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FINANCIAL INTERMEDIARIES AND ECONOMIC GROWTH IN GHANA: AN EMPIRICAL INVESTIGATION

Sheilla Nyasha[1] and Nicholas M. Odhiambo

Abstract

This paper examines the impact of bank-based financial development on economic growth in Ghana during the period from 1970 to 2014 – using the autoregressive distributed lag (ARDL) bounds testing approach. Unlike some previous studies, the current study uses five proxies to measure the level of bank-based financial development, including a composite index of bank-based financial development derived from various financial development indicators. The empirical results of this study show that the impact of bank-based financial development on economic growth in Ghana is sensitive to the proxy used to measure bank-based financial development. The results also tend to vary over time. Overall, our results show that when the ratio of domestic credit extension to the private sector by banks to GDP, and the composite index are used as proxies, bank-based financial development has a positive impact on economic growth in Ghana. However, when the ratio of deposit money banks' assets to GDP is used as a proxy, bank-based financial development has a negative impact on economic growth. These results apply, irrespective of whether the analysis is done in the short run or in the long run. Other results show that when the ratio of the claims of deposit money banks on the private sector to broad money is used as a proxy for bank-based financial development, bank-based financial development is found to have a negative impact on economic growth in the short run, but a positive impact in the long run. However, when the ratio of quasi liquid liabilities to GDP is used, the relationship tends to be positive in the short run, but negative in the long run.

Keywords: Ghana, Bank-Based Financial Development, Economic Growth

JEL Classification Code: E2, G2, O1

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1. Introduction

The importance of financial sector development in promoting economic growth has been extensively studied in the literature, and well documented in the history of development finance (see, among others, Goldsmith, 1969; McKinnon, 1973; Gelb, 1989; Roubini and Sala-i-Martin, 1992; King and Levine, 1993). While it has been widely acknowledged that financial development is important in propelling economic growth (see Schumpeter, 1911; Goldsmith, 1969; McKinnon, 1973; Shaw, 1973; King and Levine, 1993; Odedokun, 1996; Kargbo and Adamu, 2009; Hassan *et al*., 2011, among others) alternative views still exist. There are some studies that support the view that the relationship between financial development and economic growth is negative. These studies include those of: Van Wijnbergen (1983); Buffie (1984); and De Gregorio and Guidotti (1995), among others. Besides these two views, there is the third one, which sees no significant relationship between financial development and economic growth (see also Robinson, 1952; Lucas, 1988; Stern, 1989; Ram, 1999; Andersen and Tarp, 2003).

Despite the existence of a large global pool of empirical work on this subject, very few studies have been conducted on the impact of bank-based financial development on economic growth. Until recently, most studies on the finance-growth nexus have focused on financial development in general, without a specific focus on any particular segment of the financial system. Yet, it is a well-known fact that financial system is made up of both bank-based and market-based segments. Only a handful of the finance-growth studies have paid specific attention to the impact of bank-based financial development – commonly referred to as the development of financial intermediaries – on economic growth. Even where such studies exist, a significant number of those studies have concentrated mainly on Asia, Latin America and selected sub-Saharan African countries, leaving Ghana with little coverage. In addition,

the majority of the studies on Ghana have focused mainly on the causality between bank-based financial development and economic growth, rather than on the impact of bank-based financial development on economic growth. Furthermore, the majority of the previous studies have mainly utilised either the maximum-likelihood test (Johansen, 1988; Johansen and Juselius, 1990), or the residual-based co-integration test (see Engle and Granger, 1987); even though it is now well known that these co-integration procedures may not be suitable when the sample size is too small (see also Odhiambo, 2009). It is also noteworthy that a significant number of the previous studies have over-relied on cross-sectional data, which might not necessarily have adequately addressed the country-specific issues (Casselli *et al*., 1996; Ghirmay, 2004).

Against this backdrop, this paper empirically examines the impact of bank-based financial development on economic growth in Ghana – over the period from 1970 to 2014. Unlike some previous studies, the current study uses five proxies to measure the Ghanaian financial intermediary development. These proxies include a composite index that captures the breadth and depth of bank-based financial development in the study country.

The study focuses on Ghana – because this country has not received much individual coverage in terms of the bank-based finance-growth nexus research in recent years. Even in the isolated cases where such research does exist, the results are largely inconclusive. Ghana also makes an interesting case study because it is one of the unsung emerging markets. Its financial sector consists of two segments: the bank-based segment and the market-based segment. Although the capital markets have been developing at a rapid rate, the Ghanaian financial sector is largely dominated by banks. Ghana is, therefore, generally referred to as having a bank-based financial system.

The rest of the paper is organised as follows: Section 2 gives an overview of the financial system in Ghana. Section 3 provides a review of the existing empirical literature on the relationship between bank-based financial development and economic growth. Section 4 deals with the estimation techniques and empirical analysis. Section 5 concludes the study.

2. Financial System in Ghana: An Overview

The apex of the Ghanaian financial system is occupied by the Bank of Ghana, which is the country's central bank. The Bank of Ghana is responsible for the formulation and implementation of monetary policy aimed at achieving the objectives of the Bank, which include stability of the national currency and the financial system at large (Bank of Ghana, 2015).

Like any other financial sector, over the years, Ghana's financial system has gone through a process of liberalization, restructuring and transformation. According to Ackah and Asiamah (2014), the transformation started as part of the Financial Sector Adjustment Programs (FINSAP) implemented from the late 1980s through to the mid-1990s. Before the 1990s' banking-sector reform, the Ghanaian banking sector was dominated by state-owned banks with official allocation and pricing of credit. This practice gave rise to an uncompetitive banking system characterised by an inefficient intermediation process (Ackah and Asiamah, 2014).

The financial sector reforms that stretched for decades focused on the improvement of the regulatory and supervisory framework, the promotion of non-bank financial institutions and the restructuring of distressed banks (Ministry of Finance and Economic Planning, 2012).

The outcome of these reforms has been the privatisation of state-owned banks and the increased competition within the sector, as a result of the rapid growth in the number and types of financial institutions, as well as the diversity in products and services offered by these institutions. Although the banking sector reforms brought positive results, the Ghanaian financial sector still has room for further improvement to be on a par with its peers in terms of financial system stability, financial inclusion and competitiveness (see International Monetary Fund, 2011: 5; European Investment Bank, 2013).

According to the International Monetary Fund (2011), challenges currently facing the Ghanaian banking sector include deficiencies in commercial banks' risk management, supervision and the insolvency regime, as well as state involvement. While the state has controlling interests in five banks – amounting to 29% of the banking system assets – the performance of these state-owned banks has not been impressive, owing to lending practices that focus on developmental objectives at the expense of prudential considerations (International Monetary Fund, 2011: 5).

From the economic growth front, Ghana's overall macro-economic conditions further deteriorated in 2014 (International Monetary Fund, 2015). The volatility of the gas supply from Nigeria, a sharp fall in the currency and rising inflation, which required policy-tightening, have led to the slowdown of the country's real GDP growth rate from 7.3% in 2013 to less than 4.5% in 2014 (International Monetary Fund, 2015). To tackle the structural imbalances, and to point the economic growth in the upward path, the government of Ghana has immediate plans to embark on a fiscal stabilisation strategy, with assistance from the

International Monetary Fund. If realised, the International Monetary Fund (2015) reckons the program should support fiscal adjustment for the 2015-2017 period.

Despite the short-term downside risks, it is the International Monetary Fund's (2015) view that Ghana's long-term growth prospects are positive, and that the growth rate is expected to rebound to 7.8% by 2017 – based on the assumption that current macro-economic problems will be addressed, according to the plan under an International Monetary Fund program.

3. Bank-Based Financial Development and Economic Growth

The debate on the impact of bank-based financial development on economic growth has been ongoing since the 19th Century. Initially, the debate had a general focus on financial development and economic growth. However, as the hunt for the forces driving economic growth intensified, development economists went a step further and dissected financial development into bank-based and market-based financial development; and they analysed the impact of each financial segment on economic growth. In both cases, the documented empirical evidence is, however, largely mixed and inconclusive.

Although the existing empirical evidence on the impact of bank-based financial development on economic growth is largely mixed and inconclusive, it basically falls into three categories. The first category consists of those studies that support the argument that bank-based financial development has a positive impact on economic growth. The second category comprises those studies that view bank-based financial development as being bad for economic growth. It is this group that concludes that bank-based financial development has a negative impact on economic growth. Then there is a third category, although not so popular,

that supports the view that the impact of bank-based financial development on economic growth is over-emphasised; the two are not related; and bank-based financial development has no significant impact on economic growth.

Of the studies on the impact of bank-based financial development on economic growth, there are those of De Gregorio and Guidotti (1995); Odedokun (1996); Ahmed and Ansari (1998); Ram (1999); Andersen and Tarp (2003); Agbetsiafa (2004); Güryay *et al*, (2007); Kargbo and Adamu (2009); Hassan *et al*. (2011); Sackey and Nkrumah (2012); Ogunyiola (2013); Adu *et al*. (2013); Samanhyia *et al*. (2014); and Petkovski and Kjosevski (2014), among others. Due to the complexity of the subject, the empirical literature on the impact of bank-based financial development on economic growth varies largely, depending on the empirical approach employed; the country coverage; the time periods; and the proxies of bank-based financial development used. As such, a single study may present one view, or two views, or all three views – depending on the proxies used or the countries covered in the study.

Based on panel data analysis, De Gregorio and Guidotti (1995) tested the empirical relationship between bank-based financial development and economic growth in a large cross-country sample. Generally, they found that bank-based financial development is positively related to economic growth; for Latin America the impact was found to be negative. Using the annual data over varying periods, from the 1960s through to the 1980s, Odedokun (1996) found that financial development promotes economic growth in about 85% of 71 less-developed countries. A negative association between financial development and economic growth was, however, discovered in at least 15% of the 71 countries studied.

In the same vein, Ahmed and Ansari (1998) examined the relationship between financial sector development and economic growth in the three major South-Asian economies of India, Pakistan, and Sri Lanka, using pooled data, based on time-series and cross-sectional observations. The results revealed that bank-based financial development has a positive impact on economic growth in these countries. Using several measures of bank-based financial development, Agbetsiafa (2004) studied the long-run equilibrium relationship between financial development and economic development in eight sub-Saharan African countries. The results confirmed the existence of a long-run relationship between bank-based financial development and economic growth in all eight of these countries.

Using the ARDL approach, Kargbo and Adamu (2009) examined the relationship between financial development and economic growth in Sierra Leone for the period 1970 to 2008; and they found that financial development exerts a statistically significant positive effect on economic growth. Two years later, Hassan *et al*. (2011) studied the role of financial development on the economic growth process in low- and middle-income countries, using both panel regressions and variance decompositions. The results indicated a positive relationship between financial development and economic growth. Using the Johansen co-integration analysis, Sackey and Nkrumah (2012) examined the effects of financial sector development on economic growth in Ghana. They found a statistically significant positive relationship between financial sector development and economic growth.

Ogunyiola (2013) empirically investigated the long-run relationship and short-run dynamics between bank-based financial development and economic growth in Cape Verde for the period 1980 to 2011. Using the Johansen and Juselius approach to co-integration, the empirical results indicated the existence of a long-run relationship between economic growth

and bank-based financial development in Cape Verde. However, in the short run, no significant relationship was found to exist between the two. Adu *et al*. (2013) investigated the long-run growth effects of financial development in Ghana. They found that the impact of bank-based financial development on economic growth is proxy-sensitive. Using credit to the private sector as a ratio to GDP, and total domestic credit as proxies of bank-based financial development, the results confirmed the impact to be positive. Conversely, using the broad money stock to GDP ratio, the nature of the impact turned out to be negative.

Likewise, Samanhyia *et al*. (2014) investigated the long-run effect of financial sector development on economic growth in Ghana; and they found conflicting evidence that supports both the positive and negative impact of bank-based financial development on economic growth, depending on the proxy under consideration. Also, Petkovski and Kjosevski (2014) examined the impact of bank-based financial development on economic growth in 16 transitional economies from Central and South Eastern Europe – using a generalised method of moments dynamic panel method. The research results showed that while the ratio of quasi money is positively related to economic growth, credit to the private sector and interest margin are negatively related to economic growth in these study countries.

Contrary to the conclusions reached in several recent studies that attest to the existence of a relationship between bank-based financial development and economic growth, Ram (1999), in his 95-country study, found that bank-based financial development does not promote economic growth. The main pattern was that of an insignificant negative association between financial development and economic growth. Similarly, Andersen and Tarp (2003) found a weak association between financial development and economic growth in their 74-country study. Güryay *et al*. (2007) likewise found a negligible effect of bank-based financial

development on economic growth in Northern Cyprus in their finance-growth nexus analysis based on the Ordinary Least Squares estimation method.

As demonstrated by the literature reviewed, despite being there three views, the popular view from the empirical front is in favour of the positive impact of bank-based financial development on economic growth.

4. Estimation Techniques and Empirical Analysis

4.1 Co-integration – The ARDL Bounds Testing Procedure

This study uses the autoregressive distributed lag (ARDL) bounds testing approach to examine both the long-run and the short-run relationship between bank-based financial development and economic growth in Ghana. Unlike most widely used co-integration testing methods associated with Engle and Granger (1987), Johansen (1988) and Johansen and Juselius (1990), this method has numerous advantages. Firstly, the ARDL-bounds testing approach does not impose the restrictive assumption that all the variables under study must be integrated of the same order. Thus, the ARDL method can be used, regardless of the stationarity properties of the variables – provided they are not integrated of order two or higher. Secondly, the ARDL technique allows for inferences on long-run estimates; and it provides unbiased estimates of the long-run model and valid t-statistics – even when some of the regressors are endogenous (Odhiambo, 2008) – which is not possible under the alternative co-integration testing methods (see also Majid, 2008). Thirdly, the ARDL model takes a sufficient number of lags to capture the data-generating process in a general-to-specific modelling framework, in order to obtain optimal lag length per variable. Fourthly, unlike the conventional co-integration methods that estimate the long-run relationships within the context of a system of equations, the ARDL method uses a single reduced-form equation,

(see also Duasa, 2007). Finally, the ARDL procedure has superior small sample properties, when compared with other methods of co-integration testing (Pesaran and Shin, 1999). It provides robust results for a smaller sample size under co-integration analysis. Based on these advantages, the ARDL approach is, therefore, considered to be suitable for the analysis in this study. Of late, the method has also been increasingly used in empirical research.

4.2 Empirical Model Specifications

The empirical model of the study is specified as follows:

$$GDP_t = T + \alpha_0 + \alpha_1 BFD_{it} + \alpha_2 INV_t + \alpha_3 SAV_t + \alpha_4 TOP_t + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Where:

GDP = economic growth, proxied by real GDP growth rate;

BFD = different proxies of bank-based financial development (M2, PSC, CPS, BA, BDI); where:

M2 = the ratio of quasi liquid liabilities to GDP

PSC = the ratio of domestic credit extension to private sector by banks to GDP

CPS = the ratio of claims of deposit money banks on private sector to broad money

BA = the ratio of deposit money banks' assets to GDP

BDI = composite index of bank-based financial development (see also Demirguc-Kunt and Levine, 1996)

INV = investment proxied by gross fixed capital formation as a ratio of GDP

SAV = savings proxied by gross domestic savings as a ratio of GDP

TOP = trade openness proxied by the sum of the ratio of imports of goods and services to GDP and ratio of exports of goods and services to GDP

T = trend

t = current period

α_0 = constant

α_1- α_4 = respective coefficients

ε_t = error term

Five regressions (models) are specified. In each of these regressions, a proxy of bank-based financial development is included, one proxy at a time. Thus, in Model 1, bank-based financial development is proxied by M2; in Model 2 by PSC, in Model 3 by CPS, in Model 4 by BA, and in Model 5 by BDI.

Following the work of Demirguc-Kunt and Levine (1996), a conglomerate index of bank-based financial development (BDI) can be calculated by averaging the means-removed values of the four indicators of bank-based financial development in a two-step procedure. Firstly, the means-removed values of the ratio of quasi-liquid liabilities to GDP (M2), the ratio of domestic credit extension to private sector by banks to GDP (PSC), the ratio of claims of deposit money banks on private sector to broad money (CPS) and the ratio of deposit money banks' assets to GDP (BA) are computed. The means-removed value of variable X is defined as Xm = [X – mean (X)] / [ABS (mean{X})], where ABS(z) refers to the absolute value of z. For mean (X), the average value of X over the 1970-2014 period was used. Secondly, a simple average of the means-removed M2, PSC, CPS and BA is taken to obtain an overall index of bank-based financial development (BDI).

Following Pesaran *et al*. (2001), the ARDL representation of the model in equation (1) is shown as equation (2):

$$\Delta GDP_t = T + \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta GDP_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta BFD_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta INV_{t-i} + \sum_{i=0}^{n} \alpha_{4i} \Delta SAV_{t-i} + \sum_{i=0}^{n} \alpha_{5i} \Delta TOP_{t-i} + \sigma_1 GDP_{t-1} + \sigma_2 BFD_{t-1} + \sigma_3 INV_{t-1} + \sigma_4 SAV_{t-1} + \sigma_5 TOP_{t-1} + \mu_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where:

T = trend

t = current period

α_0 = constant;

α_1- α_5; σ_1- σ_5 = respective regression coefficients;

Δ = difference operator;

n = lag length; and

μ_t = white noise-error term

Based on the ARDL model specified in equation (2), the ARDL-based error-correction model is specified as follows:

$$\Delta GDP_t = T + \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta GDP_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta BFD_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta INV_{t-i} + \sum_{i=0}^{n} \alpha_{4i} \Delta SAV_{t-i} + \sum_{i=0}^{n} \alpha_{5i} \Delta TOP_{t-i} + \xi_1 ECM_{t-1} + \mu_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

4.3 Data Sources

This study utilised the annual time-series data, covering the period from 1970 to 2014. The annual data used in the study were obtained from the World Bank Databank (World Bank, 2015). All model estimations were computed using Microfit 5.0 software.

4.4 Stationarity Tests

Although the ARDL procedure does not require all variables to be integrated of the same order, the stationarity test provides guidance as to whether ARDL is suitable or not, since it is only appropriate for the analysis of variables that are either I(0) or I(1). On this premise, before any analysis is made, the variables are first tested for stationarity, using the Phillips-Perron (PP) unit-root test. To cater for possible structural breaks within the dataset, the second stationarity test, the Perron (1997) (PPURoot), was utilised (see Appendix 1 for break dates). The results of the stationarity tests for all the variables are presented in Table 1.

Table 1: Stationarity Tests for all Variables

Phillips-Perron (PP)				
Variable	**Stationarity of all Variables in Levels**		**Stationarity of all variables in First Difference**	
	Without Trend	With Trend	Without Trend	With Trend
GDP	-4.387***	-6.552***	–	–
M2	-1.496	-1.909	-6.267***	-6.195***
PSC	-0.765	-2.103	-7.469***	-8.004***
CPS	-5.153***	-6.434***	–	–
BA	-0.590	-1.723	-4.751***	-4.938***
BDI	-1.458	-3.006	-9.587***	-10.319***
INV	-1.226	-3.156	-9.007***	-9.019***
SAV	-3.473**	-3.456*	–	–
TOP	-0.849	-2.191	-5.905***	-5.843***
Perron, 1997 (PPURoot)				
Variable	**Stationarity of all Variables in Levels**		**Stationarity of all variables in First Difference**	
	Without Trend	With Trend	Without Trend	With Trend
GDP	-6.690***	-6.408***	–	–
M2	-3.196	-3.650	-7.188***	-7.036***
PSC	-3.458	-4.204	-9.067***	-9.236***
CPS	-6.752***	-6.657***	–	–
BA	-4.805	-4.063	-5.879**	-5.759**
BDI	-5.179*	-5.447*	–	–
INV	-4.646	-4.339	-8.518***	-8.398***
SAV	-4.496	-4.451	-5.533**	-5.615**
TOP	-3.251	-2.963	-7.551***	-7.248***

Note: *, ** and *** denote stationarity at 10%, 5% and 1% significance level

Overall, the results reported in Table 1 show that the variables are a mixture of those integrated of order zero and of order one, thereby satisfying the stationarity property requirement for the ARDL bounds testing procedure. The next step is to perform a co-integration test to examine whether the variables in each model are co-integrated.

4.5 Co-integration Test

The long-run relationship between the variables in the specified models is examined using the co-integration test based on the ARDL bounds testing method in a two-step approach. Firstly, the order of lags of the first differenced variables in equations (2) is determined. This is followed by the application of a bounds F-test to equation (2), in order to establish the existence of a long-run relationship, if any, between the variables under study. The null hypothesis of no co-integration is expressed as H_0: $\sigma_1 = \sigma_2 = \sigma_3 = \sigma_4 = \sigma_5 = 0$. This is tested against the alternative hypothesis of co-integration, expressed as H_1: $\sigma_1 \neq \sigma_2 \neq \sigma_3 \neq \sigma_4 \neq \sigma_5 \neq 0$. The calculated F-statistic is compared with the critical values computed by Pesaran *et al*. (2001). If the calculated F-statistic lies above the upper bound level, the null hypothesis of no co-integration is rejected at the corresponding significance level; and it may be concluded that the variables in question are co-integrated. However, if the calculated F-statistic lies below the lower-bound level, the null hypothesis of no co-integration is accepted; and it follows that the variables are not co-integrated. In the event that the calculated F-statistic falls within the upper and the lower-bound levels, the results are interpreted as inconclusive. The results of the bounds F-test for this study are reported in Table 2.

Table 2: Bounds F-test for Co-integration

Model	Dependent Variable	Function	F-statistic	Co-integration Status
1	GDP	F(GDP|M2, SAV, INV, TOP)	5.7896***	Co-integrated
2	GDP	F(GDP|PSC, SAV, INV, TOP)	6.2118***	Co-integrated
3	GDP	F(GDP|CPS, SAV, INV, TOP)	4.7565**	Co-integrated
4	GDP	F(GDP|BA, SAV, INV, TOP)	4.5557*	Co-integrated
5	GDP	F(GDP|BDI, SAV, INV, TOP)	5.7097**	Co-integrated

Asymptotic Critical Values						
Pesaran *et al*. (2001), p.301, Table CI(v) Case V	1%		5%		10%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
	4.40	5.72	3.47	4.57	3.03	4.06

Note: *, ** and *** denote statistical significance at 10%, 5% and 1% levels respectively

The results of the ARDL bounds test for co-integration reported in Table 2 indicate that the calculated F-statistic in all the five models is higher than the critical values reported by Pesaran *et al*. (2001) in Table CI (v) Case V. It can, therefore, be concluded that the variables in the specified models are co-integrated.

4.6 ARDL-Based ECM Model Estimation

To determine the optimal lag length of each model, the Akaike information criterion (AIC) or the Bayesian information criterion (BIC) is utilised. The optimal lag-length selected, based on AIC is ARDL(2,4,0,1,0) for Model 1; ARDL(1,4,0,4,0) for Model 2; ARDL(1,4,4,0,0) for Model 3; ARDL(2,2,1,1,0) for Model 4; and ARDL(1,4,4,0,0) for Model 5. The long-run and short-run results of the models are reported in Table 3 Panel A and Panel B, respectively.

Table 3: Estimation of Long-Run and Short-Run Coefficients

	Model 1 - M2 ARDL(2,4,0,1,0)	Model 2 - PSC ARDL(1,4,0,4,0)	Model 3 – CPS ARDL(1,4,4,0,0)	Model 4 – BA ARDL(2,2,1,1,0)	Model 5 - BDI ARDL(1,4,4,0,0)
Panel A: Estimated long-run coefficients (Dependent variable: GDP)					
Regressors	**Coefficient (t-statistic)**				
C	1.1903(0.5145)	5.5939(1.7104)*	-2.9224(-1.8375)*	-3.2041(-2.2039)**	-2.3743(1.1095)
T	0.2803(2.6508)**	-0.2554(-0.9580)	0.30922(2.5532)**	0.3354(3.2586)***	0.2775(1.8981)*
M2	-0.2220(-1.7248)*	-	-	-	-
PSC	-	0.7891(1.8839)*	-	-	-
CPS	-	-	0.7928 (2.2718)**	-	-
BA	-	-	-	-0.2089(-1.8365)*	-
BDI	-	-	-	-	0.3480(1.9360)*
INV	0.1563(1.7183)*	0.3877(1.8530)*	0.0772 (0.2537)	-0.0823(-0.3346)	0.0596(0.1657)*
SAV	-0.0225(-0.1145)	-0.2463(-0.6555)	-0.0478(-0.2690)	0.1334(1.7763)*	-0.1140(-0.5026)
TOP	-0.0336(-0.5731)	-0.1105(-1.3956)	-0.0489(-0.8890)	0.0302(0.5363)	-0.1153(-1.8056)*
Panel B: Error Correction Representation for the Selected ARDL Model (Dependent variable: ΔGDP)					
ΔT	0.3285(2.5151)**	-0.2049(1.0244)	0.3087(2.3797)**	0.3859(3.0206)***	0.2328(1.7985)*
ΔGDP(1)	0.3255(1.8839)*	-	-	0.3458(2.1647)**	-
ΔM2	-0.2285(-0.7926)	-	-	-	-
ΔM2(1)	0.2095(0.8008)	-	-	-	-
ΔM2(2)	0.4495(1.7009)*	-	-	-	-
ΔM2(3)	0.1534(0.5566)	-	-	-	-
ΔPSC	-	0.7188(1.2660)	-	-	-
ΔPSC(1)	-	0.198 4(.4222)	-	-	-

	Model 1 - M2 ARDL(2,4,0,1,0)	Model 2 - PSC ARDL(1,4,0,4,0)	Model 3 – CPS ARDL(1,4,4,0,0)	Model 4 – BA ARDL(2,2,1,1,0)	Model 5 - BDI ARDL(1,4,4,0,0)
Panel B (continued): Error Correction Representation for the Selected ARDL Model (Dependent variable: ΔGDP)					
ΔPSC(2)	-	0.3815(0.7908)	-	-	-
ΔPSC(3)	-	1.0990(2.3651)**	-	-	-
ΔCPS	-	-	0.0949(1.0646)	-	-
ΔCPS(1)	-	-	-0.6369(-2.7295)**	-	-
ΔCPS(2)	-	-	-0.4509(-3.0697)***	-	-
ΔCPS(3)	-	-	-0.1842(-2.2629)**	-	-
ΔBA	-	-	-	-0.8865(-2.7330)***	-
Δ BA(1)	-	-	-	0.3703(1.2199)	-
ΔBDI	-	-	-	-	0.1297(0.4532)
Δ BDI(1)	-	-	-	-	-0.0348(-0.1182)
Δ BDI(2)	-	-	-	-	0.1927(.7406)
Δ BDI(3)	-	-	-	-	0.7110(3.0626)***
ΔINV	0.1832(0.7241)	0.3109(1.2814)	0.5725(2.2581)**	0.2240(0.8666)	0.6196(2.2756)**
ΔINV(1)	-	-	0.5612(2.4030)**	-	0.4721(1.7006)*
ΔINV(2)	-	-	0.2107(0.9741)	-	0.1400(0.5406)
ΔINV(3)	-	-	0.3387(1.8020)*	-	0.3965(1.7456)*
ΔSAV	-0.2857(-1.2942)	0.1120(0.5165)	-0.0477(-0.2707)	-0.2696(-1.3652)	-0.0956(-0.5140)
ΔSAV(1)	-	0.3336(1.3724)	-	-	-
ΔSAV(2)	-	0.4721(1.5006)	-	-	-
ΔSAV(3)	-	0.4455(1.7273)*	-	-	-
ΔTOP	-0.0394(-.5853)	-0.0887(-1.4247)	-0.0488(-0.8955)	0.0348(0.5300)	-0.0967(-1.5214)
ECM(-1)	-0.9723(-5.0054)***	-0.8021(-5.1038)***	-0.9984(-5.8423)***	-0.8504(-5.2659)***	-0.8388(-5.1730)***
R-squared	0.6734	0.6582	0.7063	0.6250	0.6769
F-statistic	4.0855	2.9774	5.0108	6.0412	4.5396
Prob(F-statistic)	0.001	0.010	0.000	0.000	0.000
DW statistic	2.1794	2.1485	1.9249	2.0697	2.0812

Notes: 1. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.
2. Δ=first difference operator.
3. ΔX = X-X(-1); Δ X(1) = X(-1)-X(-2); Δ X(2) = X(-2)-X(-3); Δ X(3) = X(-3)-X(-4); where X=relevant variable.

As reported in Table 3, the results show that the impact of bank-based financial development on economic growth varies, depending on the bank-based financial development proxy used to measure bank-based financial development. The results also tend to vary over time. When using the ratio of domestic credit extension to the private sector by banks to GDP (Model 2) and the composite index of bank-based financial development (Model 5) as measures of bank-based financial development; the results reveal that bank-based financial development has a positive impact on economic growth. Thus, an increase in the level of bank-based financial development – based on these proxies – in Ghana leads to an increase in economic growth. These results apply irrespective of whether the estimation is done in the short run or in the long run. The long-run positive impact is supported by the coefficients of PSC (in Model 2) and BDI (in Model 5) in Panel A, that are statistically significant and positive; while the short-run impact is evidenced by the coefficients of ΔPSC(1) in Model 2 and ΔBDI(3) in Model 5 in Panel B, that are also statistically significant and positive.

However, when the ratio of deposit money banks' assets to GDP is used as a proxy, bank-based financial development is found to have a negative impact on economic growth. These results also apply, irrespective of whether the estimation is done in the short run or in the long run. The negative impact is supported by the coefficients of BA and ΔBA in Panels A and B, respectively (in Model 4), that are statistically significant and negative.

The results reported in Table 3 further show that when the ratio of the claims of deposit money banks on the private sector to broad money is used as a proxy for bank-based financial development, bank-based financial development is found to have a positive impact on economic growth in the long run, but a negative impact in the short run. The coefficient of CPS in Model 3,

Panel A that is significant and positive; and that of ΔCPS (1), ΔCPS (2) and ΔCPS (3) in Model 3, Panel B that is significant but negative confirms these results. Conversely, when the ratio of quasi liquid liabilities to GDP is used, the relationship tends to be negative in the long run, but positive in the short run – as confirmed by Model 1's coefficient of M2 that is significant but negative, and that of ΔM2(2), that is significant and positive, in Panels A and B, respectively.

These findings – on the impact of bank-based financial development on economic growth in Ghana – although inconclusive, are consistent with previous studies that found bank-based financial development to have a positive, or a negative, or no significant impact at all on economic growth, depending on the proxy used to measure bank-based financial development (see also Ogunyiola, 2013; Adu et al., 2013; Samanhyia et al., 2014; Petkovski and Kjosevski, 2014).

Other results show that the impact of the control variables – investment, savings and trade openness – on economic growth is sensitive to the model in which they are incorporated. Investment has a long-run and short-run positive impact on economic growth in Model 5; only a long-run impact on economic growth in Models 1 and 2; and only a short-run positive impact in Model 3. Everywhere else, its impact on economic growth is insignificant. Savings, on the other hand, while they have a long-run positive impact on economic growth in the long run in Model 4, and a short-run positive impact in Model 2; they have an insignificant impact on economic growth in other models. However, the results further reveal that in Ghana, trade openness has a negative impact on economic growth in the long run – but only under the conditions in Model 5. In other models, its impact is statistically insignificant. The coefficient of ECM (-1) was also found to be negative and statistically significant, as expected, in all the models.

The R-squared of at least 62% in each of the five models indicates that the regression for the underlying ARDL model fits well. The models passed all the tests performed for serial correlation, functional form, normality and heteroscedasticity, as shown by the results displayed in Table 4; except Model 5 that did not pass the normality test. However, an inspection of the Cumulative Sum of Recursive Residuals (CUSUM) and the Cumulative Sum of Squares of Recursive Residuals (CUSUMSQ) graphs in Figure 1 shows that there is stability, and that there is no systematic change identified in the coefficients at the 5% significance level over the study period. Thus, the CUSUM and CUSUMSQ graphs show that the parameters in all the models are stable over the sample period.

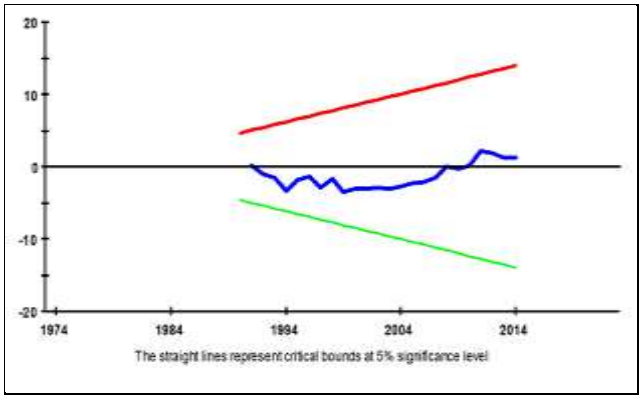
Table 4: ARDL – VECM Diagnostic Tests

LM Test Statistic	**Results**				
	Model 1 - M2	**Model 2 - PSC**	**Model 3 – CPS**	**Model 4 - BA**	**Model 5 - BDI**
Serial Correlation: CHSQ(1	0.5208[0.761]	1.4588[0.163]	0.0799[0.777]	1.1755[0.278]	1.7157[0.173]
Functional Form: CHSQ(1)	1.7204[0.190]	1.2716[0.259]	1.0834[0.298]	2.7311[0.217]	2.1705[0.125]
Normality: CHSQ (2)	0.4014[0.818]	1.7646[0.161]	2.4620[0.119]	0.8604[0.650]	4.5909[0.094]
Heteroscedasticity: CHSQ (1)	2.4197[0.120]	1.2822[0.257]	0.4117[0.521]	1.1186[0.290]	0.3074[0.579]

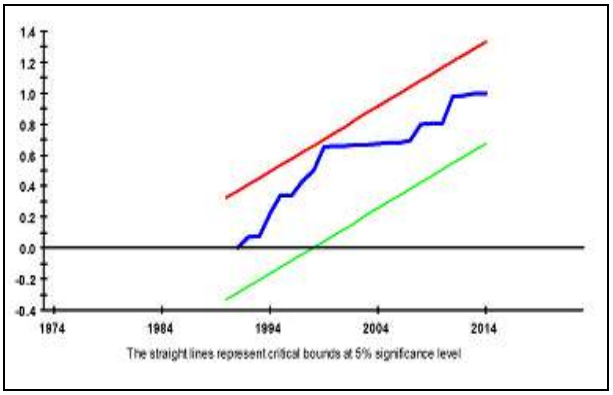
Figure 1: Plot of CUSUM and CUSUMQ

Model 1 - M2

Plot of Cumulative Sum of Recursive Residuals

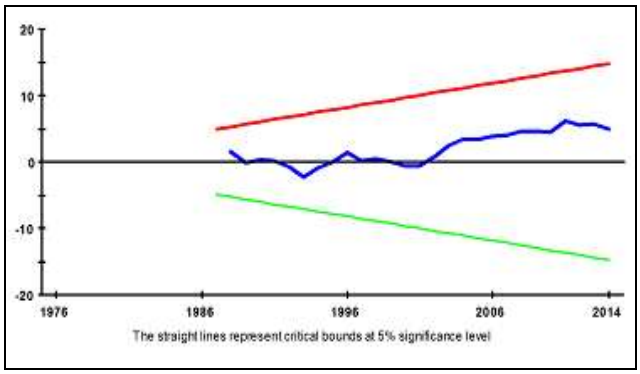


Plot of Cumulative Sum of Squares of Recursive Residuals

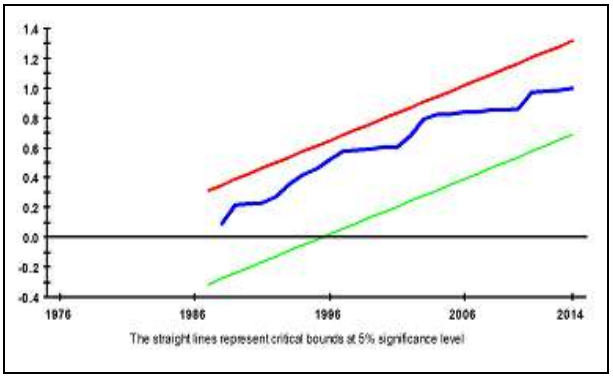


Model 2 - PSC

Plot of Cumulative Sum of Recursive Residuals

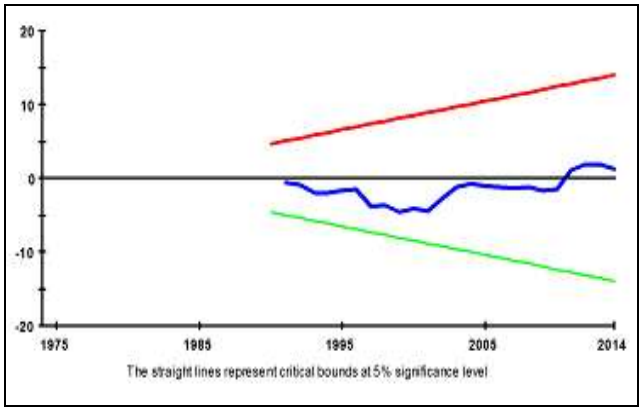


Plot of Cumulative Sum of Squares of Recursive Residuals

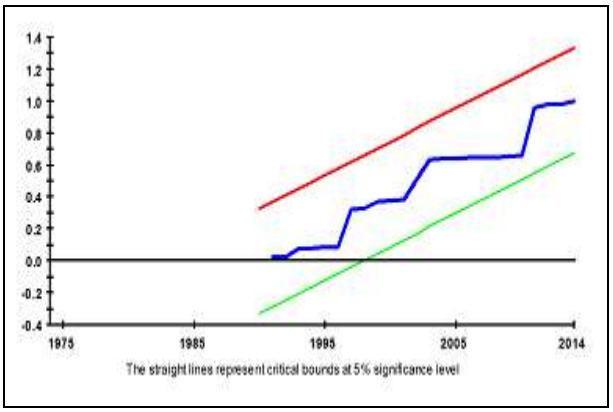


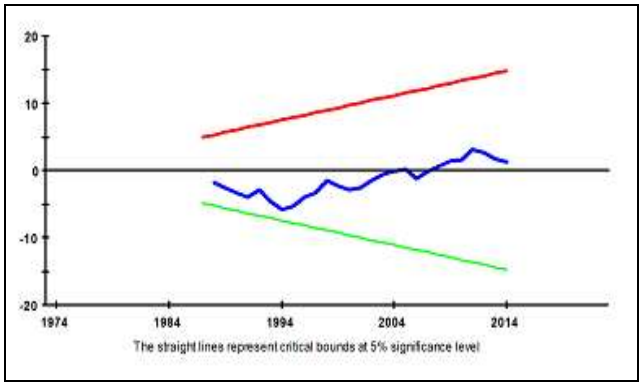
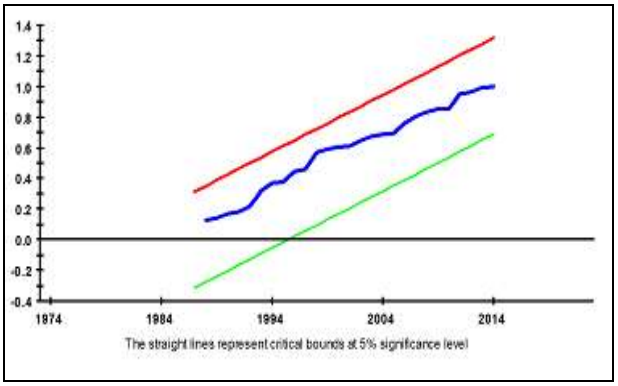
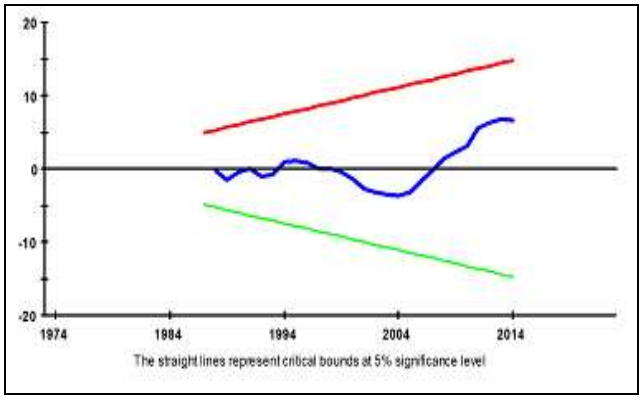
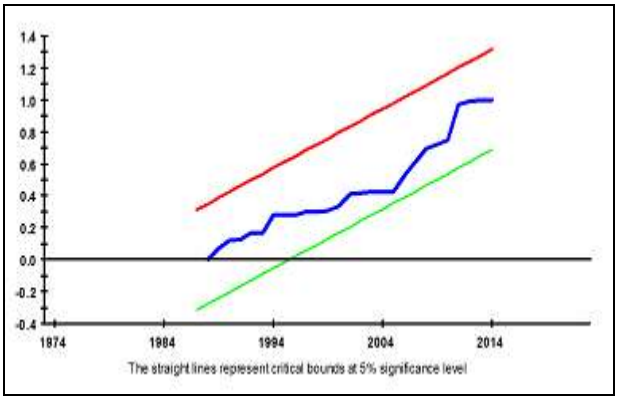
Model 3 – CPS

Plot of Cumulative Sum of Recursive Residuals



Plot of Cumulative Sum of Squares of Recursive Residuals



Model 4 - BA	
Plot of Cumulative Sum of Recursive Residuals	Plot of Cumulative Sum of Squares of Recursive Residuals
	
Model 5 - BDI	
Plot of Cumulative Sum of Recursive Residuals	Plot of Cumulative Sum of Squares of Recursive Residuals
	

5. Conclusion

This article has examined the impact of bank-based financial development on economic growth in Ghana – during the period from 1970 to 2014. The study was driven by the current debate on the role of bank-based financial development on the economic growth process; which centres on whether banking development has a positive, or negative, or no significant impact on economic growth. Unlike some previous studies, the current study uses five proxies of bank-based financial development, namely: i) The ratio of quasi-liquid liabilities to gross domestic product (GDP); ii) the ratio of domestic credit extension to private sector by banks to GDP; iii) the ratio of the claims of deposit-money banks in the private sector to broad money; iv) the ratio of deposit money banks' assets to GDP; and v) a composite index of bank-based financial development derived from the first four proxies. This composite index was constructed using the method of means-removed average. Furthermore, the current study uses the ARDL bounds testing procedure to examine the impact of bank-based financial development on economic growth in the study country. This procedure has superior small sample properties; hence, it is considered to be more suitable for this study. The empirical results of this study show that the relationship between bank-based financial development and economic growth in Ghana is complex; and that the impact of bank-based financial development on economic growth in this country is sensitive to the proxy used to measure bank-based financial development. The results also tend to vary over time. Overall, the results show that when the ratio of domestic credit extension to the private sector by banks to GDP, and the composite index are used as proxies, bank-based financial development has a positive impact on economic growth in Ghana. However, when the ratio of deposit money banks' assets to GDP is used as a proxy, bank-based financial development has a negative impact on economic growth. These results apply,

irrespective of whether the analysis is done in the short run or in the long run. Other results show that when the ratio of the claims of deposit money banks on the private sector to broad money is used as a proxy for bank-based financial development, bank-based financial development is found to have a negative impact on economic growth in the short run, but a positive impact in the long run. However, when the ratio of quasi liquid liabilities to GDP is used, the relationship tends to be positive in the short run, but negative in the long run.

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Appendix 1: Break period for variables under PPU-Root Test

Variable	**Break Period of all Variables in Levels**		**Break Period of all variables in First Difference**	
	Without Trend	With Trend	Without Trend	With Trend
GDP	1985	1983	–	–
M2	1990	1991	2006	1985
PSC	1996	1977	2000	2001
CPS	1989	1991	–	–
BA	1996	1996	2006	2001
BDI	1996	1996	–	–
INV	1992	1992	2006	1995
SAV	1977	1977	1999	1999
TOP	2005	1995	2000	2000