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THE PRODUCTIVITY OF PUBLIC DEBT BORROWING AND ECONOMIC GROWTH IN SUB-SAHARAN REGION: THE NIGERIAN CONTEXT

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Abstract

One of the significant and potential determinants of economic growth is the level or magnitude of public debt. Basically, excess public debt makes it more difficult both economically and politically for any economy to operate effectively. Even in the highly industrialised countries, excess debt accumulation serves as a constraint to prospective national development. At the period when Nigeria is recovering from the challenges of the current economic recession, the need to adopt appropriate borrowing strategies and debt management policies in a logical way in order to circumvent future difficulties becomes imperative. As a result, this study employed an ARDL model to examine the effects of domestic debt on economic growth within the context of traditional hypothesis and Ricardian hypothesis using the recent dataset on domestic debt for the period 1980 to 2015. Evidence from the estimation shows that domestic debt has over the years produced a negative effect on economic growth hence, supporting the traditional hypothesis. The result from this study implies that, a considerable amount of the borrowed funds were not adequately utilised for productive investments, instead are consistently acquired to satisfy the uneconomical expenditure programmes of the government, as such, are growth-retarding and further engendered a critical threat to fiscal sustainability. Fiscal policy practitioners and other related policy makers should earmark substantial attention to the

productive utilisation of any internally borrowed funds and ensure that resources are allocated to specific growth-oriented programmes and that adequate capacities for loan-repayment are well established.

Keywords: Domestic debt, Economic growth, Traditional hypothesis, Ricardian hypothesis

INTRODUCTION

One of the basic objectives of economic policy particularly in developing countries is the reduction of public debt, and to ensure interest payment on the existing public debt are not growing in order to avoid a future deficit. However, for the past three decades, countries in the sub-Saharan region of Africa including Nigeria have been characterised with a high level of public debt and increasing trend of poverty ratio. Traditionally, countries that are unable to generate the adequate revenue required for developmental purposes, utilised borrowing as an available option. The borrowed funds are intended to increase the productivity level through the provision of more employment opportunities and availability of adequate infrastructural facilities, and to further create an avenue for more private investment, hence, accelerate the pace of economic growth and development. Public sector borrowing can be in the form of government bonds, issuing securities, treasury bills, and directly from numerous international financial institutions. Prior to 1980s, the extent of current account deficit in many developing countries within the sub-Saharan region of Africa is largely responsible for such borrowing. As the level of public debt continues to increase around the 1980s, a large number of debtor countries received financial assistance (in the form of debt-management) from the international financial organisations. The rationale behind this approach is to raise and encourage productivity within the domestic economy while at the same time, increasing the welfare level of the population. Interestingly, the aim of this approach in reducing external debt burden is considerably realised in many sub-Saharan countries including Nigeria.

Although, the implications of external debt to developing countries has for several decades attracted the attention of policy makers around the globe. On the contrary, the effects of domestic debt have received limited attention in the literature simply because it is “domestic” hence, can be resolved without external conditions. In other words, up to the period of Structural Adjustment Programme (SAP) in the 1980s, numerous sub-Saharan countries did not give the required consideration to the negative effects and challenges posed by the domestic debt. This has resulted in several countries, including Nigeria to utilise their apex bank in financing the debt. Unfortunately, this scenario has tended to produce substantial macroeconomic instabilities

such as high monetary expansion, liquidity problems, high inflation rate, lack of available loanable funds for domestic private investment, etc. (Essien, et. al, 2016). Surprisingly, a large number of developing countries have been witnessing an ever-increasing size of the domestic debt. The structural changes in public debt in the Nigerian economy has fascinated the necessity for the government to introduce and practically implement the strategies of debt management in order to lessen the negative impact of debt and culminating deficits in the future. By and large, the burden of public debt in all resource-constrained and poorly-developing countries has continued to generate the attention of policy makers due to the ever-increasing poverty ratio, lower output growth rate, and the overall decline in the standard of living. However, limited attention was given to the growing domestic debt, and several previous studies used conceptual approach and non-recent data to conduct their analysis, thus, are doubtful to produce any meaningful result that reflects the current macroeconomic position of the Nigerian economy. An interesting question to ask is that: is the level of domestic debt in Nigeria contributed positively to the economic growth? It is in view of this that, this paper is basically aimed at evaluating the relationship between the domestic debt and economic growth in Nigeria using a long data set of thirty-five (35) years covering the period of 1980 to 2015. An empirical approach is adopted in order to provide a clear departure from the previous literature and establish meaningful results based on the estimated empirical model.

Recent evidence from the literature as postulated by Asogwa and Ezema (2016) argued that poor management of public debt has adversely affected the tempo of economic activities, resulting in a simultaneous decrease in savings and crowding out private investment, and lower economic growth rate. Similarly, Christensen (2005) established that one-tenth of aggregate public revenue in many developing countries is used for interest payments on debt. For instance, Nigeria, Ghana, Kenya and South Africa, among others, have to set aside more than 15% of aggregate revenues to pay interest on domestic debt. This has resulted in crowding out of private investments and increased a trend of poverty ratio. In the economic growth literature, the size of capital stock, technological advancement, openness to trade, quality of labour force are traditionally regarded as the major driving forces for economic growth. Henceforth, the level of country's indebtedness is also regarded as an essential determinant of economic growth. Like other sub-Saharan countries, Nigeria sufficiently borrowed both domestically and externally. Externally, the debt is largely payable to foreign creditors, including the international financial institutions. While the domestic debt is confined locally, specifically through bond and treasury bills. Although, the outcome of these debts are growth-retarding due to poor utilisation and inefficiency in domestic administration. In view of that, an understanding of the productive effects of public debt on economic growth became necessary in order to tackle the menace

hindering the rapid and sustainable development of the Nigerian economy through feasible and practical policy recommendations. As such, this paper employed the ARDL model to empirically determine whether the previously incurred domestic debts are productive to the rapid and sustainable growth of Nigeria.

The rest of this paper is therefore divided as follows: section 2 identifies the theoretical and empirical literature relating to public debt taken into cognizance the divergent views among several scholars on the relationship between debt and growth based on traditional hypothesis and the Ricardian-equivalence approach; section 3 provides the general overview of domestic debt in Nigeria using the recent dataset from the official publication of the Central Bank of Nigeria (CBN) for the period of 1980 to 2015; section 4 highlights a number of challenges and effects of excess debt accumulation in Nigeria especially in terms of fiscal prudence and macroeconomic sustainability; section 5 discusses the methodology employed; section 6 presents the empirical results, source of data collected, as well as other procedures for evaluating the results; and finally; section 7 deals with the conclusion and future implications as suggested by this paper.

THEORETICAL AND EMPIRICAL REVIEW OF LITERATURE

In the economics literature, the relationship between public debt and economic growth can be analysed within the context of Traditional hypothesis and Ricardian-equivalence hypothesis. Many kinds of literature exist on the effects of debt in both developing and developed countries, although most literature are conceptual, and limited attention was given to the empirical analysis particularly in the case of Nigerian economy. In the traditional hypothesis, an increase in public sector debt is considered as a burden on future generation, especially in the long-run (Jhingan, 2010; Bhatia, 2008; and Anyanwu, 1997). In view of the high increase in public debt, a consumer would consider himself to be wealthier and therefore resort to higher spending. The increased demand for goods and services in the short run will raise output and employment level. As the marginal propensity to consume is higher than the marginal propensity to save, the increase in private savings ultimately reduces relative to a shortfall in public savings. As a result, real interest rate would escalate in the economy, encouraging capital inflows from abroad via foreign investment. While in the long run, the higher interest rate would discourage investment and consequently crowd out private sector participation in the market-driven economy. The lower investment eventually leads to a simultaneous decrease in capital stock and aggregate output. Therefore, the overall impact is the eventual decrease in consumption level, decreased welfare and standard of living as well as economic growth. On the other hand, the Ricardian hypothesis considered the effect of government debt to be neutral in the economy (Ijeh, 2008;

and Cohn, 2007). Considering that consumers are rational, the discounted sum of future taxes is equivalent to the current deficit. Consequently, the shift between taxes and deficits does not generate aggregate wealth effects. The increase in public sector debt does not affect the level of consumption. As such, the rational consumer who is encircled by the menace of current deficits saves for future increase in taxes and therefore total savings in the economy are relatively not affected. A decrease in government savings is harmonised and filled-up by an increase in private savings. In view of unchanged aggregate savings, other macroeconomic indicators such as national income; output growth and productivity level; interest rates; and investment level remains unaffected. It is in view of this background that this paper identifies the following studies from the literature and critically reviewed as follows:

Empirical review in favour of traditional hypothesis

Literature in support of the effects of public debt based on the traditional hypothesis include the following contributions: Using a statistical tool known as Value at Risk (VaR) technique, Asogwa and Ezema (2016) investigate the structure of domestic debt and the associated risk in Nigeria. The study found that there is a lack of confidence in the management of domestic debt in Nigeria, as a result, a large number of investors have reliably shown high reluctance to hold longer maturities. The government has therefore only been able to issue more of short-term debt instruments. This has adversely affected the tempo of economic activities, resulting in a simultaneous decrease in savings, crowding out investment, and lower economic growth rate. Similarly, Christensen (2005) studies the role of domestic debt markets in Sub-Saharan Africa covering twenty-seven (27) countries in the region. Findings from the estimation using an OLS technique shows that domestic interest payments, on the average, assumed about one-tenth of aggregate public revenue. While other countries, including Ghana, Kenya and South Africa, among others, allocated over 5% of aggregate revenues to pay interest on domestic debt. Consequently, in most developing countries, an increase in domestic borrowing undeniably results to crowding out of private investments hence adversely affect the tempo of economic growth, especially in the long run.

Further estimates using an OLS estimation technique by Adofu and Abula (2010) shows that the increasing trend in domestic debt profile in the Nigerian economy has negatively affected the growth rate. In other words, there exist no positive relationship between domestic debt and economic growth within the review period. Similarly, Adepoju, Salau and Obayelu (2007) submitted that, on the average, Nigeria has been paying annually US$1 billion to Paris club creditors and a further US$0.8 billion to its other multilateral and commercial creditors, indicating the excess debt burden on the economy. A meaningful reduction in the debt burden

will positively improve the country's creditworthiness before the investors, thereby increasing the confidence level and promotion of private sector participation in the country. Otherwise, the limited resources meant for sustainable growth and developments are to be diverted to other projects that lacked social and economic relevance to the citizenry. Further study using a reduced form simulation model by Gupta (1994) in analysing debt crisis and economic reforms in the Indian economy shows that a negative effect of public debt on the economic growth exist. Also, public debt as a percentage of GNP is not likely to show any significant declining trend when a reasonable and a larger portion of government's borrowing will be consumed by interest payments on the public debt.

Likewise, a study by Huixin, Shen, and Yang (2016) investigates debt-dependent effects of fiscal expansions in a nonlinear neoclassical growth model under rational expectations. The result supports the conventional view that public sector expenditure is less expansionary when it is highly indebted. In an economy where domestic debt is high and spiral, there is high expectation of a future increase in taxes and as a result, implies a stronger negative effect on consumption and further weakens the short-run simulation effect of an increased public expenditure. While, in the long run, both higher tax level and a larger increase in tax rates make investment and labour respond more negatively in higher indebted economies than in lower-debt economies, thereby producing a negative effect on economic growth. In the same vein, Ajayi (2007) using a simple percentage analysis argues that increased debt accumulation has negative effects on investment and a constraint impact on the economic growth of a nation. In view of that, if a large amount of domestic wealth are unaccountably relocated to foreign countries in the form of capital flight, tax revenues are adversely affected while policy variables and other macroeconomic indicators such as economic growth cease to be representative of the real situation. In addition, capital outflows exceeded foreign debt accumulation in Kenya, indicating a reduction of domestic resources within the review period.

Furthermore, Penner and Rivlin (2016) investigate the dimension of budget problem in the US economy using a conceptual approach. The study holds the view that; lower national debt will result in a higher rate of economic growth and vice versa. But, speedy and sustained economic growth does not reduce the burden imposed by social security, medical care, or other components, because as individual welfare increases, people may be less resistant to a tax increase or decreases. Likewise, with a lower national debt, the burden and macroeconomic effect imposed by interest costs on economic growth will significantly reduce to the barest minimum. In addition, Reinhart, Rogoff and Savastano (2003) established that sound institutions and a history or track record of good economic management affect the interest rate at which a country can borrow. The assumption is that, as its external debt increases, a country becomes

more volatile and vulnerable to external shocks and therefore may suddenly be shut out of international capital markets and ultimately suffers a debt crisis.

In another similar development, Alenoghena (2015) investigates the implication of fiscal deficits financing and financial market development in Nigeria. The study was estimated using Autoregressive Distributed Lag (ARDL) model in order to capture the long-run equilibrium relationship between the variables. The result shows that budget deficit, domestic debt and government expenditure significantly impacted on the development of Nigerian financial markets. Also, domestic debt significantly has negative effects on private sector investment, providing more support to the fact that government domestic debt crowds out private sector investment in Nigeria and further engendered negative effects on the sustainability of macroeconomic growth. Moreover, Hans and Philip (2011) posits that large government debt increase uncertainty about future inflation, interest rate and other macroeconomic variables thereby affecting the desired level of economic growth negatively.

Further evidence is provided by Stephen, Mohanty and Fabrizio (2010) in a study that examines the implication of future debt on the industrial countries of Europe using a conceptual analysis. The paper concludes that large public debt has a negative and significant consequence on the economic growth. Countries with a relatively vulnerable fiscal system and a high degree of dependence on foreign investors to finance its deficits generally experience a higher increase in domestic debts. Hence, this adversely affects the tempo of economic activities and contributes to lower output growth. This result is consistent with the study findings of Michael, Eduardo and Kenneth (1994). Likewise, using a panel data from nine (9) OECD countries by applying general equilibrium models, Smith (1996) holds the view that, government domestic debt implies future taxes for local residents. The present value of future tax payments needed to finance government debt is viewed as a liability. These results indicate that a country with an accumulated public debt has its citizen's wealth kept in domestic bonds than an asset. This, therefore, discourages private sector participation and consequently affects output growth in the economy.

In addition, Aro-Gordon (2015) conducted a study on the relationship between sovereign debt and economic growth in Nigeria using Cointegration and Vector Error Correction Model (VECM). Finding shows that large and accumulated public debt significantly affects the growth of output and consumption level. Also, it is evident that debt/GDP ratio has significant and long-run negative effects on economic growth of the Nigerian economy. Similarly, Reinhart and Rogoff (2010) conceptually examine the experience of 44 OECD countries covering two centuries of panel data to analyse the relationship between government debt, inflation and growth. Surprisingly, the relationship between public debt and growth is remarkably similar

across developing countries and advanced economies, countries with high debt/GDP ratio (averagely 90% and above) are associated with outstanding lower growth rates. While on the other hand, economies with much lower levels of government debt/ GDP ratio, are associated with lower levels of economic growth. In another development, Anyanwu and Erhijakpo (2004) investigate the impact of domestic debt on economic growth in Nigeria using a modified version of the Barro growth model. The result from the analysis shows that accumulated domestic debt as a ratio of GDP has a significant and negative effect on economic growth during the review period. On the other hand, prior to the study period, previously expanded domestic debt has contributed positively and establishes significant effects on economic growth.

In the same vein, Matiti (2013) study the relationship between public debt and economic growth in Kenya using an OLS regression analysis. The study holds the view that, domestic borrowing consumed a significant proportion of public sector revenue, which poses a greater risk to fiscal sustainability. However, domestic debt compared with external debt is characterised by higher interest payment which is contracted mainly on concessional terms, and it is, therefore, costly to maintain. As a result, economic activities are affected that led to lower output growth in the economy. Similarly, Atique and Malik (2012) examine the effects of domestic and external debt in Pakistan using a log-linear model. Empirical evidence from the study shows that domestic debt negatively affects the performance of the economy, thereby resulting into low output growth.

Empirical review in favour of the Ricardian-equivalence hypothesis

The relationship between public debt and economic growth that are consistent with the assumption and theoretical contributions of Ricardian-equivalence are also identified in the literature by this paper. This includes the following contributions as postulated by different scholars: Essien, et al. (2016) provides an empirical support to this growing debate in a study that examines the macroeconomic impact of public debt in Nigeria using a VAR model and Granger causality test as techniques of analysis. The result of the estimation shows that neither external nor domestic debt had any impact on economic growth during the review period. The policy implication of this is that most of the public borrowings made within the period under consideration are not growth-oriented. In spite of this, it was established that inflation responded positively to shocks in innovations from external debt and negatively to innovations from domestic debt. Similarly, Singh (1999) empirically examines the relationship between government domestic debt and economic growth in India. VAR model, cointegration and the Granger causality tests based on annual time series data are used for the estimation. Results from the analysis show support for the hypothesis of Ricardian equivalence in India. However,

the findings of the Granger causality test show no relationship between the two macroeconomic variables. This implies that neither cointegration relationship, nor direction of causality exists between domestic debt and economic growth in India for the period under review.

Furthermore, another empirical evidence is provided by Angeloni, Faia and Winkler (2011) in a study conducted among Euro countries concerning debt consolidation and financial stability using a simple descriptive analysis. Finding reveals that there are significant improvements in economic growth and debt cost. This implies that all consolidation strategies, regardless of its features, improve significantly over the non-consolidation circumstance in terms of long-term economic growth and costs of debt performance. In another development, Dinneya (2006) using Taylor's macroeconomic model submitted that the level of external debt and the consequent debt obligations has no any negative effects on the Nigerian economy within the review period, but the marginal contributions for the period were not the same. However, debt did not satisfy the Taylor conditions for positive contribution to economic growth for a recent period, while for the remaining period, debt indeed contributed positively to the growth of the Nigerian economy. The conflicting results, therefore, buttress the argument that debt can be both growths enhancing as well as growth retarding. In other words, the significant role of debt in any nation's economic growth depends on how capital is utilised and managed in the host economy. The contribution of debt (either domestic or external) in Nigeria is largely positive and significant during those periods when the debt was better managed and negative when little or no attention was paid to debt management.

Similarly, using an OLS estimation technique, Ajayi and Oke (2012) studies the effects of external debt on economic growth in Nigeria. Findings reveal a positive and significant relationship between debt and economic growth in Nigeria. The policy implication of this result is that it is necessary to manage debt (either external or domestic) in the best possible way in order to obtain a maximum associated benefit. In the same vein, Ramzan, Faridi and Tariq (2010) examine the impact of domestic debt on economic growth in Pakistan using an OLS regression analysis. The study reveals that domestic debt established a positive impact on the economic growth of Pakistan. This implies that the funds generated through domestic borrowing are judiciously utilised in financing public sector expenditures that contribute significantly to output growth. Similarly, Maana, Owino and Mutai (2008) examine the effects of domestic debt on the Kenyan economy. The study found no evidence that domestic borrowing crowded out private sector lending during the review period. Using a modified Barro growth regression model, the results further indicate that expansion of domestic debt had a positive but insignificant effect on economic growth.

In another analysis, Jernej, Aleksander and Miroslav (2014) empirically examine the transmission mechanism and impacts of public debt borrowing using a panel dataset of twenty-five (25) independent member states of the European Union (EU). The paper categorised the member nations into two subgroups namely; old members and new members, and hence data collection is also conducted for the period spanning 1980 to 2010 and 1995 to 2010, respectively based on the status of member nations. The paper utilised a generalised economic growth model using panel estimation and other methodological techniques for the analysis. The result from the estimations established that low levels of public debt have a positive impact. However, beyond 80% to 90% threshold level for old members and 53% to 54% for new members, the impact reversed to negative effect.

In addition, Babu, et al., (2015) investigates the effect of domestic debt on economic growth of East African Community (EAC) using a regression analysis. The result shows that domestic debt expansion has a positive and significant effect on economic growth of the EAC member countries. This implies that increased domestic debt contributes to aggregate output growth within the review period. Likewise, Mba, Yuni and Oburota (2013) analyses the implication of domestic debt on economic growth in Nigeria using cointegration technique and VECM. Findings from the estimation reveal that domestic debt and credit have a significant, positive and direct relationship with economic growth. Moreover, public sector spending has a direct but not significant relationship with GDP, and that debt servicing has an inverse relationship with output growth within the period under consideration.

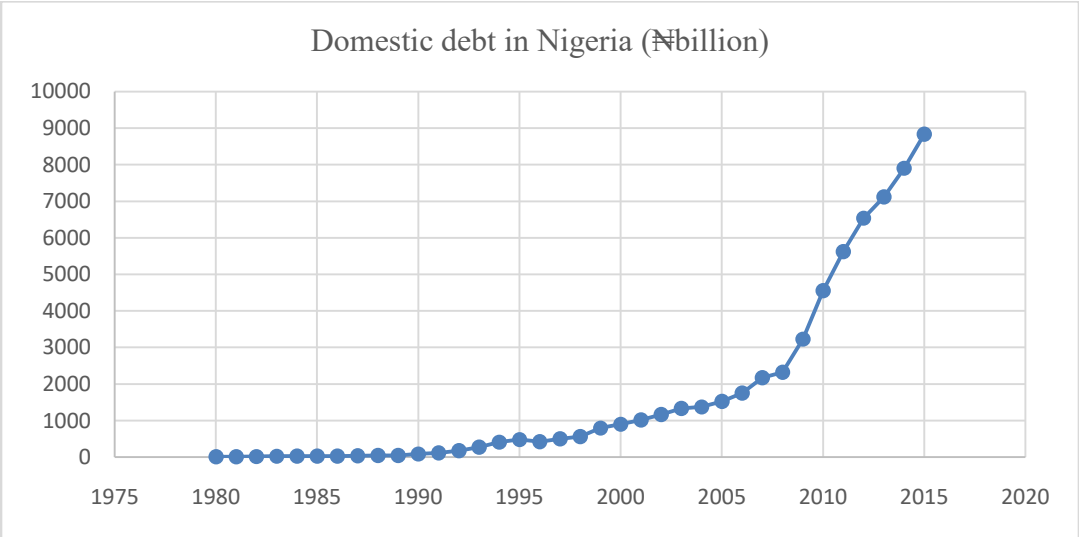
In conclusion, one of the significant and potential factors determining how much government policy can be employed or attaining the desired level of growth is the extent of public debt (Essien, et al., 2016). Undeniably, excess public debt is believed to be a constrained and a retarding element both economically and politically for any economy to operate effectively. Even among the highly industrialised countries of the world, excess debt accumulation serves as a hindrance or deterrent factor to any significant national development in the future (Bhatia, 2008). Interestingly, public debt can also be employed to control the tempo of economic activities through discrepancies in the volume, structure, and the rate of interest on such debt. A long-term maturity structure of public debt will lower aggregate liquidity in the economy while a short-term maturity will increase liquidity (Asogwa & Ezema, 2016; and Jhingan, 2010). Public debt borrowing is largely utilised by the public sector as an essential and viable tool for controlling the performance of macroeconomic variables like exchange rate; money supply; inflation; among others since it encompasses the major part of total credit supply of the country. According to Isedu (2002), the government sometimes borrows domestically to

finance some developmental expenditure programmes and regulate the economic activities, hence the need for domestic debt in the analysis.

An overview of domestic debt in Nigeria

The issues of public debt have continued to attract the attention of policy makers since the end of the prolonged military administration and the emergence of a democratic regime in Nigeria. During this period, debt burden constitutes a major challenge to the revival and restoration of the Nigerian economy. Empirical evidence by Keen and Mansour (2010) reveals that revenue generation and mobilisation over the years in sub-Saharan countries has relatively improved only in countries with rich natural endowment within the region. This implies that resource-constraint countries within sub-Saharan Africa lacked sufficient revenue generation capacity to support expenditure programmes, hence, borrowing becomes a vital tool to enhance the societal well-being and finance constitutional responsibilities. Traditionally, countries do normally borrow when the capacity of revenue generation is not adequately sufficient to fund both the capital and recurrent expenditures. Hence, debt is an alternative source of borrowing, but the conditions to which the loanable-funds are subjected to and the purpose to which it will be utilised for, shall determine the relevance or otherwise of this debt to the economy. In addition, one of the most significant objectives of Nigeria's economic policy is to ensure reduction of public debt and to evade interest payments on debt from increasing in order to avoid a higher future deficit. Unfortunately, government debt increased continuously in the past three decades. Evidence from figure 1, shows the rising trend in domestic debt accumulation over a three and half decades.

Figure 1: Trend of domestic debt in Nigeria



Specifically, domestic debt increases from ₦8.22 billion (26% of GDP) in 1980 to ₦27.95 billion in 1985. During the initial years of Structural Adjustment Programme (SAP) in Nigeria, the value of domestic debt in 1986 stood at ₦28.44 billion and later increased to ₦47.03 billion in 1988. It was unfortunate when the value of domestic debt continued to increase rapidly doubling up an initial amount throughout the adjustment period. This has represented over 20% of the GDP in each respective years. In 1990, the value still represented nearly 25% of GDP, with an average amount of ₦84.90 billion. Since the early 90s up to the later years of 1998, government domestic debt represented over 30% of GDP within these respective years. During these years, Nigeria experienced several military coup d'état under different administrations, as such, there was no designated regulatory agency to check the inefficiency and lack of transparency in the public administration. By way of analysis, from the inception of SAP in 1986 up to the eve of transition period, the value of domestic debt accelerated rapidly at the speed of horse. This explains the extent of poor economic policies and inefficiency in domestic administration. It can also be viewed from increased dependence of the economy on mono-product due to poor diversification, hence the result is the growing macroeconomic disequilibrium and fiscal imprudence. In 1999, a new democratic administration emerged in the country with the better expectations to restore the image of Nigeria among sub-Saharan countries through provision and rehabilitation of dilapidated infrastructures and raise the welfare level of the citizenry. Previously, the Central Bank of Nigeria (CBN) possessed the responsibility of managing and coordinating all issues regarding domestic debt through the issuance of government treasury certificates, treasury bills, treasury bonds, and development stocks. The strategies adopted and embraced in managing debt by the Apex bank then, resulted in several challenges and incompetency. As a result, the Nigerian government introduced an independent and sovereign Debt Management Office (DMO) in the year 2000 with the objective of realising effective and reliable debt management practices through central coordination and management of public debt in all the three-tiers of government. From the year 2000 up to 2015, the value of domestic debt rose consecutively from9% to 13% of GDP. This, however, shows a declining percentage in contrast to what is obtained during the previous years. This may partly be explained due to the increased rate of GDP over the years. However, despite the corresponding increase in real GDP, rising trend of domestic debt inflicted more social and economic hardship, as well as increased rate of poverty among the citizenry as shown by the declining growth rate (CBN bulletin, 2015).

Challenges and effects of public debt in Nigeria

The challenges and effects of domestic debt are part of the complex perspectives affecting the structural balance of the Nigerian economy over several years. Despite the successful debt cancellation in 2003, the issue of fiscal sustainability in Nigeria seems to be another area of great concern, particularly with the recent introduction of new economic policy in April 2017 titled “Nigerian Economic Recovery and Growth Plan” aimed at restoring the productivity level of the economy. These debt challenges occur through debts servicing by consuming a significant part of savings which are designed for public investment, as well as more uncertainty associated with a future increase in sovereign financial crisis. Such uncertainties will affect the expenditure decisions of both the consumer and investor, hence causing a prospective increase in public debt resulting to more of Ricardian effects than the Keynesian effects (Dabrowski, 2016). In the event of no benefit being generated from the investment of loanable funds, the ability of government to fund other expenditure programmes will negatively be affected. As such, public sector expenditure on education, health, social services, and other priority sectors will adversely decline. Hence, decreased expenditure in these sectors will largely affect the welfare state and general well-being of the citizenry. In view of that, it becomes a necessary criterion for debt servicing not to reduce allocated funds meant for sustainable human development as stipulated in human right treaties (De coyuntura, 1999).However, this has never been the case in Nigeria, given the dilapidated infrastructures, increase youth employment, high poverty ratio and mass illiteracy. Moreover, a debtor country like Nigeria, which depends solely on mono-product exportation (petroleum products), the high cost of debt servicing will have a tendency of increased exploration and depletion of this product beyond the sustainability level, hence produce further negative effects in the long-run. Furthermore, the situation of debt crises in Nigeria has significantly interrupted numerous economic activities, this arises primarily through a decline in international commodity prices.

Since the primary aim of public borrowing is to accelerate rapid growth and sustainable development, the public sector in Nigeria over the years has deliberated for dependence on domestic borrowing than external borrowing for productive investment. However, the rising trend in the growth of domestic debt indicates how the Nigerian government used the debts for political and economic reasons as an alternative to money creation or shortfall in generated revenue. Although, the growth in the debt has not been adequately utilised for productive investments that will generate future dividends, instead are consistently incurred as financial resources to satisfy the unproductive and wasteful expenditure programmes of the public sector, hence, are not growth-oriented and further pose a severe risk to fiscal sustainability. The growing effect is the overall decline and lower pace of economic activities, lower output growth,

unstable exchange rate, high youth unemployment, and increased poverty ratio among the citizenry. Since the power shift from the military regime to a democratic administration as well as the associated relationship between poverty; debt; and unemployment, greater emphasis was accorded to the austere challenges of debt reduction. It is also a significant element of the current development strategies in Nigeria as highlighted in the Economic Recovery and Growth Plan (ERGP). Much of the outstanding debt were contracted during the military administration and lacked the required accountability thrust, hence, considered as odious debt. The modalities, procedures and channels through which the debt is owed still remains masked, clandestine and enigmatic, for the reason there is, no accountability or transparency in the way these debts are accumulated (Akinboye, 2006). Several attempts were established in order to provide a lasting and feasible solution to the growing challenges. Prominent among includes regulating the relationship with the international finance organisations under debt relief mechanism to create an avenue for negotiations, engaging in debts restructuring and rescheduling, and further lay a foundation for a meaningful debt reduction. This has resulted in numerous negotiations which led to over 60% external debt reduction as granted by the Paris Club while other measures remain abortive.

RESEARCH METHODOLOGY

One of the common challenges attributed to time series and other macroeconomic data is the non-stationarity property of the data. The use of such data in econometric analysis can result in spurious regression. As a result, the logarithm transformation and differencing is required to stabilise the data which can then be utilised for analysis. The stationary linear combination of the time series are defined by the nonstationary data which are employed to model the long run equilibrium relationship. As such, each deviation from the equilibrium is lagged and assumed to be corrected in the next period (Maddala & Kim, 1998). Several techniques are adopted in the literature in an attempt to evaluate the effects of public debt in both developed and developing countries. Such techniques includes the Ordinary Least Square (OLS) estimation analysis, Engle-Granger cointegration, Granger causality approach, Johansen cointegration test, Vector Autoregression (VAR) model, descriptive survey and conceptual approach.

However, for the purpose of this article, an Autoregressive Distributed Lag (ARDL) model as developed by Pesaran and Shin (1997) and Pesaran, Shin and Smith (2001) is employed. The ARDL model is relatively a superior approach in contrast to other multivariate methods particularly in time series analysis. A significant evidence to this is that, the ARDL model does not involve pre-testing the policy variables, meaning that, the test on the possible existence of equilibrium relationship among the variables in level can be applicable irrespective

of whether the underlying explanatory variables are integrated at 1(0), 1(1) or mutually cointegrated (Pesaran & Shin, 1997; and Pesaran, et.al, 2001). Furthermore, it is also established by Pesaran et.al (2001) that, if any of the examined policy variables has an order of integration higher than one, for instance, a variable integrated at 1(2), then, the critical values provided by Pesaran et al. (2001), which are calculated based on 1(0) and 1(1) variables, are no longer valid. In addition, both the short-run and long-run coefficients of the model are simultaneously estimated.

Following the Pesaran, et.al 2001, the ARDL model for this paper can be expressed as:

$Y_t=\beta_1 +\sum_{i=1}^{p} \beta_i y_{t-i} + \varepsilon_t$……. (1)

Where,

Y_t is the level of economic growth at time t, y_{t-1} is the lagged value of economic growth at time t-i, β_1 is the intercept, β_i are the trend parameters, ε_t is the normally distributed white noise with zero mean and constant variance; p = number of lags; *i* = discrete value defined as 1, 2, 3,…..k.

The model in equation (1) can be transformed into a functional form as follows:

Y = f (DD)…….. …… (2)

Where, Y is the economic growth proxied by GDP, and DD is the domestic debt.

Furthermore, equation (2) can be expressed in a simple log-log form as:

$LGDP_t = \beta_0 + \beta_1 LDD_t + \mu_t$ ……..……..……..….. (3)

However, as shown by Pesaran, et. al (2001), equation (3) can be redefined and expressed into an ARDL framework as follow:

$\Delta LGDP_t = \alpha_o + \pi_1 LGDP_{t-i} + \pi_2 LDD_{t-l} + \sum_{i=1}^{p} \psi_{1i} \Delta LGDP_{t-i} + \sum_{i=1}^{p} \theta_{1i} \Delta LDD_{t-l} + \varepsilon_1$ ……..……..…… (4)

Where,

α_o = represent the constant term

Δ = represent the first difference operator

π = are the long-run coefficient

ψ; θ = are the short-run dynamics

ε_t = is the white noise

In order to investigate the presence of long-run relationship between the examined variables, an ARDL Bound testing as postulated by Pesaran, et al. (2001) is adopted. The model is based on the F test, which is a test of hypothesis of no cointegration among the examined variables against the presence of cointegration relationship between the examined variables in the model. The formulated hypothesis is denoted as: H_0: $\beta_1 = \beta_2 = 0$; H_1: $\beta_1 \neq \beta_2 \neq 0$.

To ease the estimation process, two critical values (lower bound and upper bound) are given by Pesaran et.al (2001) for conducting the cointegration test. The lower critical bound assumes that no cointegration relationship among the variables, while the upper critical bound shows the presence of cointegration relations. Estimating the ARDL bound test is the first step to implement the F-statistic (F-stat) with significances of the lag level variables. The decision criterion is that, if the computed F-stat is greater than the upper bound values, then, the variables are cointegrated. Again, if the F-stat is less than the lower critical bound, then no cointegration relation. In addition, if the F-stat falls between the lower and upper bound values, then the result is inconclusive.

Once an evidence of cointegration exists among the examined variables, the next step is to estimate the coefficient of the long-run relationship among the variables. Now, the equation (4) in ARDL framework can be expressed as given below:

$$\Delta LGDP_t = \alpha_1 + \sum_{i=1}^{p} \psi_{1i} LGDP_{t-i} + \sum_{i=1}^{p} \theta_{1i} LDD_{t-i} + \varepsilon_{1t} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

After estimating the long-run model, the short-run coefficients of the variables are further estimated through the ECM framework of the ARDL model. Thus, the ECM model can be derived from equation (4) as follows:

$$\Delta LGDP_t = \alpha_2 + \sum_{i=1}^{p} \psi_{2i} \Delta LGDP_{t-i} + \sum_{i=1}^{p} \theta_{2i} \Delta LDD_{t-i} + \delta EC_{t-i} + \varepsilon_1 \ldots\ldots\ldots (6)$$

Where, δ indicates the speed of adjustment parameters back to long-run equilibrium after short-run shock.

EMPIRICAL RESULTS

In this section, the empirical result obtained from the data estimation shall be presented. This includes the unit root test based on Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) tests. In addition, the ARDL Bound testing approach to cointegration is also evaluated in order to determine the existence of long run equilibrium relationship among the examined variables in the model.

Unit Root testing

To test for a unit root, several techniques have been developed, but for the purpose of this study, Augmented Dickey-Fuller (ADF) unit root test and Philips-Perron (PP) unit root test are utilised in order to measure the time series property of the data. The variables employed in the study are Logarithm of Gross Domestic Product (LGDP) and Logarithm of Domestic Debt (LDD). In addition, annual time series data obtained from the statistical bulletin (2015) of Central Bank of Nigeria are used for the empirical analysis. The data covers the period of thirty-five (35)

years from 1980 to 2015 accounting for both the military and democratic regimes in Nigeria. The values are given in constant prices of local currency in Nigeria using 2010 base year, but are later transformed into logarithm in order to ensure appropriate scaling of the values. In view of that, Table 1 present the summary findings of the unit root tests:

Table 1: Summary findings of Unit Root test

	Augmented Dickey-Fuller Test			Phillip-Perron test		
Variables	**Level**	**First difference**	**Decision**	**Level**	**First difference**	**Decision**
LGDP	-2.227 *Prob*. 0.4381	-154.085* *Prob*. 0.0000	Stationary at first difference	-24.944* *Prob*. 0.0000	-135.286* Prob. 0.0000	Stationary at all level of difference
LDD	-1.426 *Prob*. 0.8355	-4.518* *Prob*. 0.0052	Stationary at first difference	-1.672 *Prob*. 0.7425	-4.508* *Prob.* 0.0053	Stationary at first difference

*indicates stationary at all levels of significance

The result in Table 1 shows that LGDP is not stationary at level, but stationary at first difference using the ADF test. Although, the situation appeared differently in PP test as the LDGP is found to be stationary at all levels of differences as indicated by the 1%, 5% and 10% levels of significance, respectively. In other words, all the respective t-statistics are greater than their corresponding critical values at all level of significance. Furthermore, the results of LDD using both the ADF and PP test is found to be nonstationary at level but stationary at first differences with a significant probability value at all levels, respectively. Therefore, from the aforementioned results, this paper concludes that the time series properties for LGDP and LDD within the sample period of this study (1980-2015) are stationary at first difference. This allows for further cointegration analysis.

Result for ARDL Bound Test

One of the basic reasons of estimating an ARDL model is to utilise it as a basis for applying the Bound test. The null hypothesis of this model is that there is no long-run relationship between the examined variables. In the literature, Pesaran and Shin (1997) has established that when the underlying data generating process of time series is I(1), the Ordinary Least Square (OLS) parameter estimators in the short-run are $T-$consistent, where T is the sample size. The Bounds testing is an extension of ARDL modelling which uses the F and t-statistics to test the significance of lagged levels of the variables in a univariate error correction system when it is unclear if the data generating process underlying a time series is trend or first difference stationary (Pesaran, et. al, 2001). Also, the ARDL Bounds testing estimates both the short run

and long run relationships simultaneously and provide unbiased and reliable estimates. The result of this tests is given below:

Table 2: Summary result of ARDL Bound test using EViews 9

Test statistic	**Value**	**K**
F-statistic	13.55	1
Critical Value Bounds		
Significance	Lower Bound	Upper Bound
10%	5.59	6.26
5%	6.56	7.30
1%	8.74	9.63

The result in Table 2 indicates that the F- statistic for this Bound test is 13.55, which is greater than the critical values of both the lower and the upper bounds at all levels of significance, respectively. As a result, the null hypothesis of no long-run relationship shall be rejected. This implies that, there is a relationship between domestic debt and economic growth in Nigeria within the sample period of this study.

In order to examine the existence of long-run equilibrium relationship between the variables, error correction term is estimated and the results are presented in Table 3. The results indicate that there is an existence of long-run equilibrium relationship between the domestic debt and Gross Domestic Product (GDP) in Nigeria for the period under consideration. In addition, there is a relative adjustment in the level of GDP when the capacity of domestic debt increases. Empirical results further reveal that, a 10% increase in the level of domestic debt will result in a long-run negative effect on the desired level of GDP by 30%. This negative effect, however, shows that domestic debt is growth-retarding in the Nigeria for the period under examination.

Table 3: Summary result of ARDL Cointegration and Long-run Form using Eviews 9

Cointegrating Form				
Variable	Coefficient	Std Error	t-statistics	Prob.
CointEq(-1)	-0.470981	0.091976	-5.120666	0.0000
Cointeq = LGDP – (-0.3947*LDD + 10.0528 + 0.1324*@TREND)				
Long run Coefficients				
Variable	Coefficient	Std Error	t-statistics	Prob.
LDD	-0.394733	0.035923	-10.988396	0.0000
C	10.052778	0.089159	112.751206	0.0000
@TREND	0.132400	0.007311	18.110931	0.0000

It can be observed from Table 3 that the results of long-run coefficients are all desirable with a significant prob. values of 0.000, respectively. Interestingly, the coefficient of Constant and TREND are all positive and found to be significant with a coefficient values of 10.052 and 0.132 and a corresponding prob. values of 0.0000, respectively. Furthermore, the error correction coefficient is negative and statistically significant which established the existence of long-run equilibrium relationship between GDP and domestic debt in Nigeria. With a coefficient value of -0.471, it indicates a rapid adjustment process with accumulated disequilibrium of the preceding years adjusting back to the long-run equilibrium in the present period. The results from the model estimation shows that domestic debt has a significant and negative implication on economic growth. This finding is consistent with the traditional hypothesis which established that debt has a negative effect on economic growth and supported by the recent literature based on the contribution of Asogwa and Ezema (2016); Huixin, Shen, and Yang (2016); Alenoghena (2015); Aro-Gordon (2015); and Matiti (2013).

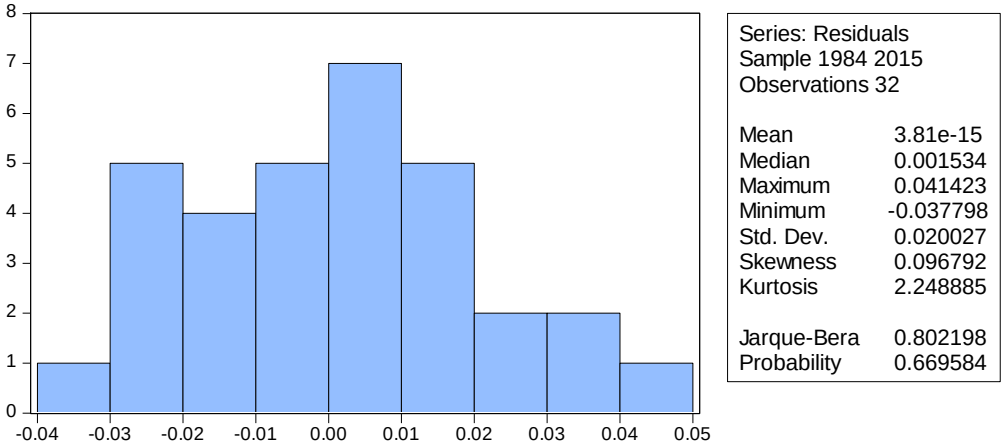
To ensure the robustness and stability of the model, several diagnostic tests are conducted in order to determine the validity of the findings. These diagnostic tests include the LM serial correlation test, heteroskedasticity test, normality test, and CUSUM and CUSUMSQ test, respectively.

Table 4: Result for Serial Correlation and Heteroskedasticity test using Eviews 9

Serial Correlation LM test: Breusch-Godfrey			
F-statistic	0.58078	Pro. F(2,21)	0.5682
Obs*R-squared	1.677233	Prob. Chi-Square (2)	0.4323
Heteroskedasticity test: Breusch-Pagan-Godfrey			
F-statistic	0.551999	Prob. F(8,23)	0.8052
Obs*R-squared	5.154353	Prob. Chi-Square (8)	0.7410
Scaled explained SS	1.662732	Prob. Chi-Square (8)	0.9897

Results from Table 4 shows the estimated findings for both serial correlation and heteroskedasticity test, respectively. The model shows no evidence of serial correlation in the residuals, as the probability values are all found to be insignificant. In the case of heteroskedasticity test, the result shows the presence of no heteroskedasticity among the residual of the model. This is evidenced by the probability values that are all found to be insignificant, hence desirable. Furthermore, normality test is conducted and the results are shown below:

Figure 2: Result of Normality test



Evidence from Figure 2 shows the results of normality test conducted on the model's residual. Finding shows that the model is normally distributed since the probability value is greater than 0.10. In addition, the histogram is bell-shaped and the Jarque-Bera statistic is not significant, hence desirable. Finally, the Cumulative Sum of Recursive Residuals (CUSUM) and the Cumulative Sum of the Recursive Residuals Square (CUSUMQ) tests as developed by Brown, Durbin and Evans (1975) are also conducted and the results are presented as follows:

Figure 3: Result of CUSUM test

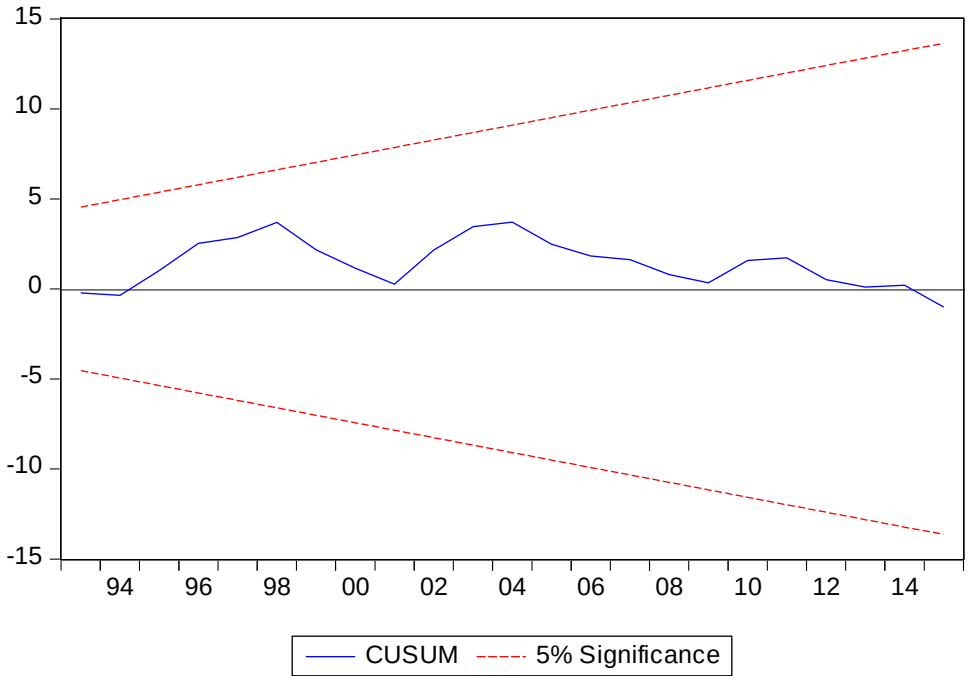
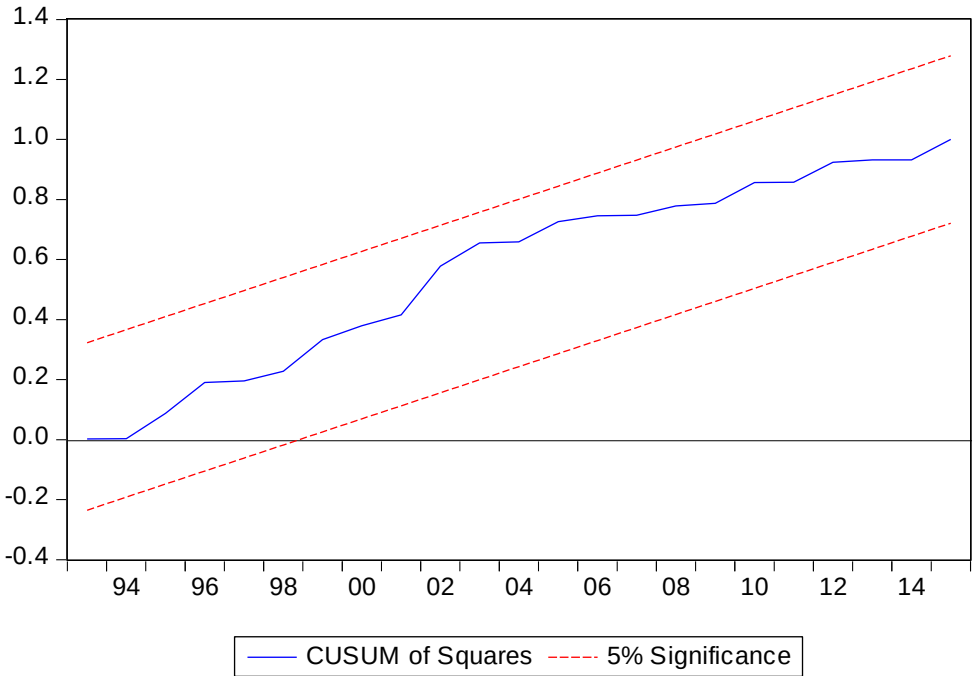


Figure 4: Result of CUSUMSQ test



Evidences from Figure 3 and Figure 4 show the stability condition of the model. When the plot of CUSUM and CUSUMSQ statistics stays within the 5% significance level, the estimated coefficients are said to be stable. The CUSUM test is based on the cumulative sum of recursive residuals on the set of observations and further updated recursively, and is plotted against the break point. Since the plot of CUSUM and CUSUMSQ statistics does not cross either of the red lines in this model, the paper concludes that the regression coefficients are generally stable within the sample period of time.

CONCLUSION AND FUTURE PROSPECT

This paper employed an ARDL model to estimate the relationship between domestic debt and economic growth in Nigeria based on annual time series data covering the period of 1980 to 2015.The debt crisis that erupted in many developing countries including Nigeria, particularly after the oil-boom era in the 1980s, has stimulated basket of challenges including economic and social impediments to the extent that up till now, enormous countries are still encircled with heavy public debt. Hence, the need to evaluate the productivity of public debt borrowing among the developing countries of Sub-Saharan Africa becomes imperatives and essential. The traditional approach to managing the challenge of these debts is to either utilise the apex bank in financing the debt services or borrowing from other government agencies. Unfortunately, this approach has certainly produced enormous macroeconomic instability leading to the issue of

liquidity problems within the financial sector. It is uneconomical for a country like Nigeria to borrow funds meant for debt servicing, given the growing challenges and rapid expansion of the hitherto incurred public debt. Since debt servicing on most domestic borrowings are held until loanable funds from international financial institutions are cleared and paid off, it implies that any loanable funds that are not judiciously utilised toward the path of sustainable growth may grossly undermine the operational activities of domestic financial institutions and limits the international competitive drive. It is against this background that this study examined the productivity effects of domestic debt on economic growth in Nigeria with the view to identifying the existing relationship.

The results concludes that domestic debt has over the years produced a negative effect on economic growth through a reduction in productivity level as shown by the declining growth rates, as well as increased economic and social hardship on the citizenry hence, consistent with the traditional hypothesis. One of the significant aspect to examine when evaluating the productivity of public debt is the economic policies of developing countries with a view to ensuring market-oriented economy. Most of these policies are found to be inefficient in encouraging long-term and sustainable growth, especially in the contemporary business world. Unless policies designed are consistently pursued and take into cognisance the dynamic and complex business environment, the negative effect of public borrowing will continue to surface and retard the economy from attaining sound macroeconomic stability in the long-run.As a matter of recommendations, Nigeria as a country must restructure its national priorities and position the economy towards long-run and sustainable growth. The new economic reform policy recently introduced in April 2017 titled the Nigerian Economic Recovery and Growth Plan (NERGP) should be vigorously and objectively pursued by the present administration and persistently sustained by any future leadership. This will accelerate the pace of economic activities, ensure long-run growth and sustainable development in the future. Likewise, adequate measures on capital flight should be taken and prioritised in order to prevent any future recurrence with the view to regaining more financial resources over time. The funds realised through a prevention of capital flight after appropriate conviction can be utilised to finance the NERGP policy reform, hence, reducing the effects of further borrowing on the economy. In addition, establishing and implementing a suitable as well as effective strategies for debt management is essential for the national interest of Nigeria to circumvent challenges posed by debt in the future. This will involve strict compliance with accountability and legal frameworks which are designed for national capacity building toward debt management. Beyond the issue of appropriate debt management, fiscal policy practitioners and other related policy makers should allot substantial attention to the productive utilisation of any domestically-

borrowed funds, and ensure that resources are allocated to specific growth-oriented programmes and that adequate capacities for loan-repayment are also well established. This will reduce the negative effect posed by debt and further enhance the status of macroeconomic indicators towards attaining the desired level of growth in the country.

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APPENDICES

APPENDIX 1: Raw data used for the estimation

Years	LGDP	LDD
1980	3.451574	2.106570209
1981	9.632859	2.415252846
1982	9.61481	2.708556739
1983	9.536021	3.101055789
1984	9.53092	3.245404799
1985	9.612728	3.330384999
1986	9.631547	3.347750894
1987	9.633248	3.605201606
1988	9.693715	3.850777191
1989	9.758154	3.851202364
1990	9.868152	4.431924518
1991	9.862617	4.755301657
1992	9.884314	5.181568359
1993	9.899881	5.612530848
1994	9.902443	6.010243857
1995	9.920993	6.169053862
1996	9.960714	6.040196614
1997	9.989165	6.21810418
1998	10.01381	6.329418186

1999	10.01902	6.678098815
2000	10.07274	6.800452768
2001	10.13728	6.92458683
2002	10.27359	7.061334967
2003	10.36437	7.192696975
2004	10.46369	7.222803363
2005	10.53143	7.330344004
2006	10.59652	7.469231678
2007	10.66715	7.682315442
2008	10.73667	7.749454852
2009	10.8169	8.079627018
2010	10.90801	8.423282847
2011	10.95973	8.634592725
2012	11.00093	8.785315662
2013	11.05436	8.870519575
2014	11.11473	8.97512677
2015	11.14221	9.086702732

APPENDIX 2: Unit root ADF and PP test

Null Hypothesis: LGDP has a unit root Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.269880	0.4381
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LGDP) Method: Least Squares
Date: 05/01/17 Time: 15:16 Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGDP(-1)	-0.127372	0.056114	-2.269880	0.0306
D(LGDP(-1))	0.001554	0.006715	0.231494	0.8185
C	1.185037	0.517960	2.287892	0.0294
@TREND("1980")	0.008321	0.002889	2.880068	0.0073

R-squared	0.357935	Mean dependent var	0.044393
Adjusted R-squared	0.293728	S.D. dependent var	0.042419
S.E. of regression	0.035649	Akaike info criterion	-3.720058
Sum squared resid	0.038126	Schwarz criterion	-3.540487
Log likelihood	67.24099	Hannan-Quinn criter.	-3.658819
F-statistic	5.574742	Durbin-Watson stat	1.261167
Prob(F-statistic)	0.003667		

Null Hypothesis: D(LGDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-154.0849	0.0000
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LGDP,2)
Method: Least Squares
Date: 05/01/17 Time: 15:16
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LGDP(-1))	-1.004701	0.006520	-154.0849	0.0000
C	0.009750	0.014749	0.661095	0.5134
@TREND("1980")	0.001930	0.000690	2.798356	0.0088

R-squared	0.998805	Mean dependent var	-0.180994
Adjusted R-squared	0.998728	S.D. dependent var	1.064210
S.E. of regression	0.037962	Akaike info criterion	-3.620388
Sum squared resid	0.044673	Schwarz criterion	-3.485709
Log likelihood	64.54659	Hannan-Quinn criter.	-3.574458
F-statistic	12951.83	Durbin-Watson stat	1.349450
Prob(F-statistic)	0.000000		

Null Hypothesis: LGDP has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-24.94394	0.0000
Test critical values:	1% level	-4.243644	
	5% level	-3.544284	
	10% level	-3.204699	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.012926
HAC corrected variance (Bartlett kernel)	0.051439

Phillips-Perron Test Equation
Dependent Variable: D(LGDP)
Method: Least Squares
Date: 05/01/17 Time: 15:17
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGDP(-1)	-1.038588	0.021327	-48.69733	0.0000
C	9.637849	0.187844	51.30763	0.0000
@TREND("1980")	0.052305	0.002576	20.30707	0.0000

R-squared	0.987655	Mean dependent var	0.219732
Adjusted R-squared	0.986883	S.D. dependent var	1.038166
S.E. of regression	0.118901	Akaike info criterion	-1.339239
Sum squared resid	0.452396	Schwarz criterion	-1.205924
Log likelihood	26.43669	Hannan-Quinn criter.	-1.293219
F-statistic	1280.025	Durbin-Watson stat	0.191417
Prob(F-statistic)	0.000000		

Null Hypothesis: D(LGDP) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-135.2864	0.0000
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.001314
HAC corrected variance (Bartlett kernel)	0.001705

Phillips-Perron Test Equation
Dependent Variable: D(LGDP,2)
Method: Least Squares
Date: 05/01/17 Time: 15:17
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LGDP(-1))	-1.004701	0.006520	-154.0849	0.0000
C	0.009750	0.014749	0.661095	0.5134
@TREND("1980")	0.001930	0.000690	2.798356	0.0088

R-squared	0.998805	Mean dependent var	-0.180994
Adjusted R-squared	0.998728	S.D. dependent var	1.064210
S.E. of regression	0.037962	Akaike info criterion	-3.620388

Sum squared resid	0.044673	Schwarz criterion	-3.485709
Log likelihood	64.54659	Hannan-Quinn criter.	-3.574458
F-statistic	12951.83	Durbin-Watson stat	1.349450
Prob(F-statistic)	0.000000		

Null Hypothesis: LDD has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.425586	0.8355
Test critical values:	1% level	-4.243644	
	5% level	-3.544284	
	10% level	-3.204699	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LDD)
Method: Least Squares
Date: 05/01/17 Time: 15:18
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LDD(-1)	-0.114547	0.080351	-1.425586	0.1637
C	0.530841	0.190170	2.791403	0.0088
@TREND("1980")	0.019078	0.016270	1.172591	0.2496

R-squared	0.126912	Mean dependent var	0.199432
Adjusted R-squared	0.072344	S.D. dependent var	0.148151
S.E. of regression	0.142692	Akaike info criterion	-0.974445
Sum squared resid	0.651549	Schwarz criterion	-0.841129
Log likelihood	20.05278	Hannan-Quinn criter.	-0.928424
F-statistic	2.325757	Durbin-Watson stat	1.504546
Prob(F-statistic)	0.114006		

Null Hypothesis: D(LDD) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.518474	0.0052
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LDD,2)
Method: Least Squares
Date: 05/01/17 Time: 15:18
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LDD(-1))	-0.793022	0.175507	-4.518474	0.0001
C	0.207255	0.071592	2.894960	0.0069
@TREND("1980")	-0.002857	0.002636	-1.083651	0.2869

R-squared	0.397105	Mean dependent var	-0.005797
Adjusted R-squared	0.358209	S.D. dependent var	0.182292
S.E. of regression	0.146038	Akaike info criterion	-0.925806
Sum squared resid	0.661138	Schwarz criterion	-0.791127
Log likelihood	18.73870	Hannan-Quinn criter.	-0.879876
F-statistic	10.20931	Durbin-Watson stat	2.032436
Prob(F-statistic)	0.000392		

Null Hypothesis: LDD has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.671665	0.7425
Test critical values:	1% level	-4.243644	
	5% level	-3.544284	
	10% level	-3.204699	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.018616
HAC corrected variance (Bartlett kernel)	0.026484

Phillips-Perron Test Equation
Dependent Variable: D(LDD)
Method: Least Squares
Date: 05/01/17 Time: 15:19
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LDD(-1)	-0.114547	0.080351	-1.425586	0.1637
C	0.530841	0.190170	2.791403	0.0088
@TREND("1980")	0.019078	0.016270	1.172591	0.2496

R-squared	0.126912	Mean dependent var	0.199432
Adjusted R-squared	0.072344	S.D. dependent var	0.148151
S.E. of regression	0.142692	Akaike info criterion	-0.974445

Sum squared resid	0.651549	Schwarz criterion	-0.841129
Log likelihood	20.05278	Hannan-Quinn criter.	-0.928424
F-statistic	2.325757	Durbin-Watson stat	1.504546
Prob(F-statistic)	0.114006		

Null Hypothesis: D(LDD) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.508509	0.0053
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.019445
HAC corrected variance (Bartlett kernel)	0.019114

Phillips-Perron Test Equation
Dependent Variable: D(LDD,2)
Method: Least Squares
Date: 05/01/17 Time: 15:19
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LDD(-1))	-0.793022	0.175507	-4.518474	0.0001
C	0.207255	0.071592	2.894960	0.0069
@TREND("1980")	-0.002857	0.002636	-1.083651	0.2869

R-squared	0.397105	Mean dependent var	-0.005797
Adjusted R-squared	0.358209	S.D. dependent var	0.182292
S.E. of regression	0.146038	Akaike info criterion	-0.925806
Sum squared resid	0.661138	Schwarz criterion	-0.791127
Log likelihood	18.73870	Hannan-Quinn criter.	-0.879876
F-statistic	10.20931	Durbin-Watson stat	2.032436
Prob(F-statistic)	0.000392		

APPENDIX 3: Result of ARDL model
Dependent Variable: LGDP
Method: ARDL
Sample (adjusted): 1984 2015
Included observations: 32 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): LDD
Fixed regressors: C @TREND

Number of models evalulated: 20
Selected Model: ARDL(2, 4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LGDP(-1)	0.713623	0.166013	4.298600	0.0003
LGDP(-2)	-0.184604	0.124654	-1.480928	0.1522
LDD	-0.054976	0.031801	-1.728769	0.0973
LDD(-1)	-0.071435	0.045667	-1.564256	0.1314
LDD(-2)	0.063451	0.045430	1.396690	0.1758
LDD(-3)	-0.003844	0.046049	-0.083470	0.9342
LDD(-4)	-0.119108	0.038029	-3.132062	0.0047
C	4.734663	0.911417	5.194840	0.0000
@TREND	0.062358	0.011951	5.217729	0.0000

R-squared	0.998447	Mean dependent var	10.25068
Adjusted R-squared	0.997907	S.D. dependent var	0.508185
S.E. of regression	0.023250	Akaike info criterion	-4.452734
Sum squared resid	0.012433	Schwarz criterion	-4.040496
Log likelihood	80.24374	Hannan-Quinn criter.	-4.316089
F-statistic	1848.335	Durbin-Watson stat	2.149984
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

ARDL Cointegrating And Long Run Form
Dependent Variable: LGDP
Selected Model: ARDL(2, 4)
Date: 05/01/17 Time: 16:40
Sample: 1980 2015
Included observations: 32

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LGDP(-1))	0.184604	0.124654	1.480928	0.1522
D(LDD)	-0.054976	0.031801	-1.728769	0.0973
D(LDD(-1))	-0.063451	0.045430	-1.396690	0.1758
D(LDD(-2))	0.003844	0.046049	0.083470	0.9342
D(LDD(-3))	0.119108	0.038029	3.132062	0.0047
D(@TREND())	0.062358	0.011951	5.217729	0.0000
CointEq(-1)	-0.470981	0.091976	-5.120666	0.0000

Cointeq = LGDP - (-0.3947*LDD + 10.0528 + 0.1324*@TREND)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LDD	-0.394733	0.035923	-10.988396	0.0000
C	10.052778	0.089159	112.751206	0.0000
@TREND	0.132400	0.007311	18.110931	0.0000

ARDL Bounds Test
Date: 05/01/17
Time: 16:40
Sample: 1984 2015
Included observations: 32
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	13.55825	1

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	5.59	6.26
5%	6.56	7.3
2.5%	7.46	8.27
1%	8.74	9.63

Test Equation:
Dependent Variable: D(LGDP)
Method: Least Squares
Date: 05/01/17 Time: 16:40
Sample: 1984 2015
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LGDP(-1))	0.184604	0.124654	1.480928	0.1522
D(LDD)	-0.054976	0.031801	-1.728769	0.0973
D(LDD(-1))	0.059500	0.038295	1.553739	0.1339
D(LDD(-2))	0.122952	0.036796	3.341451	0.0028
D(LDD(-3))	0.119108	0.038029	3.132062	0.0047
C	4.734663	0.911417	5.194840	0.0000
@TREND	0.062358	0.011951	5.217729	0.0000
LDD(-1)	-0.185911	0.037164	-5.002472	0.0000
LGDP(-1)	-0.470981	0.091976	-5.120666	0.0000

R-squared	0.683067	Mean dependent var	0.050193
Adjusted R-squared	0.572830	S.D. dependent var	0.035574
S.E. of regression	0.023250	Akaike info criterion	-4.452734
Sum squared resid	0.012433	Schwarz criterion	-4.040496
Log likelihood	80.24374	Hannan-Quinn criter.	-4.316089
F-statistic	6.196325	Durbin-Watson stat	2.149984
Prob(F-statistic)	0.000265		

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
F-statistic	11.23450	(2, 23)	0.0004
Chi-square	22.46901	2	0.0000

Null Hypothesis: C(1)=C(4)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1)	0.713623	0.166013
C(4)	-0.071435	0.045667

Restrictions are linear in coefficients.