Economic Analysis and Policy 47 (2015) 11–21

Contents lists available at ScienceDirect

Economic Analysis and Policy

journal homepage: www.elsevier.com/locate/eap

Full length article

Financial development and economic growth in Nigeria: Evidence from threshold modelling

Oluwatosin Adeniyi [a,*], Abimbola Oyinlola [a], Olusegun Omisakin [b], Festus O. Egwaikhide [a]

[a] Department of Economics, University of Ibadan, Ibadan, Nigeria
[b] Department of Economics and Business Studies, Redeemer's University, Mowe, Nigeria

ARTICLE INFO

Article history:
Received 27 June 2014
Received in revised form 22 June 2015
Accepted 26 June 2015
Available online 29 June 2015

JEL classification:
O16
E44
F36
G28

Keywords:
Financial development
Economic growth
Non-linearities
Nigeria

ABSTRACT

This paper re-examined the relationship between financial development and economic growth in Nigeria. Unlike existing studies, we attempted to assess the information content of non-linearities in the finance–growth nexus for Nigeria. We also attempted to inventively gauge the impact of financial reforms on the Nigerian economy particularly in terms of economic growth. Using annual data covering the period 1960–2010, we factored in threshold effects through the financial development (FD) measures. Following these, we unearth a number of interesting results. First, financial development negatively impacted growth but a sign reversal resulted on accounting for threshold-type effects. This is indicative of some turning points in the finance–growth association. Second, using a composite index of FD led to a similar outcome. Third, on the heels of sample splitting, the coefficients for the pre- and post-reform era are hardly distinguishable casting doubt on the efficacy of financial system reforms. On the basis of the foregoing, broader structural reforms should pervade Nigeria's policy space if the aim of sustained, inclusive and employment-generating growth is to be realized.

1. Introduction

Investigating the role of financial development in understanding the growth trajectories of countries has a long history in economics. Over these years, both theoretical and empirical arguments have been offered as explanations for the contribution of the financial system to the process of economic growth. However, theoretical ambiguities and empirical inconclusiveness remain. In terms of theory, the idea that finance influences growth is fairly standard. Nonetheless, what is less clear is the precise timing of such influence namely whether the growth of the economy is preceded by an initial expansion in the demand for and delivery of financial services on one hand or if the precondition for financial development is sustained economic growth at the inception on the other. On the empirical side, there is also a multiplicity of conclusions. Regardless of the orientation of specific studies (panel or country-centred), sample coverage, estimation techniques among

* Corresponding author. Tel.: +234 703 3275 062.
E-mail address: saino78@yahoo.com (O. Adeniyi).

http://dx.doi.org/10.1016/j.eap.2015.06.003
0313-5926/

other criteria, there is evidence in at least four possible directions.[1] First, the finance leads growth view as in Ghirmay (2004), Agbetsiafa (2004) and Abu-Bader and Abu-Qarn (2008). Beginning with the most recent, Abu-Bader and Abu-Qarn (2008) studied the finance–growth association for Middle East and North African countries and found causality running from financial development to economic growth in Egypt, Morocco and Tunisia respectively. Also, seven of the countries in Agbetsiafa (2004) turn up with the finance causes growth conclusion. In line with the previous two studies, the success rate for Ghirmay (2004) stood at a little over 60% (8 out of the 13 sampled SSA economies showed that finance causes growth).

Second, the growth leading up to finance paradigm which posits that sustained increases in overall economic activity is at least a necessary precursor of a rise in the demand for improved financial services. To empirically support this view, two papers by Nicholas Odhiambo, which are appealing examples, are briefly summarized next. Specifically, Odhiambo (2004) using data for South Africa demonstrated that growth predates financial system advancement, while a similar outcome is reported in Odhiambo (2008) even with the analysis focused squarely on the Kenyan economy. Using data for the period between 1969 and 2005 both years inclusive, and savings as an intervening explanatory variable, Odhiambo concludes in favour of unidirectional causality from Kenya's economic growth to financial sophistication.

Third, bi-directional causality has also been reported in a handful of studies notable among which is Akinboade (1998) for Botswana. In his study, the two indicators of financial development namely private sector credit and bank deposit liabilities caused economic growth in the Granger sense. Also, there is a statistically important reverse causation from output growth to both of these finance measures.

Fourth, a pocket of attempts have also wound up in the precincts of no causal linkage (Atindehou et al., 2005 appears to be an example to display for SSA). In a study of the role of financial intermediation in economic growth for a group of 12 countries in West Africa, the authors' unearth evidence suggesting, in line with the earlier theoretical proposition of Lucas (1988), that the potential influence of finance in defining the growth trajectory of economies might be overrated. With other words, the growth effects emanating from finance was largely absent in their sample.

The foregoing notwithstanding, an examination of the finance–growth nexus remains an interesting empirical exercise in the case of Nigeria. First, the country is a candidate to study since her saga with respect to financial sector reforms dates back to the well-known structural adjustment programme (SAP) adopted around 1986. This far-reaching economic reform agenda had financial reforms especially of the banking industry as an integral component. Following SAP, marked structural makeover, in terms of bank ownership, number of onshore and offshore branches, total liquid liabilities among others has taken place. It is thus interesting to assess if these has translated to expanded opportunities for economic activities to thrive. Second, incorporating thresholds into the modelling framework is another exciting research direction to pursue. This offers a chance to arrive at estimates which convey some information about the critical level of a key variable, financial development, which must be reached before growth impacts begin to materialize. This is instructive for the sequencing of reforms particularly in developing countries where the costs of policy errors are likely to be accentuated given the prevailing economic malaise emblematic of their domestic landscape.

The present study attempts to add to existing knowledge in a number of respects. First, the introduction of thresholds into the financial development–economic growth space. This has not been done so far in this literature especially for Nigeria. The basic intuition underpinning this is that the influence of finance on growth might only become palpable once a given level of financial development is attained by an economy. Interestingly, a recent support appears in Rousseau and Wachtel (2011) where the conclusion is that the link between finance and growth might be more complex than suggested by linear models. Second, we embark on an assessment of the likely impact of financial sector reforms in the context of Nigeria. We are not aware of any study, particularly on Nigeria, which emphasizes the potential impact of thresholds[2] in evaluating financial reforms. Third, beyond the already expected use of distinct measures of financial development, an index that broadly covers a multi-faceted conception of financial development is used with a view to more meaningfully quantifying the growth impact of Nigeria's financial system. This in our estimation is also novel to the finance–growth empirical discourse on Nigeria. Finally, needless to say, we contemplate a few policy implications for Nigeria on the basis of the findings from our empirical exercise.

As a preview, our results broadly suggest the following. One, both financial indicators returned negative growth coefficients but the signs were reversed on the inclusion of squared terms suggesting a critical role for thresholds in the finance–growth nexus. Two, using the composite index of finance lead to a qualitatively similar outcome. Three, both total liquid liabilities as a share of GDP and private sector credit to GDP ratio displayed indistinguishable coefficients for the pre- and post-reform era. In sum, therefore, the impact of finance on economic growth in Nigeria may have little to do with the financial sector reforms adopted in the mid-80s.

Following this introductory section, the trends in financial development indicators and economic growth for Nigeria are displayed in Section 2. Section 3 provides a literature review on the subject matter with pointed emphasis on studies with

[1] Our emphasis here is basically on single country studies using data on African countries and even in a few instances where countries from other regions are included we chose to isolate and detail on SSA evidence only. This narrowed focus helps in at least two ways other than the simplicity it brings into the analysis. First, SSA countries are more likely to be credible comparators since over time they have typically meandered through a similar growth path with Nigeria. Two, the broader literature on the finance–growth nexus is vast. Hence, getting into the nitty-gritty would not add much to the core – especially the goal, analysis and discussion – of the present paper.

[2] Although there are a number of incisive studies which focus explicitly on a threshold perspective to the finance–growth nexus (see for instance, Rousseau and Wachtel, 2002, Rousseau and Yilmazkuday, 2009 and Yilmazkuday, 2011 among others), none of these have focused on Nigeria.

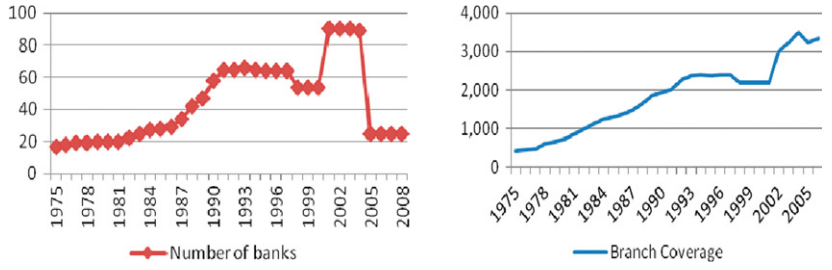

Fig. 1. Trends in number of commercial banks and branch coverage in Nigeria (1975–2008).

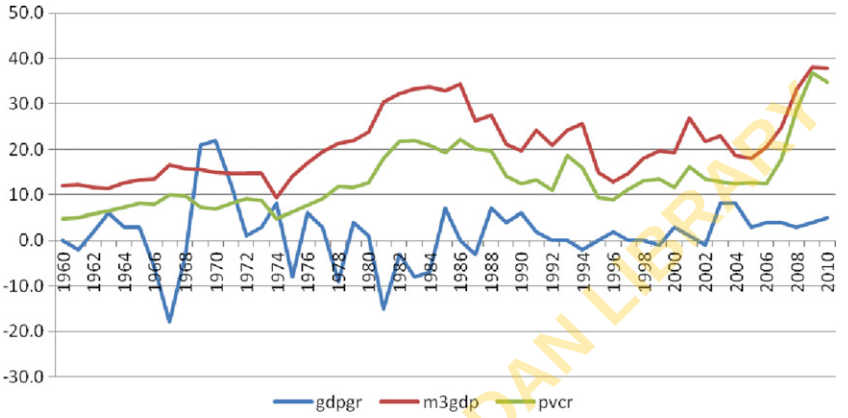

Fig. 2. Financial development and real GDP growth in Nigeria (1960–2010). Notes: In this chart, gdpgr, m3gdp and pvcr stand for the growth rate of GDP per capita, liquid liabilities to GDP ratio and the share of credit extended to the private sector in GDP. The variables are measured as percentages.

an African cum country-specific leaning. Data, methodology and other related technical exigencies find a home in Section 4. The ensuing findings are in turn presented and discussed in Section 5. In Section 6, the conclusion and policy implications are provided.

2. Financial development and economic growth in Nigeria: an overview[3]

This section sets the tone for the eventual data analysis and results discussion. It is primarily devoted to providing a portrayal of both the financial and wider economic environment in Nigeria. Some leading macroeconomic indicators are historically profiled with a view to making some sense of policies that plausibly underlie their observed trends.

In Fig. 1, the plausible influence of financial liberalization in the wake of the adoption of the structural adjustment programme (SAP) from 1986 is depicted. The correspondence between increase in number of commercial banks and the proliferation of branches echoes the conviction about private sector led growth which was commonplace at the time. Precisely, the number of banks rose from a total of 22 in 1982 to an unmatched 58 by 1990, while the number of branches moved in tandem from 991 (as of 1982) to 1939 (by 1990). Although branch coverage appears to be trending upwards, more recent reforms by way of the bank restructuring embarked upon by the Central Bank of Nigeria (CBN) saw the quantum of banks plummet to 25 by 2005 as against the 90 commercial banks in operation in 2004.

The financial development (FD) indicators, namely liquid liabilities to GDP and private sector credit share of GDP are depicted in Fig. 2. Both FD measures are higher particularly in the post-reform era. This seems to plausibly suggest improved performance of banks especially with respect to the key growth promoting role of channelling funds to the domestic private sector. Also, the trends in credit to the private sector mimic liquid liabilities both overall (that is, long term pattern) and in terms of tracking turning points (shorter term variation). Of course, private credit is comparably lower as it represents only a proportion of the total funds available in the financial system.

Also in Fig. 2, beyond 1986, higher variability appears to have greeted the onset of reforms. The volume of loanable funds is seen to be higher, but the accompanying uncertainties about these volumes may have moderated the growth promoting effects of financial reforms. To support the foregoing, growth in real GDP per capita also shows relatively less variability over this horizon. While there were more up and down movements before 1986, these swings appear to stabilize precisely from around 1988. The highest growth record in this post-reform era would be the 7.8% recorded in 2003. Therefore, higher

[3] It is vital to note that the bulk of the discussion in this section leans substantially on the far deeper analysis offered in Ekor and Adeniyi (2012).

Table 1
Five year averages of financial indicators and macroeconomic aggregates in Nigeria.

5 year averages	gdpgr	infl	mgrw	m3gdp	pvcr	gexp
1960–1964	1.8	3.0	2.2	12.0	5.9	7.1
1965–1969	−0.6	4.0	5.6	14.9	8.6	12.6
1970–1974	9.2	10.2	−3.7	13.6	7.5	19.1
1975–1979	−0.8	21.4	15.9	18.8	9.3	25.7
1980–1984	−6.4	16.0	10.2	30.7	19.0	20.5
1985–1989	3.0	25.8	−10.2	28.4	19.0	21.2
1990–1994	1.2	35.8	1.8	22.9	14.2	19.5
1995–1999	0.2	25.6	1.8	16.0	11.2	18.1
2000–2004	3.8	13.6	−1.8	21.9	13.3	15.7
2005–2010	3.8	11.5	10.6	28.7	23.8	12.7

Notes: The underlying data were obtained from the Central Bank of Nigeria (CBN) statistical bulletin, 2010. The acronyms infl, mgrw and gexp represent the inflation rate, money supply growth and government expenditure respectively. The other variables – gdpgr, m3gdp and pvcr – retain their prior designation.

output growth rates were associated with marked volatility pre-reform, while a more predictable but lower growth regime seems to have surfaced in the aftermath of economic reforms.

Taking these trends together one is left at first blush with an impression that deeper financial markets have resulted in lower output variability. Equally important, from a staidly look at Fig. 2, is the picture of no palpable linkage between growth and financial development measures pre-reform on one hand and the somewhat similar direction of movement post-1986 on the other. However, the perceptibly lower variability in economic performance is suggestive of the plausible occurrence and influence of a major regime shift in the wake of the financial sector reforms. This leaves ample room to contemplate the likely presence of non-linearities in the finance–growth nexus in Nigeria.

Table 1 displays the averages of the financial development indicators alongside macroeconomic variables such as growth of GDP per capita, money supply growth (to capture monetary policy position), government spending (indicative of fiscal policy stance) and inflation rate (to signal the existence or otherwise of broader macroeconomic stability). In similar fashion, the average growth figures in the post-reform have gravitated away from the negative zone. More specifically, real output growth which stood at 1.2% in the 1990–1994 sub-period increased by slightly more than a factor of three to settle at 3.8% by 2000–2004. This, however, remained unaltered over the subsequent six years (2005–2010).

Interestingly also, the financial sector sometimes seems related to growth as for example an increase in total liquid liabilities to GDP ratio from 16% (1995–1999) to about 22% (2000–2004) corresponds with a rise in growth from a meager 0.2% to 3.8% over the same periods. A similar pattern can be seen when credit to the private sector share in GDP is juxtaposed with per capita output growth. Equally worthy of note, is the appreciable variability in inflation – which is typically double digit – and how closely its pattern appears to be linked with the activities of the fiscal policy managers with respect to spending. Further to this, some historical flavour of likely inconsistencies on the part of the monetary authorities especially in accommodating fiscal indiscretion is felt from the vacillation observed in the growth of money supply in the Nigerian economy.

Overall, the linkage between financial development and economic growth appears to be inconclusive from this portrayal. However, there seems to be indications of non-linearities plausibly due to the reform package deployed in the second half of the sample.

3. Literature review

The conflicting theoretical views on the relationship between financial depth and economic progress are briefly highlighted before the empirical evidence is pursued. While there are several empirical studies, the focus is restricted to a few papers which meet the defining criterion of being SSA-centric.[4]

Theoretically, the initial thinking popularized by the work of Schumpeter (1911) was that the financial sector plays a significant role in influencing the course of growth via the provision of improved quality and quantity of financial services. These potentially growth promoting services include, but are not exclusive to, the efficient mopping up of savings, effective monitoring of firms, exercise of necessary corporate governance, identification and allocation of investment to high return yielding ventures as well as risk hedging (Levine, 2005 provides the finer details on these financial system functions). However, Robinson's (1952) submission that enterprise paves the way for financial advancement challenged this orthodox view. In her opinion, higher growth creates the impetus for heightened demand for diverse categories of financial services. Patrick (1966) posited somewhere in-between suggesting that the finance–growth linkage fits better within a chicken

[4] As a way of capturing the turn of events during the most recent revision of our paper, we acknowledge a similar study by Odhiambo (2014). The author examined the relationship between banks, stock markets and economic growth in South Africa. Beside the fact that his paper is not on our country of interest namely Nigeria, the complementarity between bank-based and market-based financial development which he primarily pursued is not the focus of our enquiry. To reiterate, we attempted to demonstrate the existence of thresholds in the finance–growth relationship for Nigeria, while we also inventively assessed the impact of financial reforms on the Nigerian economy. These are the contributions of the present study to the financial development–economic growth literature particularly on Nigeria.

and egg frame. Ultimately, to his mind, the relationship is bidirectional and which constitutes *cause* and *effect* will be largely determined by an economy's stage of development. Yet another view is that of Lucas (1988) which doubts if the finance–growth nexus is not unduly overrated. In other words, no causal relationship should be expected.

The empirical debate, even in SSA, has equally been in perpetual flux. Ogun (1986) using data for twenty economies over the period from 1969 to 1983 concluded in split samples of low and high income countries that financial intermediation has no significant impact on economic growth. Although little is obvious in terms of the reverse causality in his paper, there are some shortfalls with his cross-sectional regression. First, the number of cross-sectional units, namely 20, is small implying that the estimates could embody appreciable bias. Second, sample splitting on the premise of the first concern is somewhat more problematic. It thus is not surprising that finance falls short as an explanation for growth in his sample. To leverage on the gains accruable from a broader pool of observations, panel data analysis specific to SSA have also been undertaken. A few of such are quickly touched on in turn. Seck and El Nil (1993) using data for 21 African countries found a positive and significant relationship between the real interest rate – their financial liberalization measure – and real output with gross savings ratio, gross investment and financial savings forming the conditioning set.

A similar conclusion was reached by Charlier and Oguie (2002) using a relatively expanded sample of 24 countries and with terms of trade variability now featuring as an explanatory variable. More recently, Fowowe (2008) attempts a shift from previous studies by constructing an index of financial liberalization. Unlike the earlier studies which narrowed down to an integral part of financial reform, that is interest rate liberalization, his index captures the notion that the progression of liberalization policies was gradual rather than abrupt. Using two alternative indices, alongside the constructed reform index, finance is statistically and positively linked to economic growth suggesting evidence for the supply leading hypothesis. In a later attempt, however, Fowowe (2011) using a heterogeneous panel Granger causality framework found bi-directional causality in a sample of 17 countries not too different from the 19 in his previous study. Besides the multiplicity of outcomes in panel assessments, it is arguably dubious to infer any specific policy thrust from panel regression estimates. Since they suggest responsiveness of the regressand to specific independent variables in the average panel member, there is really little that individual countries can garner as policy lessons. Hence, country-by-country assessments have a huge potential in terms of enriching the debate.

As the next batch of studies show, however, the controversy on the financial development–economic growth causality is still not entirely obviated even in single country treatments. Abu-Bader and Abu-Qarn (2008) found support for finance driven growth in Egypt, Morocco and Tunisia. Ghali (1999) looking at Tunisia alone also concluded on this supply leading hypothesis. However, while Akinboade (1998) found two-way causality between finance and growth in Botswana, Eita and Jordan (2007) using data on the same country showed that regardless of the financial development indicator adopted, finance caused growth but causality in the other way was absent. Contrariwise, Odhiambo in 2004 and 2008 found evidence in favour of enterprise led financial development – in the parlance of Robinson (1952) – for South Africa and Kenya respectively.

From the foregoing, the final word on the finance–growth debate remains elusive. Both the theoretical and empirical literatures show marked divergence as regard two key aspects. One is the existence of a relationship between financial development and economic growth. Two is the precise direction of causality. Therefore, the present study focuses on investigating the finance–growth linkage for Nigeria. It incorporates thresholds into the model with a view to unpacking the possibility that a critical mass must be reached by the financial sector before finance can begin to positively affect growth. Digging further, sample splitting is done in order to gauge the influence of reforms – particularly within the financial sector – on Nigeria's economic performance.

4. Methodology and data issues

In this section the analytical approach to answering our key questions, "to what extent are thresholds important in the finance–growth linkage for Nigeria" and "how much influence does financial reform wield in Nigeria's economic growth", is laid out. It begins with the conventional stationarity testing, proceeds to establishing the existence or otherwise of long-run association and then ends with regressions quantifying the impact of finance on growth in Nigeria.

Since proceeding with estimations without due consideration of the underlying time-series properties of the data is synonymous to courting spuriousness, the Elliot et al. (1996) and Ng and Perron (2001) unit root tests are deployed to elicit the order of integration of all variables. Next, the autoregressive distributed lag (ARDL) model a la Pesaran et al. (2001) is used to query the existence of a long-run financial development–economic growth relationship. This approach has been acknowledged superior to both residual based methods such as the Engle–Granger two-step procedure and the vector autoregression (VAR) based Johansen maximum likelihood framework especially in small sample applications like ours.

4.1. The methodology

In its general form the ARDL specification which bothers less about the order of integration of variables is as follows[5]:

$$\Delta Y = \gamma_0 + \gamma_1 Y_{t-1} + \gamma_2 F_{t-1} + \gamma_3 X_{t-1} + \sum_{i=1}^{n} \tau_{1i} \Delta Y_{t-i} + \sum_{i=0}^{m} \tau_{2i} \Delta F_{t-i} + \sum_{i=0}^{p} \tau_{3i} \Delta X_{t-i} + \varepsilon_t. \quad (4.1)$$

[5] Although the order of integration is assumed not so important to the conclusion of the ARDL approach, we begin with initial integration testing for each variable to make certain that there are no I (2) variables. This is a necessary precautionary mechanism to avoid biasedness.

In Eq. (4.1), Y is the real GDP per capita our proxy for economic growth, while the F set contains not only the three financial development markers but also their corresponding polynomial (threshold) forms. Also, X represents a vector of additional growth determinants namely money supply growth, government expenditure and inflation.[6]

Long-run co-movement is gauged by a test of joint significance on the coefficients of the lagged levels of all variables appearing on the right hand side. More formally, this is a Wald (F-) test of the null hypothesis of the form:

$$\gamma_1 = \gamma_2 = \gamma_3 = 0. \tag{4.2}$$

To ascertain cointegration, Pesaran et al. (2001) provided two sets of critical values for the cointegration test. The lower critical bound assumes that all the variables are I(0), meaning that there is no cointegration among the variables, while the upper bound assumes that all the variables are I(1) implying the obverse. If the computed F-statistic is greater than the upper critical bound, then the null hypothesis will be rejected suggesting that there exists a cointegrating relationship among the variables. If the F-statistic falls below the lower critical bounds value, it implies that there is no cointegration. However, when the F-statistic lies within the lower and upper bounds, then the test is inconclusive.

Following cointegration, the next step is to estimate the impact multipliers both in the short- and long-run within a vector error correction model (VECM) framework specified as:

$$\Delta Y = \varpi_0 + \sum_{i=1}^{d} \varpi_{1i} \Delta Y_{t-i} + \sum_{i=0}^{e} \varpi_{2i} \Delta F_{t-i} + \sum_{i=0}^{f} \varpi_{3i} \Delta X_{t-i} + \lambda_1 ECT_{t-1} + \varepsilon_t \tag{4.3}$$

$$\Delta F = \theta_0 + \sum_{i=1}^{d} \theta_{1i} \Delta F_{t-i} + \sum_{i=0}^{e} \theta_{2i} \Delta Y_{t-i} + \sum_{i=0}^{f} \theta_{3i} \Delta X_{t-i} + \lambda_2 ECT_{t-1} + \varepsilon_t \tag{4.4}$$

where, λ_1 and λ_2 – the error correction term coefficients – convey information on the speed of adjustment towards the equilibrium following shocks to the system. Beyond these, all other variables maintain their prior definitions.

4.2. Data issues: description, construction and sources

In terms of data related aspects especially for the three financial development variables we follow similar descriptions as the ones provided in Adeniyi et al. (2012). These measures are the ratio of liquid liabilities to GDP and domestic credit to the private sector as a share of GDP. Taken in turn, the ratio of M3/GDP captures the total liquid liabilities of the financial system by broadly including key financial institutions such as the central bank, deposit money banks and other non-bank financial institutions (NBFIs). The second indicator, domestic credit to the private sector, distinguishes between the end users of the claims of financial intermediaries by capturing only the claims on the domestic private sector.

In keeping with the standard practice the study uses the growth of real GDP per capita as a proxy for economic growth, while money growth, public spending and inflation are additional regressors included alongside the two financial development measures. The underlying data, from 1960 to 2010, on the variables of interest were obtained from the website version of the Central Bank of Nigeria (CBN) Statistical Bulletin and World Development Indicators (WDI) online database hosted by the World Bank.

5. Empirical results and interpretation

This section opens with a short missive on the order of integration of the variables used in the analysis. Following this, the results of the test of the existence of long-run association deploying the Johansen procedure is presented, while the estimates from static regressions are equally displayed and discussed. Next, precisely to gauge the plausible impact of financial reforms on the Nigerian economy, both cointegration and parsimonious ARDL model findings are reported. Noteworthy also is the election of a bounds testing approach to ascertaining long-run co-movement largely owing to the small sizes of the pre- and post-reform samples. Ultimately, a concise summary of the evidence is provided just before the key conclusions and policy implications are delved into subsequently.

As a well established rule of thumb in the empirical literature, macroeconomic time series are subjected to stationarity testing. This practice is with a view to avoiding spuriousness in regression estimates. To this end, the Ng–Perron unit root test was conducted and the results displayed in Table 2. To sum up, all four statistics appear to support stationarity on first differencing across variables. In other words, each of the time-series are I(1).[7] To query cointegration, sequel to the foregoing, the results of the Johansen maximum likelihood approach are shown in Table 3. The trace statistics shows the existence of two cointegrating vectors for models A and B, while model C turns up with three cointegrating equations. However, the

[6] It is equally worthy of note that two variants of Eq. (4.1) corresponding to our measures of financial system advancement were used in the cointegration analysis.

[7] Although some of the test statistics, for example MZ_a and MZ_t, seem to suggest that variables such as inflation, the polynomial term of private credit to GDP ratio and money growth are stationary at level. We nonetheless proceed with the broad conclusion that the variables are I(1) since this receives overwhelming support from the statistics in Table 2.

Table 2
Ng–Perron modified unit root test results.

Variables	Levels				1st differences			
	MZ_a	MZ_t	MSB	MPT	MZ_a	MZ_t	MSB	MPT
fndx	−7.8802	−1.9430	0.2466	3.2661	−23.5520	−3.4243	0.1454	1.0652
gdpgr	−8.0880	−2.0107	0.0249	0.0316	−15.5027	−2.7819	0.1795	1.5887
gexp	−4.9798	−1.5730	0.3159	4.9320	−20.9984	−3.2397	0.1543	1.1687
infl	−14.0246	−2.6473	0.1887	1.7501	−58.7747	−5.4207	0.0922	0.4177
m3gdp	−2.1380	−0.6456	0.3020	8.6547	−24.4910	−3.4983	0.1428	1.0040
mgrw	−23.7449	−3.3273	0.1401	1.4254	−21.4780	−3.0204	0.1406	2.0013
poly1	−1.8048	−0.5070	0.2809	8.7745	−24.4333	−3.4937	0.1430	1.0080
poly2	−37.9805	−3.8865	0.1023	1.9172	−21.9924	−3.2638	0.1484	1.2936
pvcr	0.5861	0.1715	0.2925	11.7444	−23.1660	−3.3844	0.1461	1.1223
1%	−13.8000	−2.5800	0.1740	1.7800	−13.8000	−2.5800	0.1740	1.7800
5%	−8.1000	−1.9800	0.2330	3.1700	−8.1000	−1.9800	0.2330	3.1700

Note: The asymptotic critical values, corresponding to the 1% and 5% levels of significance respectively, for each of the four Ng–Perron test statistics are as specified in the lower panel of Table 2.

Table 3
Johansen cointegration test results.

Cointegrating equations	Trace statistic	0.05 critical value	Max-eigenstatistic	0.05 critical value
Model A				
None	127.4651*	95.7537	57.1024*	40.0776
At most 1	70.3627*	69.8189	26.7699	33.8769
At most 2	43.5928	47.8561	20.6600	27.5843
Model B				
None	131.1760*	95.7537	52.0085*	40.0776
At most 1	79.1676*	69.8189	32.2171	33.8769
At most 2	42.9505	47.8561	20.5872	27.5843
Model C				
None	105.1947*	69.8189	44.0106*	33.8769
At most 1	61.1841*	47.8561	24.6218	27.5843
At most 2	36.5623*	29.7971	18.8763	21.1316

Notes: Models A, B and C respectively designate cointegrating equations featuring total liabilities to GDP ratio (m3gdp), private sector credit share of GDP (pvcr) and the constructed index of financial development (fndx).
* Represents statistical significance at the 5% level.

alternative maximum-eigenstatistic suggests a unique cointegrating relationship across all three models. To keep our gaze squarely on the relationship of interest, we adopt a single cointegrating relationship and report estimates of the long-run regressions in Table 4.

Turning wholly to Table 4, both financial development measures are negatively correlated with the growth of per capita GDP. However, only private sector credit share of GDP shows marginal significance. On including the squared terms, which is how we elect to gauge the influence of thresholds, there is a reversal of signs of coefficients although insignificant across the board. Precisely, what we glean is evidence in favour of a threshold of some sort namely that financial advancement at inception does not seem to matter much for growth but as a critical level of FD is reached and eventually exceeded there appears to be a positive, albeit statistically weightless, growth effect. In passing, we note that money growth and inflation are negatively associated with economic growth but only the former appears to be precisely estimated. Government spending turns up positive estimates across FD measures but these are devoid of significance at the conventional levels. Furthermore, a peep at column 3 seems to suggest that the positive growth influence of FD could also be achieved with an index which summarizes the information in both FD metrics, although this is equally not significant.

In sum, while thresholds may be somewhat informative in unearthing the growth spurring role of financial system development using distinct measures, a similar outcome is obtainable with a composite index. This, in the main, appears to imply that reforms targeted at a broader spectrum of financial sector functions are likely to yield more fruits as the Nigerian economy moves along its growth trajectory.

Another important question the study set out to tackle is an assessment of the impact of financial reforms on Nigeria's economic growth. As a necessary first step towards accomplishing this goal, the bounds cointegration test results are reported in Tables 5 and 6 for the pre- and post-1986 samples respectively. The F-statistics show that cointegration exists only in the models with m3gdp as financial indicator for both sub-samples. Consequently, Tables 7 and 8 display the results for the ARDL estimation for m3gdp and pvcr in turn.

One of the key thrusts of this study comprises an attempt to empirically gauge the weight of the influence, if any, of financial sector reforms on the finance–growth relationship in Nigeria. Table 7 is suggestive of a negative but significant contemporaneous linkage between m3gdp and economic growth, while its one period-lag shows a positive growth impact

Table 4
Estimated static regressions.

Regressors	(1)	(2)	(3)
m3gdp	−0.6622		
	(−0.6376)		
pvcr		−1.1387	
		(−1.6995)***	
fndx			0.6428
			(0.7053)
gexp	0.0695	0.0686	0.0745
	(0.3650)	(0.3720)	(0.3919)
infl	−0.0438	−0.0376	−0.0506
	(−0.6092)	(−0.5406)	(−0.7294)
mgrw	−0.1101	−0.1067	−0.1172
	(−1.7594)***	(−1.7718)***	(−1.9011)***
poly1	0.0111		
	(0.5168)		
poly2		0.0265	
		(1.5641)	
Adj-R^2	0.22	0.25	0.21
F-Statistic	0.0767	0.0355	0.0491
Durbin–Watson statistic	1.8423	1.8597	1.8411

Notes: The figures appended to the *F*-statistic are the probability values. The numbers housed in parenthesis are the *t*-statistics. Moreover, poly1 and poly2 are the squared terms for total liquid liabilities to GDP ratio (m3gdp) and private sector credit share of GDP (pvcr) in that order. fndx is a composite index of the two financial development measures. Needless to say all other variables retain their prior designation.
*** Represents statistical significance at the 10% level.

Table 5
Bounds cointegration test results (1960–1985).

	Lags	*F*-statistic	Comment
F(gdpgr|m3gdp, gexp, infl, mgrw)	1	4.3626*	Cointegration
	2	4.8703*	Cointegration
F(gdpgr|pvcr, gexp, infl, mgrw)	1	3.5153	No cointegration
	2	2.0632	No cointegration

Note: The upper (lower) bounds critical values at 1% and 5% are 5.966 (4.614) and 4.306 (3.272) respectively. These critical values are obtained from Narayan (2005, Table 2): unrestricted intercept and no trend.
* Connotes statistical significance at the 5% level.

Table 6
Bounds cointegration test results (1986–2010).

	Lags	*F*-statistic	Comment
F(gdpgr | m3gdp, gexp, infl, mgrw)	1	2.0983	No cointegration
	2	5.1227*	Cointegration
F(gdpgr | pvcr, gexp, infl, mgrw)	1	2.7204	No cointegration
	2	3.9058	No cointegration

Note: The upper (lower) bounds critical values at 1% and 5% are 5.966 (4.614) and 4.306 (3.272) respectively. These critical values are obtained from Narayan (2005, Table 2): unrestricted intercept and no trend.
* Connotes statistical significance at the 5% level.

with appreciable magnitude. This estimate appears to point, in the short-run of course, to a one-half percentage point increase in the growth of per capita GDP following a percentage point rise in m3gdp in the period 1960–1985.

The picture turns out a little less grim when the era 1986–2010 is brought in focus. Precisely, the negative – same period – growth impact is somewhat doused while the erstwhile positive marginal significance is retained at a relatively more stringent level. Put together, however, finance does not seem to alter the path of growth in any important way indicative of doubts about the efficacy of reforms in facilitating the oft-debated synergy between the financial and real sectors of the Nigerian economy.

Also, in Table 7, adjustment to shocks is quite speedy as some 66% of deviation from long-run equilibrium is corrected within a given year in the pre-reform sample. The post-reform counterpart is much lower at about 41%. Inflation, government spending and money supply growth all returned negative short-run coefficients which are in large part insignificant save for the first two lags of money growth and inflation in the pre- and post-reform periods respectively.

The results from the alternative FD indicator namely credit to the private sector credit as a share of GDP is displayed in Table 8. Qualitatively, the findings seem congruent with the ones in the preceding table. Here, as before, there appears to be no palpable contemporaneous role for financial system advancement in growth improvement although there are

Table 7
Estimates for total liquid liabilities models.

Dependent variable: GDP per capita growth				
Regressors	1960–1985		1986–2010	
	Coefficients	*t*-ratio [prob]	Coefficients	*t*-ratio [prob]
Δ (gdpgr(−1))	0.8074*	3.6506 [0.0026]		
Δ (gdpgr(−2))	0.4593**	2.4107 [0.0302]	−0.1628	−1.2262 [0.2379]
Δ (m3gdp)	−2.5660*	−3.5694 [0.0031]	−0.0880	−0.8706 [0.3968]
Δ (m3gdp(−1))	1.5537***	1.8109 [0.0916]		
Δ (m3gdp(−2))			0.2859**	2.6303 [0.0182]
Δ (infl)	−0.1593	−1.0809 [0.2980]	−0.0567***	−2.0013 [0.0626]
Δ (mgrw)	−0.1657	−1.3258 [0.2061]		
Δ (mgrw(−1))	0.3232**	2.5019 [0.0254]		
Δ (mgrw(−2))	0.2475**	2.4363 [0.0288]		
Δ (gexp)			−0.0811	−1.0369 [0.3152]
ect	−0.6642*	−5.5570 [0.0001]	−0.4112**	−2.1317 [0.0489]
Diagnostics				
R-squared	0.8298		0.6257	
Adjusted R-squared	0.7326		0.5087	
Log likelihood	−67.0967		−43.7600	
Durbin–Watson statistic	2.0248		2.1747	

Note:
* Represent statistical significance at the conventional 1% level.
** Represent statistical significance at the conventional 5% level.
*** Represent statistical significance at the conventional 10% level.

Table 8
Estimates for private sector credit models.

Dependent variable: GDP per capita growth				
Regressors	1960–1985		1986–2010	
	Coefficients	*t*-ratio [prob]	Coefficients	*t*-ratio [prob]
Δ (gdpgr(−1))	0.9677*	5.3466 [0.0001]		
Δ (gdpgr(−2))	0.8480*	5.0958 [0.0002]		
Δ (pvcr)	−4.7744	−6.5415 [0.0000]		
Δ (pvcr(−1))	3.9913*	4.6043 [0.0004]		
Δ (pvcr(−2))			0.2616***	2.0876 [0.0522]
Δ (infl)	−0.2450**	−2.4300 [0.0291]	−0.0378	−1.3007 [0.2107]
Δ (mgrw)	−0.0999	−1.2441 [0.2339]		
Δ (mgrw(−1))	0.4593*	4.5078 [0.0005]	−0.0371	−1.4184 [0.1741]
Δ (mgrw(−2))	0.3132*	4.2814 [0.0008]		
Δ (gexp)			−0.0992	−1.3096 [0.2078]
Diagnostics				
R-squared	0.9143		0.6252	
Adjusted R-squared	0.8653		0.5370	
Log likelihood	−59.2125		−43.7731	
Durbin–Watson Statistic	2.0659		1.9242	

Note:
* Represent statistical significance at the conventional 1% level.
** Represent statistical significance at the conventional 5% level.
*** Represent statistical significance at the conventional 10% level.

suggestions of lagged effects across sub-sample. The speed of adjustment is a redundant pointer in this case since there is no long-run association as defined by the bounds test reported in Tables 5 and 6.

To make certain that the estimate obtained in the pre- and post-reform models do not suffer from biases associated with parameter instability, cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests were carried out. Generally, Figs. 3 and 4 (see Appendix) show that the plotted lines remain within the five percent boundaries suggesting an appropriate model fit as well as coefficient constancy.[8] For the CUSUMSQ in the post-1986 sample, nevertheless, the thick black line marginally stretches beyond the upper limit defined by the dotted line around 1994.

[8] In the Appendix, the first pair of plots shows the CUSUM AND CUSUMSQ for the 1960–1985 period, while the next pair displays plots for the 1986–2010 sub-sample. In keeping with the standard approach of conducting data diagnostics, the statistics for normality, specification error and heteroscedasticity – not reported for want of space but available upon request – summarily point to the robustness of the model to all three tests indicative of model adequacy.

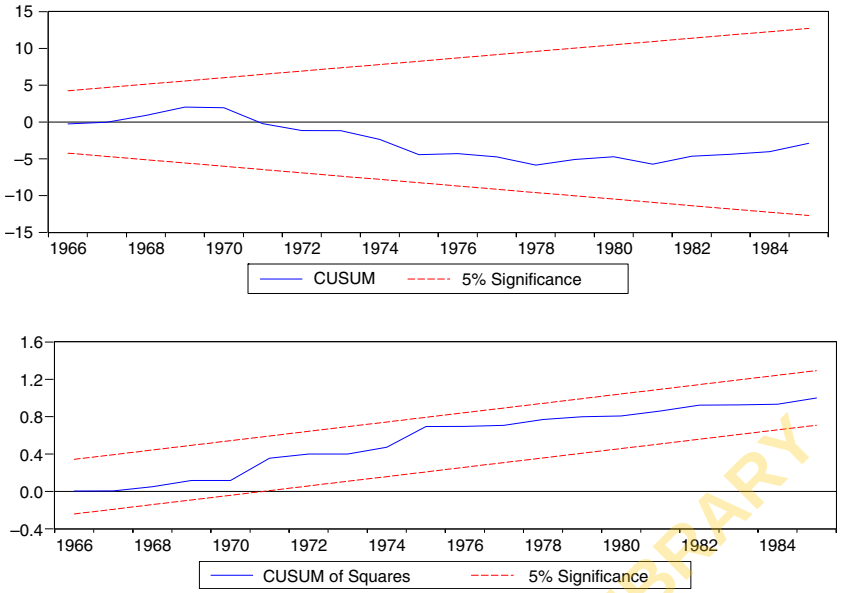

Fig. 3. Cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) plots, 1960–1985.

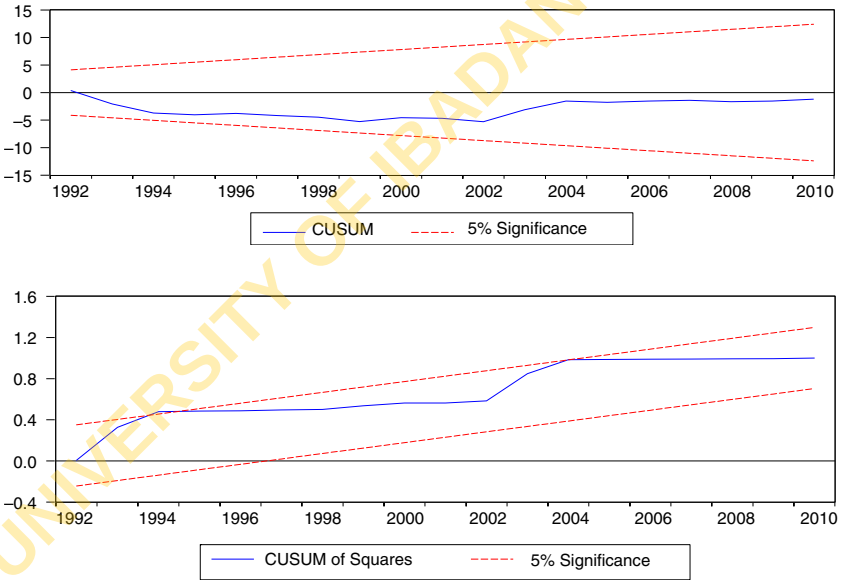

Fig. 4. Cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) plots, 1986–2010.

6. Conclusion and policy implications

This paper re-examined the relationship between financial system advancement and economic growth with Nigeria in the spotlight. Unlike existing studies, we attempt to assess the information content of non-linearities as a novel contribution to the larger literature on the finance–growth nexus for Nigeria. This we reckon is the prime innovation of the present enquiry. The objectives of the present study are twofold. One, to investigate the likely role of thresholds (here tagged non-linearities) in the association between financial development and growth. Two, to gauge whether or not the introduction of financial reforms, in the mid-1980s, has altered the finance–growth linkage for Nigeria in any appreciable way(s).

To pursue the foregoing, we proceeded as follows. First, using annual data spanning the period 1960 to 2010, we incorporated thresholds via the use of second-order polynomial terms for each of the financial development markers. This we did to elicit information on the possibility that a critical level of financial development might have to be surpassed before growth promoting effects become palpable. Two, we split the sample using the inception of the SAP in 1986 as the break date. On the two sub samples, the small sample consistent ARDL approach to cointegration testing and estimation

was followed. Following these, we wind up with a number of interesting results. First, both financial indicators returned negative growth coefficients but the signs were reversed on the inclusion of squared terms implying some role for thresholds in the finance–growth space. These positive estimates appeared to have meager statistical weight nonetheless. Summed up, therefore, it seems financial development initially matters little for economic growth but conditional on a level of the former being exceeded some positive growth influence hits the surface. Second, using a composite index – derived from our two FD metrics – leads to a largely similar outcome. Third, related now to the importance or otherwise of financial reforms, using total liquid liabilities as a share of GDP as the FD pointer, the coefficients for the pre- and post-reform era are hardly distinguishable. This seems to sit well with suggestions casting doubts on the effectiveness of financial reforms in developing countries in the wake of structural adjustment programmes. The results, with private sector credit to GDP ratio, bear a striking semblance to their earlier counterparts. Simply put, the impact of finance on economic growth in Nigeria, if any, appears to have had little to do with financial reforms adopted as an integral part of the economic recovery programme of the mid-80s.

In terms of policy interventions, the present findings offer, in our view, some useful lessons. First, since thresholds seem to matter for finance-driven growth, efforts at deepening the financial system both in terms of its size and the level of activity need to be further deployed and sustained. Second, the absence of any significant deviation between the pre- and post-reform samples suggests also that as the Nigerian government seeks to improve on its growth prospects, the arsenal should be widened beyond financial sector restructuring. A broad spectrum of structural reforms is required if Nigeria's target of playing in the league of the largest twenty economies by the year 2020 is to be achieved.

Appendix

See Figs. 3 and 4.

References

Abu-Bader, S., Abu-Qarn, A.M., 2008. Financial development and economic growth: Empirical evidence from MENA countries. Rev. Dev. Econ. 12, 803–817.
Adeniyi, O., Egwaikhide, F.O., Oyinlola, A., Omisakin, O., 2012. Foreign direct investment, economic growth and financial sector development in small open developing economies. Econ. Anal. Policy 42, 105–127.
Agbetsiafa, D., 2004. The finance–growth nexus: Evidence from sub-saharan Africa. Sav. Dev. 38, 271–288.
Akinboade, O.A., 1998. Financial development and economic growth in Botswana: A test of causality. Sav. Dev. 22, 331–347.
Atindehou, R.B., Guyeie, J.P., Amenounve, E.K., 2005. Financial intermediation and economic growth: Evidence from western Africa. Appl. Financ. Econ. 15, 777–790.
Charlier, F., Oguie, C.N., 2002. The impact of interest rate liberalisation: Empirical evidence from sub-saharan Africa. Sav. Dev. 26, 355–379.
Eita, J.H., Jordan, A.C., 2007. A causality analysis between financial development and economic growth for Botswana. Department of Economics Working Paper No. 2007-22, University of Pretoria.
Ekor, M., Adeniyi, O., 2012. Impact of financial development on manufacturing output: The Nigerian evidence. Econ. Bull. 32, 2638–2645.
Elliot, G., Rothenberg, T.J., Stock, J.H., 1996. Efficient tests for an autoregressive unit root. Econometrica 64, 813–836.
Fowowe, B., 2008. Financial liberalization policies and economic growth: Panel data evidence from sub-saharan Africa. Afr. Dev. Rev. 20, 549–574.
Fowowe, B., 2011. Financial sector reforms and private investment in sub-saharan African countries. J. Econ. Dev. 36, 79–97.
Ghali, K.H., 1999. Financial development and economic growth: The Tunisian experience. Rev. Dev. Econ. 3, 310–322.
Ghirmay, T., 2004. Financial development and economic growth in sub-saharan African countries: Evidence from time series analysis. Afr. Dev. Rev. 16, 415–432.
Levine, R., 2005. Finance and growth: Theory, mechanism and evidence. In: Aghion, P., Durlauf, S.N. (Eds.), Handbook of Economic Growth. Elsevier, North-Holland, pp. 865–934.
Lucas Jr., R.E., 1988. On the mechanics of economic development. J. Monetary Econ. 22, 3–42.
Narayan, P.K., 2005. The saving and investment nexus for China: Evidence from cointegration tests. Appl. Econ. 37, 1979–1990.
Ng, S., Perron, P., 2001. Lag length selection and the construction of unit root tests with good size and power. Econometrica 69, 1519–1554.
Odhiambo, N.M., 2004. Is financial development still a spur to economic growth? A causal evidence from south Africa. Sav. Dev. 28, 47–62.
Odhiambo, N.M., 2008. Financial development in Kenya: A dynamic test of the financial-led growth hypothesis. Econ. Issues 13, 21–36.
Odhiambo, N.M., 2014. Financial systems and economic growth in south Africa: A dynamic complimentarity test. Int. Rev. Appl. Econ. 28, 83–101.
Ogun, O.D., 1986. A note on financial deepening and economic growth: Evidence from Africa. Nigerian J. Econ. Soc. Stud. 28, 275–283.
Patrick, H.T., 1966. Financial development and economic growth in underdeveloped countries. Econ. Dev. Cultural Change 14, 174–189.
Pesaran, M.H., Shin, Y., Smith, R.J., 2001. Bounds testing approaches to the analysis of level relationships. J. Appl. Econometrics 16, 289–326.
Robinson, J., 1952. The generalisation of the general theory. In: The Rate of Interest and Other Essays. Macmillan, London.
Rousseau, P.L., Wachtel, P., 2002. Inflation thresholds and the finance–growth nexus. J. Int. Money Finance 21, 777–793.
Rousseau, P.L., Wachtel, P., 2011. What is happening to the impact of financial deepening on economic growth? Econ. Inquiry 49, 276–288.
Rousseau, P.L., Yilmazkuday, H., 2009. Inflation, financial development and growth: A trilateral analysis. Econ. Syst. 33 (4), 310–324.
Schumpeter, J.A., 1911. The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle. Havard University Press, Cambridge.
Seck, D., El Nil, Y.H., 1993. Financial liberalization in Africa. World Dev. 21, 1867–1881.
Yilmazkuday, H., 2011. Thresholds in the finance–growth nexus: A cross-country analysis. World Bank Econ. Rev. 25 (2), 278–295.