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Saving-Growth Nexus in an Oil-Rich Exporting Country: A Case of Nigeria

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Abstract

The study considers the saving-growth nexus in Nigeria using annual data over the period 1970-2013. For this purpose, ARDL bounds testing approach to co-integration and error correction model (ECM) for short run dynamics have been applied. According to empirical analyses, real GDP per capita, labour force, total savings, Oil revenue, Population growth, and Human capital are co-integrated. Compared to other variables, savings and population growth are major determinant of economic growth in the long-run. Results also revealed that the speed of adjustment to restore equilibrium is -0.549 which confirms stable long-run relationship. In the short-run, Savings, Oil revenue, Population growth, human capital and labour force appear to play a more important role. Thus, a bi-directional causality exists between savings and economic growth in Nigeria; leading to a feedback effect, such that, both the Keynes and the Solow model are relevant for Nigeria. Thus, policy makers are required *to implement policies mix* aimed at increasing savings and growth in Nigeria.

Key words: Saving; Economic growth; Autoregressive distributed lag approach; Nigeria

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INTRODUCTION

Following the conventional wisdom from a typical growth theory such as Lewis, 1955 and Solow, 1956; higher saving leads to higher investment which in turn leads to higher economic growth. The presumption in these growth models was that higher saving precedes economic growth and higher saving causes economic growth. As a result, international organizations especially, IMF and World Bank has continued to recommend to developing countries like Nigeria the need to pay close attention to policies that lead to savings higher rate in order to boost economic growth. Empirically, some authors have sought to examine the causal relationship that existed between savings and output growth, but there is no consensus. Some of the previous studies done with mixed results are Bankole and Fatai (2013); Abu (2010); Sinha and Sinha (1998); Gavin, Hausmann and Talvi, 1997; Carroll and Weil (1994); among others. Despite the enormous amount of research undertaken on growth theories, the strength of these findings has been questioned. These have been partly attributed to different sets of econometrics methodologies adopted and quality of data in such studies (Pack, 1994; Romer, 1994).

The objective of this study is to underscore both short and long-run relationships and dynamic interactions of savings, growth and its determinants in Nigeria between 1970 and 2013. This attempt and thus, understanding the nature of the bond between savings and economic growth has a great implication for policy-makers' decision about the appropriate strategies and policies to adopt for economic growth and development especially in developing countries like Nigeria.

Therefore, this current study improves on previous studies by estimating the Autoregressive Distributed Lag (ARDL) co-integration test popularly known as the bound

test to show the long-run relationships and dynamic interactions of savings, growth and its determinants. In this paper effort was geared toward examining the short-run and long-run relationships between saving and economic growth for Nigeria over the period 1970-2013, using Autoregressive Distributed Lag (ARDL) approach to co-integration and error correction model (ECM).

Following the introductory section, the rest of the paper is organized as follows: the next section provides stylized facts on Savings and growth in Nigeria. Section three provides a brief review of literature. The fourth section addresses the methodology while section five presents and discusses the empirical results. The last section concludes, with some policy implications.

1. OVERVIEW OF SAVINGS AND ECONOMIC GROWTH IN NIGERIA

Maintaining high Savings rate and sustainable economic growth has been one of the major macroeconomic goals of Nigerian government in the past decades. The economy is still the largest oil producer in the West African sub-region, but tends to concentrate on very few export goods, especially crude oil. The economy, has witnessed a continuous growth (measured by RGDP) over the years. Beginning with a sum of N4, 219 million in 1970, it rose to N3.1 billion in 1980. By 1990, the figure had climbed to N26.7 billion, rising further in year 2000 to N329.2 billion. As at 2010, the figure stood at N775.5 trillion. However, the recent GDP rebasing estimated the country GDP to be around 510 billion U.S dollars, which put the country above that of South Africa's 352 billion U.S dollars. The rebasing exercise put the Nigeria GDP growth rate at 6.7% in 2012 and rose to 7.4% in 2013.

Figure 1 presents the gross national savings in Nigeria. In 1980, gross national savings (here after refers to as GNS) consisted of 24.8 percent of GDP, with this figure reducing gradually to 17.6 percent in 1988, and further declining to 10.5 percent in 1995. From then, the percentage of savings in GDP has been fluctuating. The GNS experience in the country has been mixed since 2000s. It recorded an increased from the initial 32.7 percent in 2000, to 48.8 percent in 2006. The figure dropped to 30.2 percent and currently stood at 29.3 percent in 2013. GNS has been low and consists mostly of public saving in Nigeria. The plausible reason for this low savings rate trends can be linked to the country heavy dependence on imports in both consumption and production, as a result, the government runs a budget deficits which then head to low savings. Thus, connotes the likelihood of lower exports over import balance, which has implications for savings and growth in the country. A critical look at Figure 1 shows that GNS initially declined from relatively high levels in the three years period of 1990, 2002 and 2003 fiscal years before picking up gradually in the later years. The best performance was recorded in 2006 and 2007 respectively; 48.8 and 44.1 per cent saving rate.

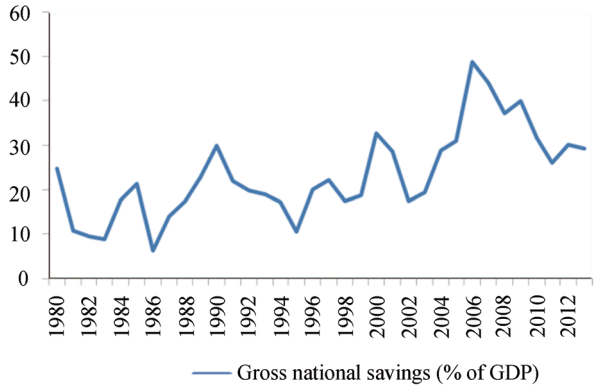

Figure 1
Structure of Nigeria's Gross National Savings (% of GDP)
Note. Source: Graphed by the authors

2. LITERATURE REVIEW

Savings plays an important role in modern growth theories. In the early growth model of Solow (1956), increases in saving rate increase the steady-state output. In the endogenous growth literature (such as Romer, 1986, 1990, 2012; Lucas, 1988) which emerged in the 1980s and 1990s, also modeled savings endogenously, either by incorporating spillovers from investment in physical and human capital (Romer, 2012) or differences in the variety and quality of inputs (Romer, 2012). Thus, endogenous theorist submitted that physical and human capital accumulation is the necessary drivers of long-run growth and that high savings rates are important determinant of the GDP growth rate.

For, example, using Vector Auto Regressive (VAR) and Vector Error Correction (VEC) model, Sinha and Sinha, 1998; Saltz (1999); Mavrotas and Kelly (2001); Adelakun (2011); and Zaren and Akbas (2013) empirically investigated the the relationship between savings and economic growth. Their findings rejected the Solow's hypothesis that saving precedes economic growth, and accept the Keynesian theory that postulated that it is economic growth that leads to higher savings.

Bankole and Fatai (2013), focusing on the cause and effect relationship between domestic savings and economic growth in Nigeria for the period of 1980-2010. While employing Granger-Causality and Engle-Granger co-integration, he found that causality runs from savings to economic growth by accepting the Solow's hypothesis. Mehrara and Musai, 2013 employed ARDL co-integration approach to determine the long run relationship among saving , investment and GDP for the period 1950-1951 to April 2003 and supported that the labor force and human capital have the most important effect on long-run economic growth.

Al-Foul (2010) investigated the long-run relationship between economic growth and savings for Morocco and Tunisia during the period 1965-2007 and 1961-2007 respectively. His regression results showed that long-run relationships exist between economic growths and saving in Morocco, there was no such evidence for Tunisia. Pertinent to that, the Granger causality test indicated, the existence of a two-way causal relationship between savings and growth in Morocco, while unidirectional causality run from growth to saving in Tunisia.

Tang and Chua, (2009) in an attempt to re-examines the savings-growth nexus in Malaysia used non-parametric methodology. Employing quarterly data from March 1991 to September 2006, he found that savings and economic growth are co-integrated with F-test indicating a bilateral causality between savings and economic growth. He advised that policies that encourage savings should be implemented as the causality test shows that savings is an engine to economic growth through its impact on capital formation.

Mohan (2006) studied the relationship between domestic savings and economic growth for various economies with different income levels using the Granger causality test. He used time series annual data from 1960 to 2001. His empirical results indicated unidirectional and bi-directional Granger causality from economic growth rate to growth rate of savings in 13 countries and five countries respectively.

Agrawal (2001) employed annual data that span from 1960 to 1994 to investigate the savings-growth nexus for seven Asian economies. His results are mixed; savings and economic growth are co-integrated for Indonesia, Thailand and Singapore, while, savings and economic growth in Malaysia, Korea, Taiwan and India are not co-integrated. Also, the Granger causality results failed to reach a consensus among the selected Asian economies. The Granger causality results indicated a uni-directional causality running from economic growth to savings in the case of Singapore, Taiwan and India, while for the case of Malaysia and Indonesia, the causality run from savings to economic growth. Surprisingly, the causality between savings and economic growth for Thailand is neutral.

In summary, three major trends of arguments are prominent in all these empirical literature. The first and second argues in favour of saving-growth nexus and growth- saving nexus respectively; while the third support a bilateral or bi-directional relationship. Authors such as Solow (1956), Jappelli and Pagano (1994), Cohen (1997), and Bankole and Fatai (2013); among others, believed that savings occur before economic growth and that policy makers should apply policies that increase the mobilization of savings in order to achieve a higher level of economic growth. Those that advocated for growth-Savings nexus, opined that economic growth occurs before savings and results in savings (Keynes, 1936; Carroll & Weil, 1994; Gavin, Hausmann & Talvi, 1997; Sinha and Sinha, 1998; Abu, 2010; among others) and as such, macroeconomic policies should be directed to policies that will acceleration growth, so as lead to expansion in the level of savings. Recently, some authors like Tang and Chua (2009); Zaren and Akbas (2013); Verma (2007) and Mohan (2006); have also found a bi-directional linkage between savings and economic growth among countries.

Therefore, this current study seeks to improve on previous studies by estimating the Autoregressive Distributed Lag (ARDL) co-integration test popularly known as the bounds test to shows the long-run relationships and dynamic interactions of economic growth and its determinants. The uniqueness of this methodology over other time series approach lies in estimating both long-run and short-run relationships in a single equation; when we have a group of time-series, some of which may be stationary, while others are not.

3. DATA AND METHODOLOGY

This study uses annual time series data that covers the period from 1970-2013 for Nigeria. Data was sourced from Central Bank of Nigeria Statistical Bulletin and African Development Indicator (ADI). The variables of interest are real GDP per capita, Labor force, total savings, Oil revenue, Population growth, and Human capital that is proxy by secondary school enrollment. All variables were transformed into the natural logarithmic form. The estimated model is discussed as follows:

From the discussion above, an unrestricted Vector Auto-regression of order ρ, VAR (ρ) was employed for the growth function, stated as:

$$\eta_t = \varphi + \sum_{i=1}^{p} \alpha_i \eta_{t-1} + \varepsilon_t \quad . \tag{1}$$

Where η_t is a vector of z_t and v_t, v_t is assumed to be the dependent variable-GDP per capita (*GDPC*) and z_t is the vector matrix which represents a set of explanatory variables. The explanatory variables used in this study are, Labor force (*LAB*), Total Savings (*TS*), Oil revenue (*OREV*), human capital (*HCD*) that is proxy by secondary school enrollment and Population growth (*POP*). α_i is a matrix of VAR parameters to be estimated and ε_t is a white noise error. Thus, stated differently, the long run relationship between economic growth and domestic growth saving can be expressed as:

$$GDPC = F\,(LAB_t, TS_t, OREV_t, HCD_t, POP_t)\ . \tag{2}$$

The co-integration techniques suggested by Pesaran, Shin, and Smith, (2001), the autoregressive distributed lag model (ARDL) will be used. This method can be adopted regardless of whether the variables are integrated of order (1) or (0) and compare to other multivariate co-integration methods such as Johansen and Juselius (1990), ARDL is a simple technique that allows the co-integration relationship to be estimated in a single equation specification; once the lag order of the model is identified.

Therefore, from Equation (3), the ARDL estimable model is specified as:

$$\Delta GDPC_t = \alpha_0 + \alpha_1 GDPC_{t-i} + \alpha_2 TS_{t-i} + \alpha_3 LAB_{t-i} + \alpha_4 OREV_{t-i} + \alpha_5 HCD_{t-i} + \alpha_6 POP_{t-i} + \sum_{i=1}^{p} \alpha_7 \Delta GDPC_{t-i} + \sum_{i=1}^{p} \alpha_8 \Delta TS_{t-i} + \sum_{i=1}^{p} \alpha_9 \Delta LAB_{t-i} + \sum_{i=1}^{p} \alpha_{10} \Delta OREV_{t-i} + \sum_{i=1}^{p} \alpha_{11} \Delta HCD_{t-i} + \sum_{i=1}^{p} \alpha_{12} \Delta POP_{t-i} + \varepsilon_t \quad (3)$$

Where *GDPC*, *TS*, *LAB*, *OREV*, *HCD*, *POP* are *GDP* per capita (measure of economic growth), Labor force, Total Savings, Oil revenue, Human capital and Population growth respectively. Δ is first differencing operator while ε = white noise disturbance error term.

The ARDL/bounds test approach for the long-run relationship between output growth and it's determinants was based on the Wald test (*F* statistic), by imposing restrictions on the long-run estimated coefficients of one period lagged level of GDP per capita, Labor force, Total Savings, Oil revenue, Human capital and Population growth to be equal to zero, that is, Ho: $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = 0$ for Equation 3. According to Pesaran et al. (2001), the explanatory variables are assumed to be integrated of order zero, or I(0) for values of the lower bound, while the upper bound values assumed that they are integrated of order one, or I(1). The decision rule is that if the computed F-statistic exceeds the upper bound value, I(1) then it can be concluded that economic growth and its determinants (under equation 3) are stable and co-integrated. Contrarily, if computed *F*-statistic falls below the lower bound value, I(0), the null hypothesis (no co-integration) cannot be rejected.

The bounds specification of short run dynamics is then estimated using Error Correction Model (ECM) of the following form:

$$\Delta GDPC_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta GDPC_{t-i} + \sum_{i=1}^{p} \alpha_2 \Delta TS_{t-i} + \sum_{i=1}^{p} \alpha_3 \Delta LAB_{t-i} + \sum_{i=1}^{p} \alpha_4 \Delta OREV_{t-i} + \sum_{i=1}^{p} \alpha_5 \Delta HCD_{t-i} + \sum_{i=1}^{p} \alpha_6 \Delta POP_{t-i} + \alpha_7 ECT_{t-1} + \varepsilon_t \quad (4)$$

From Equation (4), the one-time lagged residual term (ect_{t-1}) depicts the disequilibrium in the long run relationship and $\alpha's$ reflect the rate of change of each variable in Equation (4). Also, the goodness of fit for the bounds is checked through stability tests such as CUSUM and CUSUMSQ. Thus, this representation can be used to examine both the short and long-run relationship between the macroeconomic indicators. Consequently, Equation (4) also indicates the economic growth influenced as explained by its past values and other shocks.

4. FINDINGS AND DISCUSSION

Pesaran et al. (2001) critical values are based on the assumption that the variables are integrated of order I(0) or I(1). Unit root tests insure that none of the series is integrated of I(2) or higher. The time series properties of the variables employed in this study are evaluated by conducting Augmented Dickey-Fuller (*ADF*) and Philips-Perron (*PP*) unit root tests. The results of the unit root are presented in Table 2. Test for stationarity shows that all variables are integrated of order I(1) and thus, stationary in difference.

Table 1
Unit Root Tests

Variable		Unit root tests	
		ADF	***PP***
GDPC	Level	-5.961*	-6.068*
	1st difference	-10.984*	-16.241*
OREV	Level	-3.839*	-3.940*
	1st difference	-7.328*	-16.855*
LAB	Level	0.196	0.409
	1st difference	-9.086*	-10.554*
TS	Level	-1.618	-1.636
	1st difference	-6.268*	-6.408*
POP	Level	-5.392*	-2.046
	1st difference	-6.467*	-5.433*
HCD	Level	-2.333	-2.437
	1st difference	-3.237**	-3.189**

*Note.** and ** denote 1% and 5% significant level respectively, the optimal lag structure is determined by SIC. Source: Author's Estimation

To investigate the presence of long-run relationships among the variables, testing of the bound under Pesaran et al. (2001) procedure is employed. The empirical result from the bounds test co-integration for Nigeria is presented in table 3 below. The result revealed the computed *F*-Statistic = 27.82 from the estimation of the Wald test. The value exceeds both the upper bounds critical values for 5% significance levels (5.73) and 1% significance level (7.84). This suggests that real GDP per capita, Labor force, total savings, Oil revenue, Population growth, and Human capital are co-integrated. Thus, long run relationship exists between the growth function and aggregate Savings in Nigeria. The long-run estimated coefficients are shown in the Table 3. As can be seen, the coefficient of savings (*TS*) and population growth (*POP*) are significant. This implies that a one percent rise in savings is expected to increase GDP per capita in the long-run by 0.75 percent. The rise in quality of human capital (0.41) has been the main ingredients for economic growth. Although, the value is low and not significant, thus, infer absence of effective human capital development and therefore, an increasing population growth in the country has had negative adverse effect on the growth. This is because a lot more resources are taken out to manage and cater for the teeming growing population. Interestingly, oil revenues have a negative sign with growth. The implication of this result is that as more and more foreign earnings is derived from oil there will be more income available to the government which is not utilized to provide enabling environment that can spur productivity and other infrastructures, which will in turn hasten the level of economic growth in the country.

Table 2
Bounds Testing for Co-Integration Analysis

Computed *F*-statistic: 27.82 (SIC lags = 3)		
Bounds level:	Lower I(0):	Upper I(1):
1% critical bounds value	6.84	7.84
5% critical bounds value	4.94	5.73

Notes. Asymptotic critical value bounds are obtained from Table C1.iii: Case III: Unrestricted intercept and no trend for k=1 (Pesaran, et al., 2001, p.300).

The results of error correction model (ECM) were reported in Table 5. The short-run coefficients are less than the long-run ones. Specifically, the results suggest that the short-run impact of human capital on the economic growth is significant. The coefficients of the other explanatory variables have the expected sign and are significance.

Table 3
Estimated UECM for Nigeria Economic Growth Function Based on Equation (3)

Variable	Coefficient	*T*-statistic
C	9.752*	3.207
$GDPC_{t-1}$	-1.780*	-12.491
HCD_{t-1}	0.408	1.221
LAB_{t-1}	-0.252	-0.313
$OREV_{t-1}$	-0.090	-0.548
POP_{t-1}	-6.589*	-3.418
TS_{t-1}	0.749*	3.566
$\Delta GDPC_{t-1}$	-0.383*	-4.888
ΔHCD	-1.685**	-2.243
ΔHCD_{t-1}	1.136	1.494
ΔLAB	-3.509**	-2.269
ΔLAB_{t-1}	-3.932**	-2.239
$\Delta OREV$	0.236***	1.781
$\Delta OREV_{t-1}$	-0.488*	-3.983
ΔPOP	10.088*	3.312
ΔPOP_{t-1}	19.002*	3.474
ΔTS	-0.503**	-2.405
ΔTSt_{-1}	-0.396***	-2.018

Note. (*), (**) and (***) indicates 1%, 5% and 10% significant level respectively, R^2 = 0.914; Adj R^2 = 0.833; DW Stat = 2.765; Prob (*F*-Stat) = 0.0000

Moreover, the coefficient of the ECM is negative and it is significant at 5% level. This corroborates the existence of a stable long-run relationship and points to a long-run co-integration relationship among variables. The ECM represents the speed of adjustment to restore equilibrium in the dynamic model following a disturbance. The coefficient of the ECM is around -0.549, implying that a deviation from the long-run equilibrium is corrected by approximately 55% after each year. Thus far, the estimated results show that economic growth has both short run and long run relationship on Savings in Nigeria. In addition to the above results, the CUSUM and CUSUM square parameter stability test was conducted and presented in figure 2 and 3 below to show that the estimated parameters are stable during the sample period (1970-2013).

Table 4
Error Correction Representation for the Selected ARDL Model

Variable	Coefficient	*T*-statistic
C	0.118*	2.157
$\Delta GDPC$	-0.937*	-8.016
$\Delta GDPC_{t-1}$	-0.590*	-4.367
ΔHCD	-1.099***	-1.834
ΔHCD_{t-1}	2.022**	2.913
ΔLAB	-2.916*	-3.331
$\Delta OREV$	-0.314*	-3.246
$\Delta OREV_{t-1}$	-0.714*	-6.985
ΔPOP	13.136*	3.054
ΔPOP_{t-1}	-15.465*	-3.629
ΔTS_{t-1}	0.437**	2.724
ECT_{t-1}	-0.549**	-2.278

*Not***e.** (*), (**) and (***) indicates 1%, 5% and 10% significant level respectively, R^2 = 0.910; Adj R^2 = 0.864; DW Stat = 1.515; Prob (*F*-Stat) = 0.0000

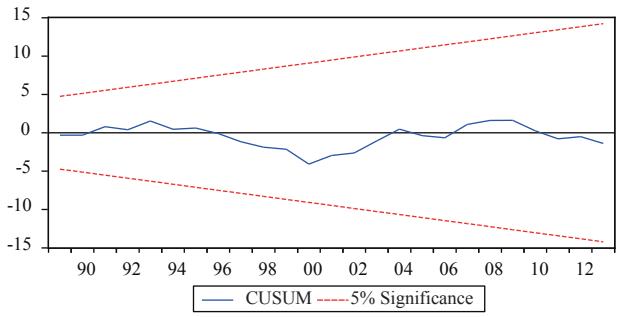

Figure 2
Stability Test, Recursive Estimates (OLS) CUSUM Test

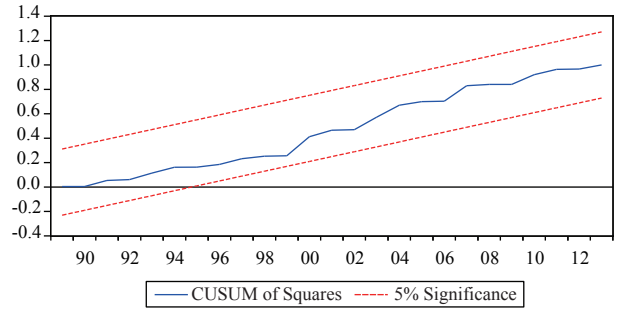

Figure 3
Stability Test, Recursive Estimates (OLS) CUSUM of Squares Test

CONCLUSION

This study query the long-run and short-run relationship between Savings, economic growth and its determinants in Nigeria using annual data for the period of 1970-2013 applying the UECM-Bounds test proposed by Pesaran et al. (2001) and the Error Correction Model (ECM). Results showed that real GDP per capita, Labor force, total savings, Oil revenue, Population growth, and Human capital are co-integrated. Estimating error correction model revealed that the speed of adjustment to restore equilibrium is -0.549 which confirms stable long-run relationship. Specifically, the results reveal that savings (*TS*) and population growth are major determinant of economic growth in the long-run. Interestingly, oil revenues have a negative sign with growth implying a high level of corruption in the system. In short-run, however, the variable of human capital does impact on economic growth, explaining only significant part of growth in Nigeria. Savings, Oil revenue, Population growth, human capital and labour force appear to play a more important role in the short-run growth. Therefore, savings contributes to economic growth in both short and long-run in Nigeria. Thus, policy makers are required to implement policies mix aimed at increasing both savings and economic growth in the country.

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