



FINANCE-GROWTH NEXUS IN AFRICA: A PANEL GENERALIZED METHOD OF MOMENTS (GMM) ANALYSIS

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ABSTRACT

The paper uses the dynamic GMM Model to examine the finance-growth nexus with panel data (1981-2010) from 24 African countries. Evidence suggests that there is a positive relationship between finance and economic growth and that there is a bi-directional causal relationship between finance and economic growth. To the extent that financial development and economic growth Granger-cause each other, we assert that policies directed at any of the two, if efficiently and vigorously pursued, could be beneficial to the study countries.

Keywords: Africa, Financial development, Economic growth.

JEL: G20, D90, E02, E44, C13, C22,

INTRODUCTION

Financial sector development has been defined as the improvement in quantity, quality and efficiency of financial intermediary services (Calderon and Liu, 2002). The writings of Schumpeter (1911), McKinnon (1973) and Shaw (1973) have postulated that financial development has a strong connection with economic growth. The theoretical basis for linking economic growth with financial development is that a well developed and functional financial system enhances the efficiency of financial intermediation by reducing transaction and information costs and also minimizes risks. The prognosis of Schumpeter (1911), in particular, is that a well-developed financial system fuels technological innovation and economic growth through the provision of financial services and resources to those entrepreneurs who demonstrate evidence of successfully producing innovative products and processes. The contention is that since the financial system mobilizes savings, distributes these savings, undertakes risk transformation, engenders liquidity, and catalyzes trade by giving credit and guaranteeing payments, it could promote economic growth and development if it is given the needed attention (Agbetsiafa, 2004). Indeed, Shen and Lee (2006) put it more succinctly that a more developed financial sector provides a fertile ground for the allocation of

resources, better monitoring, fewer information asymmetries, and economic growth. The theoretical prediction of [Schumpeter \(1911\)](#), [McKinnon \(1973\)](#) and [Shaw \(1973\)](#) has since been subjected to empirical testing by researchers. However, the avalanche of studies on the finance-growth nexus has produced inconclusive results. Besides the inconclusive results, the evidence adduced so far seems to be skewed towards the developed world. Evidence from Africa is sparse and also conflicting. This has created a knowledge gap as to the kind of relationship that exists between finance and growth in Africa. The current study contributes to the extant literature in two ways. First, it adds to the evidence on the finance-growth nexus in Africa by using a panel generalized method of moments (GMM), a statistical tool which, to the best knowledge of the author, has not been used for investigation into the finance-growth in the African context; thus, introducing a methodological innovation in the African evidence. Second, most of the studies on the finance-growth nexus in Africa have been country-specific. Although there is a budding notion that country-specific studies should be preferred to cross-section and panel studies [Arestis and Demetriades \(1997\)](#), yet it is hereby submitted that Africa's story on the finance-growth nexus will be better told if more panel studies are undertaken to boost the few case studies in Africa that have produced conflicting results ([Quartey and Prah, 2008](#); [Chukwu and Agu, 2009](#); [Esso, 2010](#); [Ndako, 2010](#); [Odhiambo, 2010](#); [Adusei, 2012](#); [Adusei, 2013](#)). Doing this will, undoubtedly, present a considerable African perspective on the finance-growth connection and consequently aid the understanding of the topic in Africa. The rest of the paper is structured as follows. The next section reviews the extant literature. This is followed by methodology section. Results section is next. Conclusion and policy implications section ends the paper.

LITERATURE REVIEW

The finance-growth nexus has attracted a lot of academic interest from many parts of the world. ([King and Levine, 1993a](#); [1993b](#); [King and Levine, 1993b](#)) and [Levine et al. \(2000\)](#) have reported a positive relationship between financial development and economic growth. [Tran \(2008\)](#) investigates the finance-growth connection in Vietnam and reports that financial development has a positive impact on economic growth. Employing bound testing (ARDL) approach to cointegration with deposit liability ratio (DLR) and credit to private sector (CPS) as proxies for financial development, [Jalil and Ma \(2008\)](#) examine the relationship between financial development and economic growth and report that both DLR and CPS have significant impact on economic growth in Pakistan but not in China. Using VAR model, [Hondroyannis et al. \(2004\)](#) empirically investigate the relationship between the development of the banking system and stock market and economic performance in Greece over the period of 1986-1999 and provide evidence to the effect that both bank and stock market financing can promote economic growth. [Guryay et al. \(2007\)](#) study the finance-growth nexus in Northern Cyprus and report that financial development has an insignificant positive effect on economic growth. The study by [Waqabaca \(2004\)](#) in Fiji reveals a positive relationship between financial development and economic growth. Contrary to the

postulation of Schumpeter (1911), McKinnon (1973) and Shaw (1973), there are studies that have shown evidence of negative relationship between financial development and economic growth (Kaminsky and Reinhart, 1999; Gourinchas *et al.*, 2001; Loayza and Rancie're, 2006; Adusei, 2012)

The issue of direction of causality between finance and growth has also received much attention in the finance-growth discourse. Calderon and Liu (2002) study the direction of causality between financial development and economic growth using decomposition test on pooled data of 109 developing and industrial countries from 1960 to 1994 and adduce evidence that financial development generally leads to economic growth. The study further provides evidence that Granger causality from financial development to economic growth and Granger causality from economic growth to financial development coexist. Hondroyannis *et al.* (2004) show that in Greece there is a bi-directional causality between finance and growth in the long-run. The causal relationship between finance and economic growth is examined by Waqabaca (2004) in Fiji using time series data from 1970 to 2000 with the direction of causality running from economic growth to financial development. Wadud (2005) investigates the long-run causal relationship between finance and development and economic growth for 3 South Asian countries (India, Pakistan and Bangladesh) and concludes that Granger causality between financial development and economic growth runs from financial development to economic growth. Guryay *et al.* (2007) obtain evidence from Northern Cyprus which indicates that the causal relationship between finance and growth runs from economic growth to financial development, without feedback. Bittencourt (2012) reports from Latin America that finance leads economic growth and emphasizes the importance of a more open, competitive financial sector in transmitting financial resources to entrepreneurs as well as the relevance of macroeconomic stability (in terms of low inflation rates) and all the institutional framework that it encompasses (central bank independence and fiscal responsibility laws), as a necessary prerequisite for financial development and consequently for continued growth and prosperity in Latin America. Although some famous studies have combined data from developed and developing countries which include some African countries (Levine *et al.*, 2000; Beck and Levine, 2002; Shen and Lee, 2006; Saci *et al.*, 2009), yet the African story regarding the finance-growth nexus is still bogged in the quagmire of obscurity because Africa-specific studies are few and skewed towards Sub-Saharan Africa. Studies that have been done in Africa have produced mixed results. Ghali (1999) reports from Tunisia that the persistence of high information and transaction costs coupled with lack of a competitive financial sector casts doubts on the existence of a positive impact of finance on economic growth in developing economies. Agbetsiafa (2004) investigates the finance-growth nexus using data from eight Sub-Saharan countries (Ghana, Ivory Coast, Kenya, Nigeria, Senegal, South Africa, Togo, and Zambia). He employs a vector error-correction model and reports that financial development and economic growth are cointegrated in the long run. The study produces evidence that there is mostly a unidirectional causality running from financial development to economic development in Ghana, Nigeria, Senegal, South Africa,

Togo, and Zambia. Under different measures of financial development, the study reports a bi-directional causality in Kenya, Zambia, Zambia, South Africa, Nigeria, Ghana, and Togo. Furthermore, the study shows that economic development appears to lead financial development in Ivory Coast and Kenya. [Ndebbio \(2004\)](#) examines financial deepening, economic growth and development for Sub-Saharan African countries and finds that a developed financial sector spurs overall growth of an economy. [Esso \(2010\)](#) also examines the finance-growth connection with focus on Burkina Faso, Cape Verde, Cote d'Ivoire, Ghana, Liberia and Sierra Leone and establishes a long-run relationship between the two variables. The study shows that financial development precedes economic growth in Ghana and Mali, growth leads finance in Burkina Faso, Cote d'Ivoire and Sierra Leone, and finance and growth cause each other in Cape Verde and Liberia.

Using three proxies of financial development (the ratio of M2 to GDP, the ratio of currency to narrow money and the ratio of bank claims on the private sector to GDP) with real GDP per capita as proxy for economic growth, [Odhiambho \(2004\)](#) examines the role of financial development on economic growth in South Africa and finds that economic growth leads financial development. Employing ARDL-Bounds testing procedure, [Odhiambo \(2010\)](#) revisits the finance-growth nexus in South Africa by looking at the dynamic causal relationship between financial development, investment and economic growth and finds evidence that confirms demand-following hypothesis (i.e. economic growth leads financial development). However, using time series data ranging from 1965 to 2010 with domestic credit as a share of GDP and broad money supply as a share of GDP as measures of financial development with real per capita GDP as proxy for economic growth, [Adusei \(2012\)](#) reports that finance undermines growth in South Africa and that there is a unidirectional causal relationship that runs from financial development to economic growth.

In Tanzania, [Odhiambho \(2005\)](#) investigates the finance-growth connection and finds that there is a bi-directional causality between financial development and economic growth. In Sudan, [Mohammed and Sidiropoulos \(2006\)](#) study the effect of financial development on economic performance from 1970 to 2004 and report a weak relationship between financial development and economic growth in Sudan, attributing the weak relationship to the inefficient allocation of resources by banks coupled with the absence of an appropriate investment climate required to promote significant private investment and foster growth in the long run as well as the poor quality of credit disbursement of the banking sector in Sudan. In Ghana, [Quartey and Prah \(2008\)](#) study the finance-growth relationship and find that whereas there is some evidence in support of demand-following hypothesis when growth in broad money to GDP ratio is used as a measure of financial development, there is no significant evidence to support either the supply-leading hypothesis or demand-following hypothesis 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. However, in a recent study in Ghana, [Adusei \(2013\)](#) reports financial development undermines

economic growth in Ghana. In Kenya, [Odhiambo \(2009\)](#) investigates the direction of causality between financial development and economic growth by examining the effect of inflation on the finance-growth nexus and reports that economic growth Granger-causes financial development in Kenya regardless of whether the causality is estimated in a bivariate framework or in a trivariate setting. The paper argues that the financial sector development in Kenya to a very extent depends on the demand for, rather than the supply of, financial services.

In Nigeria, [Chukwu and Agu \(2009\)](#) adopt multivariate VECM to investigate the causality between financial depth and economic growth from 1971 to 2008. Their results suggest that financial depth and economic growth have a stable long-run relationship. They find evidence in support of demand-following hypothesis when financial depth is proxied by banking sector's private sector credit and real broad money supply and supply-leading hypothesis when loan deposit ratio and bank deposit liabilities are used as proxies for financial depth. Focusing on stock market development, [Enisan and Olufisayo \(2009\)](#) also examine the finance-growth nexus in Nigeria and report that there is a weak evidence of demand-following hypothesis using market size as indicator of stock market development. However, a study by [Ndako \(2010\)](#) in Nigeria reports that there is a unidirectional causality from financial development to economic growth (supply-leading) when bank credit to the private sector (LBCP) is used as a measure of financial development and a bidirectional relationship between financial development and economic growth when domestic credit to the private sector (LDCP) and bank deposit liabilities (LBDL) are used to proxy financial development ([Ndako, 2010](#)).

METHODOLOGY

Model

The dependent variable in our model is economic growth and it is defined as the logarithm of real per capita GDP (LGDPCC). The independent variable is financial development. The ratio of domestic credit to the private sector to GDP and the ratio of liquid liabilities (M3) to GDP are used as measures of financial development ([Saci et al., 2009](#)). We use the ratio of domestic credit to the private sector to GDP (DCPS) to measure the level of financial services (e.g. ([King and Levine, 1993a; 1993b; Levine and Zervos, 1996; Beck et al., 2000; Levine et al., 2000](#))). The ratio of liquid liabilities to GDP (or M3/GDP) (LM3) is used to measure the overall size of the financial intermediary (e.g. ([Goldsmith, 1969; King and Levine, 1993a; 1993b; Levine et al., 2000; Rousseau and Wachtel, 2000; Rioja and Valev, 2004; Saci et al., 2009](#))). We include economic openness (LOPEN), size of government (LSG), human capital (LHC) and capital formation (CFORM) as a share of GDP as control variables. Economic openness is defined as exports plus imports divided by GDP; size of government is defined as logarithm of government consumption of goods and services as a share of GDP; and human capital is defined as logarithm of the life expectancy at birth. Indeed, all variables are log-transformed. The study uses Generalized Method

of Moments (GMM) estimation technique. Developed by Arellano and Bond (1991), GMM techniques control for unobserved country-specific effects, first-difference non-stationary variables, overcome the endogeneity of the explanatory variables by using instruments and test for the presence of autocorrelation (Saci *et al.*, 2009). The impact of financial development on economic growth is defined as:

$$y_{it} = \beta_1 y_{it-1} + \beta_2 F_{it} + \mu_i + \varepsilon_{it} \quad (1)$$

Where y is the logarithm of per capita GDP, F represents the explanatory variables, $\mu_i + \varepsilon_{it}$ represent the unobserved country-level effects and the error term, respectively. Based on the structure of Equation 1, the lagged dependent variable, y_{it-1} , which defines the logarithm of real per capital GDP for country i at time $(t-1)$, is correlated with μ_i , creating an endogeneity problem, which results in inconsistent estimators. To deal with the endogeneity problem from the unobserved country-level effects, μ_i , the first difference for Equation 1 is conducted, resulting in the following Equation 2:

$$y_{it} - y_{it-1} = \beta_1 y_{it-1} - y_{it-2} + \beta_2 (F_{it} - F_{it-1}) + (\varepsilon_{it} - \varepsilon_{it-1}) \quad (2)m$$

It is evident that after overcoming the endogeneity problem from the unobserved country level effect, μ_i , a correlation between the lagged dependent variable y_{it-1} and ε_{it-1} arises in addition to a potential correlation between the independent variables, F_{it} . To address these problems, instrumental variables need to be defined. To this end, the study assumes that there is no serial correlation between error terms, and no correlation between the lagged explanatory variables and future error terms. Making these assumptions, the lagged explanatory variables can be used as instrumental variables. We also use the first-differenced explanatory variables as instrumental variables.

Data Source

Annual panel data from 24 African countries covering the period 1981-2010 gathered from the World Development Indicators (WDI) of the World Bank (<http://www.worldbank.org>) have been used. To boost the representativeness of the findings, sample has been selected to capture every region of Africa: North, South, East, West and Central Africa. Despite data constraints, the study has made sure that at least two countries from each of the regions have been included in the sample. The 24 African countries are Ghana, Algeria, Benin, Botswana, Burundi, Cameroon, Central African Republic, Chad, Congo, Cote D'ivoire, Egypt, Gabon, Gambia, Lesotho, Madagascar, Mali, Mauritius, Senegal, Sierra Leone, South Africa, Sudan, Swaziland, Togo and Zambia.

RESULTS

The correlations between the variables are presented in Table 1. As can be observed from Table 1 there is a high correlation between LCPS and LM3 meaning that including the two financial

development measures in a model will create multicollinearity problem. We, therefore, estimate two equations with LCPS and LM3 as financial development proxies for each of the two equations.

Table-1. Correlation Matrix

	LGDPPC	LDCPS	LM3	LOG(XM)	LHC	LSG	LCFORM
LGDPPC	1.000000	0.449686	0.441395	0.351496	0.487657	0.237943	0.414847
LDCPS	0.449686	1.000000	0.757342	0.213343	0.270857	0.367790	0.232268
LM3	0.441395	0.757342	1.000000	0.235956	0.451939	0.365742	0.345390
LXM	0.351496	0.213343	0.235956	1.000000	0.175985	0.476004	0.559886
LHC	0.487657	0.270857	0.451939	0.175985	1.000000	0.020862	0.379029
LSG	0.237943	0.367790	0.365742	0.476004	0.020862	1.000000	0.342272
LCFORM	0.414847	0.232268	0.345390	0.559886	0.379029	0.342272	1.000000

The results of the dynamic GMM estimation are presented in Table 2 and 3. It is observable that financial development has supported economic growth in the study countries. This jibes with the theoretical postulation of Schumpeter (1911), McKinnon (1973) and Shaw (1973) as well as empirical findings of studies such as King and Levine (1993a; 1993b) and Levine *et al.* (2000) that financial sector development promotes economic growth. The results also demonstrate that economic openness has undermined economic growth. This implies that as the study countries become more open to the rest of the world, their growth is scuttled. It smacks of unfavorable international trade between Africa and the rest of the world. The rest of the control variables have all shown insignificant relationships with economic growth.

Table-2. Results of Dynamic GMM Estimation. Dependent Variable: LGDPPC

Variable	Coefficient	t-statistic	p-value
C	10.17319	6.835966	0.0000***
LGDPPC(-1)	-0.291695	-1.839577	0.0663*
LDCPS	0.185696	4.773244	0.0000***
LOPEN	-0.238917	-3.264086	0.0012***
LHC	-0.291384	-1.450146	0.1475
LSG	-0.036850	-0.679886	0.4968
LCFORM	0.025303	0.588168	0.5566
Adjusted R² = 0.90			

l=LDCPS as measure of financial development. ***, ** and * represent 1%, 5% and 10% significance level respectively.

Table-3. Results of Dynamic GMM Estimation. Dependent Variable: LGDPPC

Variable	Coefficient	t-statistic	p-value
C	10.01046	6.610395	0.0000***
LGDPPC(-1)	-0.287709	-1.763366	0.0783*
LM3	0.192292	2.558599	0.0108**
LOPEN	-0.242320	-3.233470	0.0013***
LHC	-0.338543	-1.584881	0.1135

LSG	0.047489	0.872039	0.3835
LCFORM	0.023727	0.538527	0.5904
Adjusted R²	= 0.90		

l = M3 as measure of financial development. ***, ** and * represent 1%, 5% and 10% significance level respectively.

The direction of causality between finance and growth has attracted a lot of empirical scrutiny, albeit inconclusive results. The current study investigates the direction of causality issue employing Pairwise Granger Causality Tests with six lags. The number of lags has been selected using Akaike Information criterion as well as Final Prediction Error criterion. Evidence presented in Table 4 indicates a bi-directional causality between finance and economic growth in the study countries. This confirms the few studies that have reported a bi-directional causality between finance and growth in Africa: [Esso \(2010\)](#) in Cape Verde and Liberia; [Ndako \(2010\)](#) in Nigeria; [Odhiambho \(2005\)](#) in Tanzania; and [Agbetsiafa \(2004\)](#) in Kenya, Zambia, South Africa, Nigeria, Ghana, and Togo. The economic implication is that policy interventions towards either growth or financial development could be beneficial to these African economies.

Table-4. Pairwise Granger Causality Tests
Lags:6

Null Hypothesis:	Obs	F-Statistic	p-value
LDCPS does not Granger Cause LGDPPC	562	2.16261	0.04513
LGDPPC does not Granger Cause LDCPS	6.14526	3.0E-06	
LM3 does not Granger Cause LGDPPC	568	5.47318	1.6E-05
LGDPPC does not Granger Cause LM3	5.45883	1.7E-05	

CONCLUSION AND POLICY IMPLICATIONS

The current study investigates the finance-growth nexus with focus on 24 purposively selected African countries using panel GMM model. Evidence gathered from the analysis supports the conclusion that there is a positive relationship between finance and economic growth. The results from the Pairwise Granger causality test provide grounds for the conclusion that financial development and economic growth Granger-cause each other. In other words, there is evidence of bidirectional causality between financial development and economic growth in the study countries. To the extent that finance and growth Granger-cause each other, we are grounded to assert that policies directed at any of the two, if efficiently and vigorously pursued, could be beneficial to the study countries. However, from the perspective of Schumpeterian as well as Keynesian writers it will be more advisable for these countries to implement policies and programmes that make finance more accessible and affordable to entrepreneurs who have productive ideas but lack funds to prosecute. To the extent that economic openness has demonstrated a negative relationship with economic growth, we are inclined to assert that international trade is not favorable to the study countries. Consequently, we would recommend trade policy reforms. Probably, subject to

international treaties and accords to which these study countries are signatories, a trade policy that focuses on import substitution coupled with strengthened institutions that promote entrepreneurship could be a step in the right direction.

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