Long-run Dynamics of Economic Growth, Gross Fixed Capital Formation and Financial Sector Development: An ARDL Analysis

Iheanacho, Eugene

Department of Economics, Abia State University Uturu. Email: eugene.iheanacho2016@yahoo.com

Abstract

This study examined the role of financial development in the long and short run dynamics of economic growth, gross fixed capital formation and savings in Nigeria from 1981 to 2014. We employ the ADF and PP for the test of stationarity level. The bounds testing approach was employed to analyze the dynamics and dominant roles of financial development. Five measures of macroeconomic variables are used including an index constructed from three indicators of financial sector development using principal component analysis. The results show that the long-run impact of financial development on real per capita come is negative. A positive and significant long run relationship between gross fixed capital formation and real income per capita coexists with a negative short run relationship, highlighting the dual effects of gross domestic savings (at lag one) on real income per capita. The impact of gross fixed capital formation on real income per capita is found to be positive both at long and short run. The findings of this study have some important policy implications for the selected macroeconomic variables and indeed financial sector development in Nigeria.

Keywords: macroeconomic variables, financial development, gross domestic savings, investment, GDP, ARDL

1.0 Introduction

In the contemporary economics, investment and savings are the most important variables whose impact and dynamics affect positively the rate of economic growth. A growth boom can be driven by positive terms of trade shock, the discovery of natural resources or the adoption of pro-growth economic policies. To support and consolidate growth beyond a boom phase, investment is a critical vehicle to create productive capacities and probably knowledge spillovers as well as new technologies. At the same time, ensuring an adequate level of national saving is important as foreign savings can be volatile and lead to "sudden stop" that force costly macroeconomic adjustments and eventually growth crisis (Solimano, 2006). Thus, the relationship between savings and investment involve analytically vital and critically policy issues of greater relevance. Firstly, the discrepancies between intended savings and investments create macroeconomic fluctuations and growth cycles in a world of less than perfectly price and wage flexibility. Second, the causality between savings, investment and economic growth can run in various directions, depending on how the theorists view the working of the economic system at macro level (Chakrarty, 1993).

However, the conventional perception is that savings contribute to higher investment and hence higher gross domestic growth, in the short-run (see Bacha 1990; De Gregorio, 1992), Kaldor (1956) and Samuelson and Modigliani (1966) studied how saving behaviors induce growth. On the other hand, if utility depends partly on how consumption, an otherwise standard growth model can imply that in growth can cause increased saving. (Carroll, Overland and Weil 2000). Thus, the direction of causality between savings, investment growth is still far from clear even though the answer is of critical important for development policy. If national investment through growth an automatic translation of savings into capital formation, the main goal of development policy should be to encourage savings, while If growth result less from national savings and capital formation as well as capital accumulation and more from other factors such as technological innovation, human capital and trade policy, the main target for development policy should be to heighten those mentioned factors (Andres, 2006).

However, more emphasis has been laid on promoting high level of savings, that give the economy large stock and a high level of output and vice-versa. Higher savings could lead to economic growth but this growth may be temporal (Mankiew, 2004). There are various channels through which national savings could be enhanced to increase investment and economic growth. Some of the channels include, increasing the level of income of consumers, supporting the choice of reducing present consumption for future consumption, a reasonable tax rate, interest rate,
and urbanization are among the various channels through which savings could be increased for effective contribution to growth (Chakravarky, 1993; Solimano, 1997). Many researchers have discovered that aggregate savings in an economy is a prerequisite for raising investment fund which could lead to economic growth (see Chakravarky, 1993; Solimano, 1997). Savings aid capital formation by raising the stock of capital and its positive effects promote earning of more income. Realistically, it could be said that the development or growth of a country depends on savings.

Over the years, Nigeria has been battling with low level of national savings and the difficulty in transmission of savings into investment as shown by the past and present statistics on savings-investment gap. Nnanna (2004) showed that one of the most macroeconomic goals pursued in Nigeria has been to increase the level of production which will enable economic growth to occur at a higher rate. To increase production, savings and capital formation have been prescribed by most economists as the first requirements, which will increase economic growth in an economy (see Solow, 1956; Mankiew, 2004). As a result, some governments have tried to design or deploy policies that would promote savings and mobilization of savings into investment to achieve higher economic growth (Abu, 2010; McKinnon 1973). In addition, contrary to the above view, other authors have continued to emphasize the importance of increase in economic growth, which not only increases the level of income and savings, but also provides funds for capital formation or investment in an economy (Carroll and Weil 1994; Keynes, 1939). These authors believe that, it is the increase in output that leads to increase in income, thus, increasing the level of savings and investment in an economy (Gavin, 1997; Sinha, 1998). The important issue that arises from the foregoing discussion is the difference in perception and empirical findings among scholars. Thus, the controversy surrounding the long and short run dynamics between savings, investment and economic growth and indeed, the roles of financial development serve as the problem that motivated this study.

With respect to the aforementioned on savings, investment and economic growth, it is not clear whether the Nigerian government and its policy makers should deploy policies that would promote saving mobilization and investment for higher economic growth or should deploy policies that would encourage and accelerate economic growth in order to raise the level of savings and investment in Nigeria. There is no study that has investigated the dynamic relationship between savings, investment and economic growth with reference to the roles of financial development in Nigeria from 1981-2014, thus, the dynamics between savings, investment and economic growth still remain largely unclear. This study therefore has come to address this controversy to enable policy makers to adopt proper policy measures that would accelerate societal development by using the bound testing approach for co-integration. They are follows; (i) To determine whether there is a long run relationship between economic growth (measured by per capita GDP) savings (measured by gross domestic savings) and investment (measured by gross fixed capital formation), in Nigeria (ii) To access the contribution of financial sector preformation the selected macroeconomic variables.

2.0 Literature Review

2.1 Theoretical Framework

Most literature on savings, investment and economic growth have concentrated the developing countries and under-developed countries (see Jangili 2010; Nwanne, 2014). These studies have not really focused on how the falling savings and investment rates impact on economic growth and vice versa in Nigeria bearing in mind the significant role played by financial sector development on the GDP growth of a nation.

Given the Keynesian economics, savings is the amount left over when the cost of a person’s consumption expenditure is subtracted from the amount of disposable income that he or she earns in a given period of time. Savings are therefore that portion of disposable income not spent on consumption but accumulated and invested directly in capital equipment or indirectly through buying of securities (Keynes, 1939). In finance, investment is the purchase of financial securities or other valuable items with an expectation of future favourable returns. But this is not real investment, because this kind of investment does not increase the national spending. Thus, real investment also called capital formation, involves the acquisition of new capital goods, plants and equipment for productive purposes (Keynes, 1936). Economic growth is the sustained expansion of potential output measured in real Gross Domestic Product over a certain period of time. Hence, economic growth requires Investment and it can be financed through private and public savings (Mohamed 2014)
Angelica (2000) opines that growth is the process of increasing the size of national economies, the macroeconomic indicators especially the GDP per capita, in an ascending but not necessarily linear direction, with positive effects on the social sector of the economy. Typically, in one sense and in the other, economic growth can be positive, zero, and negative. When the yearly average rhythms of the macro-indicators are higher than the average rhythms of growth of the population, positive economic growth occurred. But, when the annual average rhythms of macro-economic indicators, particularly GDP are equal to those of the population growth, we can speak of zero economic growth. Negative economic growth appears when the rhythms of population growth are higher than those of the macroeconomic indicators. Economic growth is a complex, long-run phenomenon which sometimes has constraints like excessive rise in population, limited resource, inadequate infrastructure, inefficient utilization of resources, excessive government intervention, institutional and cultural models that make the increase in economic growth difficult. Hence, economic growth is obtained by an efficient use of the available resources and by increasing the capacity of production of a country. It facilitates the redistribution of incomes between population and society. The cumulative effects, the small differences in the increasing rates, become big for periods of one decade or more. It is easier to redistribute the income in a dynamic, growing society, than in a static one.

Alina (2012) posits that there are situations when economic growth is confounded with economic fluctuations. But, the application of expansionary monetary and fiscal policies could lead to the elimination of recessionary gaps and to increase the GDP beyond its potential level. However, when the rate of economic growth is high in an economy, the production of goods and services and consequently, unemployment rate decreases which make the of job opportunities to increase, leading to the increase in the standard of living of the people in an economy (Alina 2012).

Savings is that part of disposable income that is not spent. People save so that they can consume more-in the future. A decision to spend now or save is really a choice of when to spend-now or in the future. This decision depends on wealth; disposable income, interest rate and tastes or preferences for spending now and waiting (Modigliani 1966). But public and private savings make up the gross domestic saving in an economy. Capital formation means the increase in the stock of real capital in a country. In other words, capital formation involve making more of capital goods as machine, tools, factories, transport etc. which are all used for further production of goods.

2.2 Empirical Literature
Verma and Wilson (2005) examined the relationship between savings, investment and economic growth in India ordinary least square method and annual time series data from 1980 to 2001. The study revealed that savings and savings and investment affect GDP in the long run while GDP has significant but small effects on household savings and investment in the short-run. However, their results and findings did not support the Solow and endogenous growth theory which states that there is growing need to increase household savings and investment so as to encourage economic growth.

Verma (2007), investigated the relationship between savings, investment and economic growth in India from 1951 to 2004 using autoregressive distributed lag bounds testing technique (ARDL) to test co-integration. The rest of ARDL co-integration revealed that GDP, GDS and GDI have long-run relationship except when GDP is a dependent variable. The study also examined the long-run and short-run elasticity of the correlation between GDP, GDS and GDI growth. The result shows that savings do not cause growth, but growth causes savings, savings drive investment both in the short run and in the long run and that investment is the driver of economic growth in.

Sultan and Hague (2011), investigated the estimation of the relationship between domestic investment, export, and economic growth in India using Johansen's co-integration methodology. The result showed that there is presence of a long-run, relationship between investment, export and economic growth in India. The study also showed that only domestic investment significantly contribute to economic growth both in the long run and the short "run, while export had positive but insignificant impact on economic growth in India. This means that Indians should continue to focus on domestic investment while diversifying investment in infrastructure.

Mohamed (2014), examined the causal relationship between savings, investment and economic growth in Ethiopia using annual time series data from 1970-2011 in a multivariate framework. Results from the ARDL Bounds testing indicate that there exists co-integration between savings investment and gross domestic product when GDP is taken as the dependent variable. The study also reviewed labour force and investment have significant positive effect on economic growth of Ethiopia both in the short run and in long run, while human capital are statistically significant.
Budha (2012) employed the Auto regressive distributed lag method to test for co-integration, error correction and granger causality analysis in examining the relation between the gross domestic savings, investment and economic growth, in Nepal for the period of 1975-2010. The result of study shows that co-integration exists between gross domestic product, savings, and investment when each of them is taken as independent variables. The result of granger causality test revealed that there is a short run and long run bi-directional causality between investment and gross domestic product as well as between gross domestic savings and investment. In his paper, Mohan (2016) examined the relationship between domestic saving and economic growth by into consideration the income levels of different countries studied, he grouped the study into different categories namely., low income countries (LIC's), low middle income countries (LMC's) upper middle income countries (UMC's) and higher income countries. The author's result supports the claim that causality runs from economic growth rate of saving. The author submitted that the income level of a country plays an important role in determining causal relationship between savings and growth.

2.3 Selected growth Models

(I) The Solow Growth Model
In the 1950's, Neo-classical economics gave rise to a long celebrated long run, supply driven, growth models such as the Solow's (1956) growth model. In this model, the rate of technological change, the savings rate, and the rate of population growth are the three parameters that determine the rate of growth in GDP of an economy in a steady state. Hence, in this model, investment plays a role only in the transition between steady states but not in the configuration of the long ma growth equilibrium of the economy. Thus, in this model, there is a causal relationship between savings, investment and economic growth, and the direction of the causality runs from savings through economic growth. This is true because &e Solow's growth model assumes that all the savings are automatically invested and translated into GDP growth under wage flexibility and full employment. Thus, in this theory, it is saving that causes changes in investment and economic growth (Solow 1956). In explaining the role of saving in economic growth, Sinha (1998) asserted that increases in saving results to increases in capital formation and investment, thereby raising the growth of national output in an economy. Following the claim by Solow authors like Jappelli and Pagano (1994), Alguacil et al (2002) among others, reported mat higher savings lead to higher economic growth.

(II) The Endogenous/Optimal Growth Theory
The endogenous growth model was propounded by Pagano (1993), The theory captures the potential effects of savings and investment on economic growth as a linear function of capital accumulation. The theory assumes that efficient financial sector might affect economic growth through three channels, reduction in transaction cost, increased savings to firms for productive investment, improving the allocation of capital and rate of savings. Thus, this model predicts that an increase in saving rate increases the growth rate through the channel of investment or capital formation. In addition, Ramsey's (1994) optimal growth theory postulates that savings leads to an increase in National income and consequently accelerate investment process. Thus, increase in investment can only induce growth in the short run while in the long-run there may be little or no impact on economic growth (Romer 1986).

3.0 Data and Methodology

3.1 Data Description

This study uses annual data covering the period of 1981 to 2014. Following Budha (2012), Toran and Olesia (2014), and Verma (2007), real gross domestic product per capita represents the economic growth of Nigeria. It is derived by dividing the real GDP by total population. It captures economic growth of Nigeria from 1981-2014. Gross domestic savings are calculated as GDP less final consumption expenditure (total consumption). To capture the financial development, the current study employs three widely indicators: credit to private sector by deposit money bank (% GDP) which excludes credit issued to the public sector (government agencies and public enterprises), the ratio of liquid liability of bank and non-bank financial development to GDP and deposit money bank assets to GDP. The volume of domestic credit to private by deposit money banks relative to the size of the Nigerian economy measures the contribution of financial depth in the private sector activities. The ratio of liabilities to GDP measures

ISSN: 1596-9061
the size of the financial development relative to the size of the Nigeria economy and the ability of financial activities to meet unanticipated demand to withdraw deposits by customers (see Naceur et al., 2014) while the ratio of deposit money bank asset to GDP captures the overall size of the banking sector relative to the size of the economy. Gross capital formation represents the rate of domestic investment. It is derived by dividing gross fixed capital formation by total population. It captures the rate of domestic labour force represents the labor force in Nigeria between the age of 18-65 years

Table 2: List of variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>RGDPC</td>
<td>GDP per capita (LCU)</td>
<td>World development indicator database, world bank (online)</td>
</tr>
<tr>
<td>CPS</td>
<td>Domestic credit to private sector over GDP</td>
<td>Beck et al (2012) financial development structure dataset. 2015 undated version</td>
</tr>
<tr>
<td>BA</td>
<td>Deposit money bank assets to GDP</td>
<td>Beck et al (2012) financial development structure dataset. 2015 undated version</td>
</tr>
<tr>
<td>Gds</td>
<td>Gross domestic savings are calculated as GDP less final consumption expenditure.</td>
<td>World development indicator database, world bank (online)</td>
</tr>
<tr>
<td>Gfcf</td>
<td>Represents the rate of domestic investment. It captures the rate of domestic.</td>
<td>World Development Indicators database, World Bank (Online)</td>
</tr>
<tr>
<td>Pop</td>
<td>It represents the labour force in Nigeria between the age of 18-65 years</td>
<td>World Development Indicators database, World Bank (Online)</td>
</tr>
</tbody>
</table>

Source: Author's Design.

We use the three indicators of financial development to construct the overall composite index \( fd\text{index} \). Given that none of the indicators could be regarded as the best or overall measure of financial development and the high correlation between the indicators (see table 2), a composite index is constructed from these indicators using principal component analysis (PCA). Principal component analysis (PCA) has commonly been used to address the problem of multicollinearity by reducing a large set of correlated variables into a smaller set of uncorrelated variables (see Stock & Watson, 2002), and has been widely employed in the construction of financial development in recent studies. Table 3, shows that the first principal component accounts for about 89.66% of the total variation in the three financial development indicators. In spirit with Aug and McKibbin (2007), the individual contributions of pcrd, liq and dmb to be standardized variance of the first principal component (eignvector of PC1)

Table 3: Correlation matrix and principal component analysis

Source: Eviews 9
3.2 Model Specification

The main objective of the present paper is to investigate the long-run and short-run relationships between RGDPC, GFCF, and GDS over the period of 1981-2014. In line with the empirical literature in economic growth, it is plausible to form the long-run relationship between RGDPC, GFCF, and GDS and FDindex. In line with endogenous growth theory, efficient financial sector (FDindex) might affect economic growth through three channels, reduction in transaction cost, increased savings to firms for productive investment, improving the allocation of capital and rate of savings. Thus, this model predicts that an increase in saving rate increases the growth rate through the channel of investment or capital formation. Therefore the linear model tests the long-run and short-run relationship between these variables in Nigeria as follows:

\[ \text{rgdpc} = f(gcfr, pop, fdindex, gds) \]  (1)

The above equation can be written in econometric model and in their respective natural log form as thus;

\begin{align*}
\ln \text{rgdpc} &= a_0 + \beta_1 \ln gcfr + \beta_2 \ln pop + \beta_3 \ln fdindex + \beta_4 \ln gds + \varepsilon_t & \text{model 1} \\
\ln \text{rgfcf} &= a_0 + \beta_1 \ln gcfr + \beta_2 \ln pop + \beta_3 \ln fdindex + \beta_4 \ln gds + \varepsilon_t & \text{model 2} \\
\ln \text{rgds} &= a_0 + \beta_1 \ln gcfr + \beta_2 \ln pop + \beta_3 \ln fdindex + \beta_4 \ln \text{rgdpc} + \varepsilon_t & \text{model 3}
\end{align*}

Where \( \ln \text{rgdpc} \) is log of real gdp per capita, \( \ln pop \) is log of labor force, \( \ln fdindex \) is log of financial development, \( \ln gds \) is the log of gross domestic savings, \( \varepsilon_t \) is the error term and \( a_0 \) is the intercept.

3.3 Methodology

3.4 Unit root Test

In time series analysis, before running the cointegration test the variables must be tested for stationarity. For this purpose, we use the conventional ADF tests, the Phillips–Perron test following Phillips and Perron (1988). The ARDL bounds test is based on the assumption that the variables are I(0) or I(1). Therefore, before applying this test, we determine the order of integration of all variables using unit root tests by testing for null hypothesis \( H_0: \beta = 0 \) (i.e \( \beta \) has a unit root), and the alternative hypothesis is \( H_1: \beta < 0 \). The objective is all variables should not be I(2) so as to avoid spurious results. In the presence of variables integrated of order two we cannot interpret the values of F statistics provided by Pesaran et al. (2001) or it will go boasted.

3.5 Cointegration Approach

In order to empirically analyse the long-run relationships and short-run relationship between real wage, inflation and production, this approach apply the autoregressive distributed lag (ARDL) co-integration technique as a general vector autoregressive (VAR). The ARDL cointegration approach was developed by Pesaran and Shin (1999) and Pesaran et al. (2001). This approach enjoys several advantages over the traditional co-integration technique documented by (Johansen and Juselius, 1990). Firstly, it requires small sample size. Two set of critical values are provided, low and upper value bounds for all classification of explanatory variables into pure I(1), purely I(0) or mutually co-integrated. Indeed, these critical values are generated for various sample sizes. However, Narayan (2005) argues that existing critical values of large sample sizes cannot be employed for small sample sizes. Secondly, Johansen’s procedure requires that the variables be integrated of the same order, whereas ARDL approach does not require variables to be of the same order. Thirdly, ARDL approach provides unbiased long-run estimates with valid t-statistics if some of the model repressors are endogenous (Narayan 2005 and Odhiambo, 2008). Fourthly, this approach provides a method of assessing the short run and long run effects of one variables on the other and as well separate both once an appropriate choice of the order of the ARDL model is made, ( see Bentzen and Engslted, 2001). In this regard, Pesaran and Shin,(1999) explain that AIC and SC perform well in small sample, but SC is relatively superior to AIC. The ARDL model is written as follow;
\[ \Delta \lnrgdpc_t = \alpha_0 + \sum_{i=1}^{n} \beta_{4i} \Delta \lnfgcf_{t-1} + \sum_{i=0}^{n} \beta_{5i} \Delta \lnnfdindex_{t-1} + \beta_5 \lnrgdpc_{t-1} + \beta_6 \lnfgcf_{t-1} + \beta_7 \lnpop_{t-1} + \beta_8 \lnnfdindex_{t-1} + \beta_9 \lngds_{t-1} + \epsilon_t \]

(2)

\[ \Delta \lnfgcf_t = \alpha_0 + \sum_{i=1}^{n} \beta_{4i} \Delta \lnfgcf_{t-1} + \sum_{i=0}^{n} \beta_{5i} \Delta \lnnfdindex_{t-1} + \beta_5 \lnrgdpc_{t-1} + \beta_6 \lnfgcf_{t-1} + \beta_7 \lnpop_{t-1} + \beta_8 \lnnfdindex_{t-1} + \beta_9 \lngds_{t-1} + \epsilon_t \]

(3)

\[ \Delta \lnnfdindex_{t-1} = \alpha_0 + \sum_{i=1}^{n} \beta_{4i} \Delta \lnnfdindex_{t-1} + \sum_{i=0}^{n} \beta_{5i} \Delta \lnnfdindex_{t-1} + \beta_5 \lnrgdpc_{t-1} + \beta_6 \lnfgcf_{t-1} + \beta_7 \lnpop_{t-1} + \beta_8 \lnnfdindex_{t-1} + \beta_9 \lngds_{t-1} + \epsilon_t \]

(4)

Where \( \Delta \) is the difference operator while \( \epsilon_t \) is white noise or error term. The bounds test is mainly based on the joint F-statistic whose asymptotic distribution is non-standard under the null hypothesis of no cointegration. The first step in the ARDL bounds approach is to estimate the three equations (2-4) by ordinary least squares (OLS). The estimation of this equation tests for the existence of a long-run relationship among the variables by conducting an F-test for the joint significance of the coefficients of the lagged levels of the variables. The null hypothesis of no cointegration and the alternative hypothesis which are presented in (Table 4) below as thus:

| Table 4 |
|-----------------|-----------------|-----------------|
| null hypothesis of no co-integration | alternative hypothesis | Equation |
| \( H_0: \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_9 = 0 \) | \( H_1: \beta_5 \neq \beta_6 \neq \beta_7 \neq \beta_8 \neq \beta_9 \neq 0 \) | 2 |
| \( H_0: \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_9 = 0 \) | \( H_1: \beta_5 \neq \beta_6 \neq \beta_7 \neq \beta_8 \neq \beta_9 \neq 0 \) | 3 |
| \( H_0: \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_9 = 0 \) | \( H_1: \beta_5 \neq \beta_6 \neq \beta_7 \neq \beta_8 \neq \beta_9 \neq 0 \) | 4 |

**Source:** Author’s design

**Note:** all the variables defined previously

Two sets of critical values for a given significance level can be determined (Narayan 2005). The first level is calculated on the assumption that all variables included in the ARDL model are integrated of order zero, while the second one is calculated on the assumption that the variables are integrated of order one. The null hypothesis of no co-integration is rejected when the value of the test statistic exceeds the upper critical bounds value, while it is not rejected if the F-statistic is lower than the lower bounds value. Otherwise, the co-integration test is inconclusive. In the spirit of Odhiambo (2009) and Narayan and Smyth (2008), we obtain the short-run dynamic parameters by estimating an error correction model associated with the long-run estimates. The equation, where the null hypothesis
of no co-integration is rejected, is estimated with an error-correction term (Narayan and Smyth, 2006; Morley, 2006). The vector error correction for the three (3) models are specified as follows:

\[
\Delta \text{lnrgdpc}_t = \alpha_0 + \sum_{i=1}^{n} \beta_{1i} \Delta \text{lnrgdpc}_{t-1} + \sum_{i=0}^{n} \beta_{2i} \Delta \text{lnrgfc}_{t-1} + \sum_{i=0}^{n} \beta_{3i} \Delta \text{lnpop}_{2t-1} + \\
\sum_{i=0}^{n} \beta_{4i} \Delta \text{lnfdindex}_{3t-1} + \sum_{i=0}^{n} \beta_{5i} \Delta \text{lnnds}_{4t-1} + \lambda_1 EC_{t-1} + \mu_1 t 
\]

(5)

\[
\Delta \text{lnrgfc}_t = \alpha_0 + \sum_{i=1}^{n} \beta_{1i} \Delta \text{lnrgfc}_{t-1} + \sum_{i=0}^{n} \beta_{2i} \Delta \text{lnrgdpc}_{t-1} + \sum_{i=0}^{n} \beta_{3i} \Delta \text{lnpop}_{2t-1} + \\
\sum_{i=0}^{n} \beta_{4i} \Delta \text{lnfdindex}_{3t-1} + \sum_{i=0}^{n} \beta_{5i} \Delta \text{lnnds}_{4t-1} + \lambda_2 EC_{t-1} + \mu_1 t 
\]

(6)

\[
\Delta \text{lnnds}_t = \alpha_0 + \sum_{i=1}^{n} \beta_{1i} \Delta \text{lnnds}_{t-1} + \sum_{i=0}^{n} \beta_{2i} \Delta \text{lnrgfc}_{t-1} + \sum_{i=0}^{n} \beta_{3i} \Delta \text{lnpop}_{2t-1} + \\
\sum_{i=0}^{n} \beta_{4i} \Delta \text{lnfdindex}_{3t-1} + \sum_{i=0}^{n} \beta_{5i} \Delta \text{lnrgdpc}_{4t-1} + \lambda_3 EC_{t-1} + \mu_1 t 
\]

(7)

ECM_{t-1} is the error correction term obtained from the cointegration model. The error coefficients (λ_1, λ_2, λ_3) indicate the rate at which the cointegration model corrects its previous period’s disequilibrium or speed of adjustment to restore the long run equilibrium relationship. A negative and significant ECM_{t-1} coefficient implies that any short run movement between the dependent and explanatory variables will converge back to the long run relationship.

3.6 Stability and Diagnostic test

To ensure the goodness of fit of the model, diagnostic and stability tests are conducted. Diagnostic tests examine the model for serial correlation, functional form, non-normality and heteroscedasticity. The stability test is conducted by employing the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) suggested by Brown et al. (1975). The CUSUM and CUSUMSQ statistics are updated recursively and plotted against the break points. If the plots of the CUSUM and CUSUMSQ statistics stay within the critical bonds of a 5 percent level of significance, the null hypothesis of all coefficients in the given regression is stable and cannot be rejected.

4.0 Presentation of Empirical Results

4.1 Descriptive statistics and graphical analysis

Table 3 presents the mean, median, maximum and minimum values and standard deviation for the variables used in this study. The average rgdpc over the year is N12.36 with maximum price of N12.85 and a minimum price of N12.057. The standard deviation 0.253, the skewness and kurtosis are 0.7107 and 1.960 respectively. All the variables have some statistical features, however gds evidence of negative skewness and fat tail (kurtosis) with N-2.75 and N13.99 respectively

Figure 1 explains the trends in the other variables in Nigeria over the period of 1981 to 2014. There is evidence of gradual decrease in real gdpc from 1981 to 1987 and relatively unchanged up until 2002. There is a drastic upward movement from 2003 which could be as a result various policy formulations that created positive impact among the
masses. There is a continuous decrease in the trade openness. The gross fixed capital formation had been inconsistency over the period of research, and has its lowest point in 2005. The movement in all the variables have witness a movement due to poor trade liberalization evince from the steep decrease in the variable.

Table 5: Summary of descriptive statistics

<table>
<thead>
<tr>
<th></th>
<th>LRGDPC</th>
<th>LLAB</th>
<th>LGFCF</th>
<th>LGDS</th>
<th>LFDINDEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>12.36577</td>
<td>3.969572</td>
<td>2.440962</td>
<td>3.003561</td>
<td>3.466281</td>
</tr>
<tr>
<td>Median</td>
<td>12.24791</td>
<td>3.973302</td>
<td>2.478056</td>
<td>3.007497</td>
<td>3.398537</td>
</tr>
<tr>
<td>Minimum</td>
<td>12.06759</td>
<td>3.906907</td>
<td>1.697266</td>
<td>0.604129</td>
<td>2.933380</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>0.253208</td>
<td>0.011026</td>
<td>0.426666</td>
<td>0.524658</td>
<td>0.297260</td>
</tr>
<tr>
<td>Skewness</td>
<td>0.710740</td>
<td>-0.363160</td>
<td>0.677277</td>
<td>-2.785346</td>
<td>0.594127</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>1.960201</td>
<td>1.677169</td>
<td>3.436902</td>
<td>13.99447</td>
<td>2.937753</td>
</tr>
</tbody>
</table>

Source: Eviews 9

Figure 1: Time Evolution of the selected variables

Figure 1 shows the time evolution of the selected variables for the study from 1981 to 2014. From the trend, there was gradual decrease of real gdpc between 1981 to 1984, and subsequent fluctuation up until 2003. Economically suggesting there was a disturbance in the macroeconomic environment. The similar trends were seen in gross fixed capital formation and financial development and labor. However, gross domestic savings had a sharp decreased in 2008 which coincides with the period of regime shift (change from military administration to democratic administration). In general the macroeconomic variables for this do not exhibit a steady movement over the period of study.
4.2 Unit Root Test

Table 6: Unit root test results

<table>
<thead>
<tr>
<th>Variables</th>
<th>ADF level 1(0)</th>
<th>PP level 1(0)</th>
<th>ADF differenced</th>
<th>PP differenced</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnrgdpc</td>
<td>0.5355</td>
<td>0.2542</td>
<td>-4.2583***</td>
<td>-4.2436***</td>
</tr>
<tr>
<td>lngds</td>
<td>-4.7478***</td>
<td>-4.7144***</td>
<td>-5.3099***</td>
<td>-21.983***</td>
</tr>
<tr>
<td>lnfdindex</td>
<td>-2.7595*</td>
<td>2.0930</td>
<td>-4.2874***</td>
<td>-5.4822***</td>
</tr>
<tr>
<td>lngfcf</td>
<td>-1.6000</td>
<td>-2.8496</td>
<td>-3.2690**</td>
<td>-4.8739***</td>
</tr>
<tr>
<td>lnlab</td>
<td>-1.1988</td>
<td>-1.0661</td>
<td>-6.2025***</td>
<td>-2.6471*</td>
</tr>
</tbody>
</table>

Note: all the variables are in the natural log form.
**level of significance at 5%  
***level of significant at 1%
Source: author’s computation

All of our data are transformed into the natural log form. To determine the order of integration of the variables, the ADF (augmented Dickey-Fuller) test complemented with the PP (Philips-Perron) test in which the null hypothesis is $H_0 = \beta = 0$ (i.e $\beta$ has a unit root) and the alternative hypothesis is $H_1: \beta < 0$ are implemented. The results for both the level and differenced variables are as presented in table 6.

The stationarity tests were performed first in levels and then in first difference to establish the presence of unit roots and the order of integration in all the variables. The results of the ADF and PP stationarity tests for each variable show that both tests fail to reject the presence of unit root for rgdpc, gfcf, and lab data series in level, indicating that these variables are non-stationary at levels. The first difference results show that these variables are stationary at 1% significance level (integrated of order one 1(1)). However, gds and fdindex recorded presence of stationarity at first level 1(0) at 1% level significant (ADF) and (PP) respectively. The different order of integration of the variables makes ARDL the preferred approach to this empirical study.

4.3 Result of Co-integration test

Table 7: ARDL Bounds Cointegration Test

<table>
<thead>
<tr>
<th>Functions</th>
<th>F-statistic</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frgdpc</td>
<td>4.6310***</td>
<td>Cointegration</td>
</tr>
<tr>
<td>Fgfcf</td>
<td>4.5432***</td>
<td>Cointegration</td>
</tr>
<tr>
<td>Fgds</td>
<td>4.2776**</td>
<td>Cointegration</td>
</tr>
</tbody>
</table>

Critical Value Bounds

<table>
<thead>
<tr>
<th>Bound</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>I0 Bound</td>
<td>3.29</td>
<td>2.56</td>
<td>2.2</td>
</tr>
<tr>
<td>I1 Bound</td>
<td>4.37</td>
<td>3.49</td>
<td>3.09</td>
</tr>
</tbody>
</table>

Notes: source of Asymptotic critical value bounds: perasan et el (2001)
Restricted intercepted and no trend
**level of significance at 1%** 
***level of significant at 5% restricted intercept and no trend (k=5)

The result of the cointegration test, based on the ARDL bound testing approach, are presented in Table 7.Cointegration is tested on model 1, model 2 and model 3 using real gdp per capita, gross fixed capital formation and gross domestic savings as dependent variable. The results show that the F-statistic is higher than the upper bound critical value from Perasan et el (2001) at the 1% and 5% level significance using restricted intercept and no trend in specification for the three models. Based on the aforementioned results, the null hypothesis of no cointegration is rejected in the entire three models. This indeed implies that each of the variables under consideration are bound by a long run relationship in Nigeria. The study is in line with relevant literatures in the

Table 8: Estimated Long Run Coefficient
ARDL model selected on Akaike infor criteria (AIC)

<table>
<thead>
<tr>
<th>Model A</th>
<th>Model B</th>
<th>Model C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Explanatory Variables</strong></td>
<td><strong>lnrgdpc</strong></td>
<td><strong>lngfcf</strong></td>
</tr>
<tr>
<td><strong>ARDL (2,4,0,2,1)</strong></td>
<td><strong>ARDL (3,0,0,0,0)</strong></td>
<td><strong>ARDL (1,0,0,0,0)</strong></td>
</tr>
<tr>
<td>C</td>
<td>-164.71 (-4.6162)</td>
<td>86.070(4.5070)***</td>
</tr>
<tr>
<td>lnFDindex</td>
<td>-0.6330 (-2.4640)**</td>
<td>0.0398 (0.2449)</td>
</tr>
<tr>
<td>lngds</td>
<td>0.3354 (2.4510)**</td>
<td>-0.0027 (-0.0310)</td>
</tr>
<tr>
<td>lnLab</td>
<td>44.703 (4.9317)***</td>
<td>-23.618 (-4.7499)***</td>
</tr>
<tr>
<td>lnGfcf</td>
<td>0.3021 (1.7481)*</td>
<td>0.0918 (0.2464)</td>
</tr>
<tr>
<td>lnrgdpc</td>
<td>0.8018 (3.5857)***</td>
<td>0.6693 (1.3459)</td>
</tr>
</tbody>
</table>

***level of significance at 1%  **level of significance at 5%

Source: author’s computation from eview9

4.4 Long-Run Impact

Table 8 presents the long-run coefficient estimated using ARDL approach. The results of the first model lnrgdpc show that the coefficient of financial development index (FDindex) has a statistically significant negative impact on real per capita come (lnrgdpc) at 5% level in the long-run. The coefficient of lngds is significantly positive at 5% level, suggesting that 1% increase in the gross domestic savings would significantly increase the real income per capita (lnRGDPC) by 0.33% in the long-run. This is in line with the theoretical underpinnings of Ramsey’s (1994) that in optimal growth theory savings leads to an increase in National income and consequently accelerate investment process. The result also supports Budha (2012) findings on saving and investment. Furthermore, the result also indicate that the coefficient of labor force (lnLab) and gross capital formation (lnGfcf) are significant positions at 1% and 5% respectively. Thus, increase in investment can only induce growth in the short run while in the long run there may be little or no impact on economic growth (Romer 1986). Overall, the results of the first model lnRGDPC show the significant impact of the dependent variables on the economic growth of Nigeria.

The result of the second model lnGfcf shows that the coefficient of financial development has a statistically insignificant positive effect on gross fixed capital formation (lngfcf) in the long run. The positive long-run relationship between financial development index (FDindex) and gross fixed capital formation (lngfcf) is an indication that the financial sector could be a one of the prime mover of the investment in Nigeria. (see Sultan and Hague, (2011); Budha (2012)). The coefficient of labor force is found to be significant negative at 1% level, suggesting that 1% decrease in labor force would significantly decrease the gross fixed capital formation (lngfcf) by 23.6% in the long-run. This is an indication of under-utilization of labor force in Nigeria and indeed shows that Nigeria is yet to invest on capacity building. Interestingly rgdpc is found to be significantly positive at 1% level, indicating that 1% increase in rgdpc would significantly increase the gross fixed capital formation gfcf by 0.80% in the long-run. Over all there is a clear indication of the dominant role of labor force and per capita income in the economic growth of Nigeria.

Surprisingly, the result of the third model using gross domestic savings as the dependent indicate no significant relationship between dependent variable and the independent variables.
Table 9: ECM Representation of the ARDL Model

Model selected on Akaike infor criteria (AIC)

<table>
<thead>
<tr>
<th>Explanatory Variables</th>
<th>ΔInrgdpc</th>
<th>Δlngfcf</th>
<th>Δlngds</th>
</tr>
</thead>
<tbody>
<tr>
<td>ecm(-1)</td>
<td>-0.2723(-6.4226)**</td>
<td>-0.7538(-4.9035)***</td>
<td>-0.9828(-5.0939)***</td>
</tr>
<tr>
<td>ΔlnFDindex</td>
<td>-0.0612(-1.4667)</td>
<td>-0.0584(-0.4172)</td>
<td>-0.8316(-2.0436)*</td>
</tr>
<tr>
<td>Δlngds</td>
<td>0.0134(0.9535)</td>
<td>-0.0308(-0.7004)</td>
<td></td>
</tr>
<tr>
<td>Δlngds(-1)</td>
<td>-0.0421(-2.5948)**</td>
<td>12.614(-0.9182)</td>
<td>46.200(-1.4824)</td>
</tr>
<tr>
<td>ΔlnLab</td>
<td>23.914(3.4287)***</td>
<td>-0.6519(-0.3608)</td>
<td></td>
</tr>
<tr>
<td>ΔlnLab(-1)</td>
<td>-2.6519(-0.3608)</td>
<td>-19.998(-2.6619)**</td>
<td></td>
</tr>
<tr>
<td>ΔlnLab(-2)</td>
<td>-29.592(-3.3170)***</td>
<td>-0.0460(2.0808)*</td>
<td></td>
</tr>
<tr>
<td>Δlngfcf</td>
<td>0.2413(1.8475)*</td>
<td>0.0134(0.9535)</td>
<td>0.0134(0.9535)</td>
</tr>
<tr>
<td>Δlngfcf(-2)</td>
<td>-0.1648(-1.2354)</td>
<td>0.2413(1.8475)*</td>
<td>0.0134(0.9535)</td>
</tr>
<tr>
<td>Δlnrgdpc</td>
<td>0.2687(0.6337)</td>
<td>1.1058(0.8342)</td>
<td>1.1058(0.8342)</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.9814</td>
<td>0.7873</td>
<td>1.8533</td>
</tr>
<tr>
<td>Adj R-squared</td>
<td>0.9663</td>
<td>0.7873</td>
<td>0.0306</td>
</tr>
<tr>
<td>D-W statistic</td>
<td>1.7304</td>
<td>1.8533</td>
<td>1.929</td>
</tr>
<tr>
<td>SCX(2)</td>
<td>1.1583[0.5603]</td>
<td>2.5918[0.2736]</td>
<td>1.7461[0.4177]</td>
</tr>
<tr>
<td>HetX(1)</td>
<td>5.9116[0.9493]</td>
<td>5.9766[0.5425]</td>
<td>0.6394[0.6715]</td>
</tr>
<tr>
<td>REMSEY RESET</td>
<td>1.4954[0.1555]</td>
<td>1.5399[0.1378]</td>
<td>1.5044[0.1446]</td>
</tr>
</tbody>
</table>

Note: t-statistics in ( ) p-value in [ ]

*a*level of significance at 10% **level of significance at 5% ***level of significance at 1%

Source: author’s computation from eview9

4.5 Short-Run Impact and ECM

Table 9 presents the error correction estimation for the ARDL models. The coefficient of the ECM (-1) variable in each of the three models (ΔInrgdpc, Δlngfcf and Δlngds) is found to be negative and significant at 1% level confirming the existence of a long run equilibrium relationship among the variables. The highly significant coefficient of ECM (-1) implies a relative speed of achieving the long-run equilibrium. Specifically, Δlngfcf and Δlngds models reported the highest coefficient among the models with -75% and -98% respectively. This implies that these models (Δlngfcf and Δlngds) are corrected from the short-run towards the long-run equilibrium by 75% and 98%. This means also that the long-run would be shortly corrected back within one year. However, the ECM for the first model ΔInrgdpc, also suggests high speed adjustment back to long-run equilibrium with about 27.2% of disequilibrium in the previous year returning to long-run equilibrium in the current year.

In model 1, the short-run coefficient suggests that financial development index (ΔlnFDindex) has a statistically insignificant negative effect on real per capita income (lnGDPC) in the short run. This is an indication that the Nigeria economy is yet to exploit the benefit of financial development. The lag of gross domestic savings Δlngds is significantly negative at 5% level. This is in line with the endogenous growth model which predicts that an increase in saving rate increases the growth rate through the channel of investment or capital formation. In addition, Ramsey’s (1994) optimal growth theory postulates that savings leads to an increase in National income and consequently accelerate investment process. It is also in line with the conventional perception that savings contribute to higher investment and hence higher gross domestic growth, in the short-run (see Bacha 1990; De Gregorio, 1992), Kaldor (1956) and Samuelson and Modigliani (1966). The short-run impact of lag labor force Δlnlab has a negative significant at 10% level. Again, under-utilization of previous year human capital has negative impact on growth. This is also in line with relevant literatures in this study. Furthermore, investment (Δlngfcf) has a positive significant impact on growth at 10% level.
In the second model using Δlngfcf as the dependent variable, none of the independent variables are statistically significant except the lag of gross fixed capital formation (Δlngfcf) at 10% level. In last model using Δlngds as the dependent variable, ΔlnFDindex still remained significant impact on the Δlngds thereby showing the dominant roles of financial sector development on the various macro-economic variables.

4.6 Diagnostic and Stability Tests

From the diagnostic test result (see results in table 9), there is no evidence of serial correlation heteroscedasticity in each of the ARDL models specified. The stability of the long-run coefficient is tested by the short-run dynamics. Once the ECM model given in table 9 has been estimated, the cumulative sum of recursive residuals (CUSUM) and the CUSUM of square (CUSUMSQ) tests are applied to assess parameter stability (Pesaran and Pesaran, 1997). Figures 2 plot the results for CUSUM and CUSUMSQ tests. The results indicate the absence of any instability of the coefficients because the plot of the CUSUM and CUSUMSQ statistic fall inside the critical bands of the 5% confidence interval of parameter stability.

Figure 2: Plot of CUSUM and CUSUMQ for coefficient stability of ECM model Δlnrgdpc, Δlngfcf and Δlngds
4.7 Discussion of Findings

The present of cointegration implies that each of the variables under consideration are bound by a long run relationship in Nigeria. The study is in line with relevant literatures in the likes of Nwanne and Nnanna (2014), Nomdeen ABU (2008), Mohan (2016), Toran and Olesia (2014) and Verma (2007). The results of the first model lnrgdpc show that the coefficient of financial development index (FDindex) has a statistically significant negative impact on real per capita come (lnrgdpc) at 5% level in the long-run. The coefficient of lngds is significantly positive at 5% level, suggesting that 1% increase in the gross domestic savings would significantly increase the real income per capita (lnRGDPC) by 0.33% in the long-run. This is in line with the theoretical underpinnings of Ramsey's (1994) that in optimal growth theory savings leads to an increase in National income and consequently accelerate investment process. The result also supports Budha (2012) findings on saving and investment. Furthermore, the result also indicates that the coefficient of labor force (lnLab) and gross capital formation (lngfcf) are significant positions at 1% and 5% respectively. Thus, increase in investment can only induce growth in the short run while in the long run there may be little or no impact on economic growth (Romer 1986). Overall, the results of the first model lnRGDPC show the significant impact of the dependent variables on the economic growth of Nigeria.

The result of the second model lngfcf shows that the coefficient of financial development has a statistically insignificant positive effect on gross fixed capital formation (lngfcf) in the long run. The positive long-run relationship between financial development index (FDindex) and gross fixed capital formation (lngfcf) is an indication that the financial sector could be a one of the prime mover of the investment in Nigeria. (see Sultan and Hague, (2011); Budha (2012)). The coefficient of labor force is found to be significant negative at 1% level, suggesting that 1% decrease in labor force would significantly decrease the gross fixed capital formation (lngfcf) by 23.6% in the long-run. This is an indication of under-utilization of previous year human capital has negative impact on growth. Interestingly rgdpc is found to be significantly positive at 1% level, indicating that 1% increase in rgdpc would significantly increase the gross fixed capital formation gfcf by 0.80% in the long-run. Over all there is a clear indication of the dominant role of labor force and per capita income in the economic growth of Nigeria.

In model 1 the short-run coefficient suggests that financial development index (ΔlnFDindex) has a statistically insignificant negative effect on real per capita income (lnGDPC) in the short run. This is an indication that the Nigeria economy is yet to exploit the benefit of financial development. The lag of gross domestic savings Δlngds is significantly negative at 5% level. This is in line with the endogenous growth model which predicts that an increase in saving rate increases the growth rate through the channel of investment or capital formation. In addition, Ramsey's (1994) optimal growth theory postulates that savings leads to an increase in National income and consequently accelerate investment process. It is also in line with the conventional perception that savings contribute to higher investment and hence higher gross domestic growth, in the short-run (see Bacha 1990; De Gregorio, 1992), Kaldor (1956) and Samuelson and Modigliani (1966). The short run impact of lag labor force Δlnlab has a negative significant at 10% level. Again, under-utilization of previous year human capital has negative impact on growth. This is also in line with relevant literatures in this study. Furthermore, investment (Δlngfcf) has a positive significant impact on growth at 10% level.
In the second model using Δlngfcf as the dependent variable, none of the independent variables are statistically significant except the lag of gross fixed capital formation (Δlngfcf) at 10% level. In last model using Δlngds as the dependent variable, ΔlnFDindex still remained significant impact on the Δlngds thereby showing the dominant roles of financial sector development on the various macro-economic variables.

5.0 Summary and Conclusion

This study examines the roles of financial development in long and short run dynamics of economic growth, gross fixed capital formation and savings in Nigeria from 1981 to 2014. The study employs the ADF and P.P for the test of stationarity level. The bounds testing approach was employed to analyze the dynamics and dominant roles of financial development. The long-run impact of financial development (FDindex) on real per capita come (lnrgdpc) is found to be negative. A positive and significant long run relationship between gross capital formation and real income per capita coexists with a negative short run relationship, highlighting the dual effects of gross domestic savings (lag one) on real income per capita. Interestingly, the impact of gross fixed capital formation on real income per capita is found to positive both at long and short run. The positive significant of gross domestic savings on economic growth is in line that the savings-led growth in emerging market economies implies that the economy is struggling to catch up with the technology frontier and hence growth is driven by the innovations that are taking place worldwide. The reversed impact of real income per capita on gross fixed capita formation in long run is an indication of strong link between the two variables. A negative short-run relationship impact of financial development on gross domestic savings indicates that Nigerians are yet to have access to financial activities which could be seen as poor financial inclusion.

However, the results of this study can be generalized in all other economies through the benefit of financial development and the dynamics of selection macro-economic variables in the present study. These benefits would increase the level of financial development, the level of income and savings, and indeed provides funds for capital formation or investment in an economy.

Furthermore, the study contributes to the literature by using the most recently developed model Autoregressive Distributed lag (ARDL) to examine the long and short run equilibrium among rgdpc, gfcf and gds, FDindex, and Lab. Again, more attention should be given to the relevant macroeconomic variables that would induce the gross domestic savings through diversification and investment strategies in the Nigerian economy.
References


ISSN: 1596-9061


World development Indicators (2012). Regional Highlights World Development Indicators 2012.

**ISSN: 1596-9061**