.

From the group-mean panel FMOLS developed by Pedroni, we obtain a significant positive estimate for the coefficients of financial development. Panel estimates for both

coefficients of the private sector credit and credit to the domestic sectors (the two proxies of financial development) are estimated to be 0.03 and 0.58, respectively, and the null hypothesis is rejected at the 5 per cent significance level. Accordingly, higher levels of financial development lead to faster current and future rates of GDP per capita in SSA countries. From the panel estimator, the elasticity of income growth with respect to financial liberalization is negative and insignificant, indicating little evidence of a long-run linkage between financial liberalization and per capita GDP growth. However, further causality tests carried out indicate a significant link between financial liberalization and financial development, suggesting an indirect and significant impact of financial liberalization on growth.

In the second stage, country-by-country time series investigations are considered using a multivariate cointegration test and error-correction model. The results from the VECM technique, which incorporated the cointegration effect into the causality analysis, show evidence of causality running from financial development to growth in five countries, bi-directional causal relationships in five countries and reverse causality from economic growth to financial development in two countries. The analysis yielded evidence of financial liberalization Granger causing economic growth only in two countries. However, this is not to say that financial liberalization does not promote growth as it could do so indirectly through fostering financial development. These findings appear to reinforce the Granger causality tests for the panel data as well as the fully modified group mean estimator (FMOLS). The policy implication of our results is that governments in Africa should adopt strategies to enhance the role of the financial sector in promoting economic growth. To deliver effective financial services that boost productivity, structural and institutional constraints should be reduced or eliminated. More importantly, the legal and supervisory framework and capabilities should be continuously enhanced.

Notes

1. Ucer (1997) and Mirdala (2006, p. 448) note that although financial liberalization can instigate financial crisis, it is important to recognize this indirect channel in which it tends to promote growth.
2. Although some have reported a positive association between the two (Ranciere *et al.*, 2006; Andriesz *et al.*, 2005), other findings suggest the overall effect may be ambiguous (Bonfiglioli, 2005).
3. Frequently, the words economic growth and economic development have been used interchangeably by many researchers. However, we acknowledge here that there are important differences between the two terms. In simple terms, economic growth refers to an expansion in economic activities, an increase in per capita income, etc. while the latter has a more comprehensive meaning which not only includes a rise in income but also an improvement in social welfare, education, healthcare, etc.
4. For a comprehensive literature review see also DFID (2004).
5. This technique is now common and covered in any of the standard econometric textbooks, such as Patterson (2000).
6. See Pedroni (1999) for more detailed documentation and technical procedures, especially on group panel statistics and long-run covariance of this vector process.
7. The countries are Central Africa Republic (CAR), Cameroon, Ghana, Gambia, Kenya, Lesotho, Mauritius, Malawi, Niger, Senegal, Sierra Leone, Togo, South Africa, Rwanda and Zimbabwe.

8. A similar argument has been given by Levine *et al.* (2000).
9. Following Levine *et al.* (2000), PCY and DOM are calculated as $\{0.5*[F(/t-1)/P\_e(t-1)+F(t-1)/P\_e(t-1)]\}/[GDP(t)/P-a(t)]$, where: F is credit by financial institution to the private sector (line 22d + 42d) and domestic credit by financial institutions (line 32); GDP is line 99b; P_e is the end of the period CPI (line 64); and P_a is the average CPI for the year.
10. For detailed calculation and elaboration refer to Chinn and Ito (2005, 2007).
11. It is possible that M1 and PCY may be related. However, real M1 is taken in levels and expressed into natural logarithm.
12. We acknowledge here that there may be a risk of mixing I(1) and I(0) variables. However, the literature also suggests that it is possible for more than two series integrated of different orders to combine to form a new cointegrated series of lower order integration (Harris, 1995; Pagan and Wickens, 1989).
13. Some studies have mentioned that taking averages over time in the spirit of panel time series may pose some problems, while cross-sectional averaging may be sensitive to outliers (Nieh and Ho, 2006), and thus we also look at country-by-country estimates.
14. On the other hand financial liberalization may actually have a negative impact on growth. Liberalization led reforms may increase financial fragility of the financial intermediaries institutions such as banks and increase information problems and risk-taking activities of financial institutions, leading to financial instability especially in developing countries (Arestis and Caner, 2004; Hellmann *et al.*, 2000; Stiglitz, 2000; Demirguc-Kunt and Detragiache, 1998).
15. We thank the reviewer for his/her suggestion in this regard.
16. We leave this matter for future research and empirical consideration when data availability improves.
17. To learn more about the country/individual time series behaviour and for confirmatory purposes, individual standard unit root (ADF) tests were also undertaken for each country. However, since span of our data is short such tests may have relatively lower power to reject the null hypothesis of unit roots when it is in fact false (Acaravci and Acaravci, 2007). Our country-by-country ADF test results are available upon request.
18. Despite this, it is also possible that the differences may be due to lack of quality data.
19. Note that in the case of Table X, where the effect of financial liberalization is estimated, the second term of the equation is substituted with FLIB.
20. Although Table IX provides results using the PCY variable only, the regression result using DOM is also available upon request to any curious reader.

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