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PUBLIC DEBT AND ECONOMIC GROWTH IN NIGERIA: A CONSIDERATION OF NEW EVIDENCE

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The discussion surrounding the connection between public borrowing and economic expansion has persistently endured without abating. While debt desirability proponents argue that public debt is growth-enhancing, others argue that public debt does more harm than good to the economy. In recent times, the increase in public debt in Nigeria continues to raise concerns regarding its desirability. Although several studies have been carried out in this regard, there is hardly any study that examines the public debt-growth nexus in the context of the tradable and non-tradable sectors. Second, there is hardly any study that disaggregates bank-sourced debt from non-bank-sourced debt. Thus, the study aimed to achieve two-pronged research objectives: To appraise the implications of public debt on the economic growth in the tradable sector of the Nigerian economy and to analyze the effect of public debt on the economic growth in Nigeria's non-tradable sector. This study spans from 1981 to 2020. Using the Generalized Linear Model (GLM), the following conclusions are made. Initially, different elements of public debt have varying impacts on the growth of the tradeable sector. External debt and debt obtained from non-bank sources positively drive the growth of the tradable sector. However, debt acquired from banks and the associated servicing costs hurt the growth of the tradeable sector. Furthermore, the different components of public debt have varying impacts on the growth of the non-tradable sector. Specifically, foreign debt and debt obtained from non-bank sources have a significant positive influence on the growth of the non-tradable sector. The influence of debt acquired from banks on the non-tradable sector is positive but insignificant. However, similar to the tradable sector, the servicing of debt undermines the growth of the non-tradable sector. Policy insights were provided in line with the study's findings.

Keywords: **Nigeria, economic growth, public debt, external debt, domestic debt**

JEL Classification: **F43, H63, H74, O11**

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1. Introduction

Economic growth plays a pivotal role in diminishing poverty and improving the overall well-being of emerging economies (Egbetunde, 2012; Wang et al., 2020). Hence, a major macroeconomic objective of any economy is upholding significant and sustainable growth across the various sectors with the desire for growth being more important for developing economies relative to developed economies. Sadly, Nigeria's growth rate has been relatively unimpressive with records showing that Nigeria has failed to attain the average growth of sub-Saharan Africa and global averages (World Bank, 2020). Regrettably, in the wake of COVID-19, it has been projected that Nigeria will experience economic crises which will negatively affect economic growth (Azolibe et al., 2022; Dimnwobi et al., 2022a; Dimnwobi et al., 2022b). However, the disturbing issue is that low economic growth is harmful to developing economies like Nigeria as it is linked to unemployment, rising crimes, and poverty among others (Ekesiobi & Dimnwobi, 2020; Nwokoye et al., 2020; Nwokoye et al., 2022).

Decision-makers and scholars share a keen interest in identifying the factors that contribute to economic growth. Among these factors, public debt has been recognized in prior studies as a potent driver of economic advancement, thus making it a topic of significant interest (Okon & Onoja, 2017; Onafowora & Owoye, 2017). Economic theory suggests that a developing nation's reasonable borrowing levels are expected to improve its economic growth (Onuoha et al., 2023a; Onuoha et al., 2023b). Early-stage countries have smaller capital stocks and are more likely to offer higher-yielding investment possibilities than advanced nations. Provided that the borrowed funds are utilized for productive investments and there are no major macroeconomic setbacks, policies that modify economic incentives should lead to improvements in development and timely debt repayments (Dimnwobi et al., 2023). The primary argument that stands out is rooted in the theory of debt overhang, which suggests that when a nation's debt surpasses its ability to repay later, anticipated costs associated with servicing the debt restrain both local and international investments, thereby impeding economic expansion (Okere et al., 2023). Some considerations argue that, at sustainable debt levels, additional borrowing would be expected to boost growth. Others contend that large debt holdings can stifle economic progress (Okon & Onoja, 2017; Onafowora & Owoye, 2017; Saungweme & Odhiambo, 2020).

Nigeria, one of the biggest African economies has been amassing public debt over the years. From the 1980s onwards, there was a consistent build-up of public debt that persisted without interruption until 2005. However, in that year, the Paris Club granted the country a debt amnesty amounting to $18 billion. In light of this, between 2004 and 2006, there was a significant decline in the country's overall debt and foreign debt, with reductions of 59.0% and 90.8% respectively. This debt reduction, on the other hand, saved the country $2.3 billion in annual debt payment costs. According to the nation's Debt Management Office, Nigeria has experienced a substantial rise in its total debt, despite the implementation of debt

forgiveness and restructuring programs in the nation over time. The country's overall public borrowing, for example, rose from $64.5 million in 2013 to $67.7 million in 2014 and $70.9 million in 2017. The country's total debt was $79.4 million at the end of 2018, with domestic debt contributing to 68.18% of the overall debt stock and external debt accounting for 31.82% (DMO, 2018). Similarly, as of March 31, 2021, total public debt increased to N33.107 trillion or USD87.239 billion with domestic debt representing 62.33% of the overall debt stock while external debt accounted for 37.67% (DMO, 2021). The primary concern revolves around the potential differential impact of public debt across different sectors. Currently, there is a widely accepted consensus that dividing the economy into tradable and non-tradable sectors holds more significance compared to the earlier categorization by Fisher (1935). The tradeable and non-tradeable economic sectors frequently display distinct behaviors. Therefore, to comprehensively grasp the criticality of public borrowing on economic growth, it becomes necessary to adopt a differentiated approach that explores the effects separately on the tradeable and non-tradeable sectors.

Considering the aforementioned points, this study is guided by these research inquiries: (1) What is the influence of public debt on economic growth in the tradable sector of the Nigerian economy? (2) Does public debt have a significant impact on economic growth in the non-tradable sector of the Nigerian economy? This research endeavors to address these questions by presenting unique differentiators from prior research. First, studies examining the connection between public borrowing and economic growth have operated under the assumption that the tradeable and non-tradeable sectors are comparable and would exhibit similar responses to changes in public debt. However, as argued by Eliasson and Hansson (2016), the view of one homogenous economy might have been reinforced by Fisher (1935) classification of the economy into primary, secondary, and tertiary sectors. This classification blurs the line between industrial activities and services and non-market activities such as those offered by the government. Due to potential variations in the response of the tradeable and non-tradeable sectors to changes in economic factors, these sectors may differ in how public borrowing affects economic growth. Therefore, it is essential to investigate how public debt affects economic expansion in both the tradeable and non-tradeable sectors. This study aims to be the first of its kind (to our knowledge) to investigate this issue in the existing literature.

Secondly, most studies on debt in Nigeria have majorly focused on external debt and economic expansion thereby ignoring domestic debt which is a significant portion of Nigeria's total indebtedness (DMO, 2021). To tackle this issue, the study pursued a breakdown of national debt into external and internal obligations with a specific focus on examining their impacts on both the tradeable and non-tradeable sectors of the Nigerian economy. Third, we equally disaggregated domestic debt into bank-sourced debt and non-bank-sourced debt. This decomposition is essential since government debt is obtained from these two sources. Aggregating domestic debt does not aptly explain the fiscal environment. The key argument should be on which component of domestic debt that is desirable or otherwise. It is worth

noting that studies disaggregating domestic debt into these sources are rare in extant literature. Fourth, the survey of the literature revealed that previous studies on the subject matter particularly those in Nigeria have utilized the Ordinary Least Square (OLS) technique. However, for this study, we employed the Generalized Linear Model (GLM) because, unlike the OLS, it accommodates response variables with error distribution models other than the normal distribution. Finally, this study introduces fresh evidence of the connection between governmental debt and economic growth in both the tradeable and non-tradeable sectors within the Nigerian context. The outcomes of this study will aid Nigerian policymakers in striking a balance and addressing the often-conflicting objectives of achieving sustainable economic growth while managing public debt levels effectively.

The remaining portions of this paper are arranged as follows: Section two provides an analysis of relevant studies in the field. Section three outlines the procedures and data employed in this study, while section four displays the results. Section five summarizes the findings of the study and offers policy options.

2. Literature review

According to Rahman et al. (2019), economic growth is viewed as the sustained rise in a nation's actual national income over time. As emphasized by Agboola et al. (2020), economic growth serves as the cornerstone for economic progress in every country and is often gauged by the rate at which a country's national GDP is growing. It is anticipated that rising national income will bring about more advantages for the populace. Although there is no one best approach to sectoral classification, Dwyer (1992) contends that the classification of economic sectors into secondary, primary, and tertiary sectors by Fisher (1935) diminishes the distinction between industrial activities and service activities. Hence, Dwyer (1992) proposed that categorizing economic sectors into tradeable and non-tradeable sectors is more suitable, as it delineates the activities that can be exported and those that cannot be exported within an economy. Dwyer (1992) defined the tradable sector as the sector containing all those production activities in which industries are exposed to international competition (including manufacturing, agriculture, extractive sector, etc.) and the non-tradable sector as the sector comprising all other sectors that are not exposed to international competition (including construction, public administration, and health services). Eliasson and Hansson (2016) further characterized the tradeable sector as encompassing industries that produce products and services that can be produced in one nation and used in another. On the other hand, they defined the non-tradable sector as economic sectors that produce to satisfy exclusively domestic demand.

When a government borrows funds to cover budget deficits or to stimulate economic growth, it is known as public debt or government debt (Okoro, 2013). The collective amount of all

government borrowings, which includes borrowings by state, local, and federal governments, is referred to as public debt or national debt (Idenyi et al. 2016). It is generally referred to as the sum of all borrowed funds by the nation's government bodies which encompassed funds owned by public entities, public or private institutions, foreign governments, and private organizations among others (Ajayi & Edewusi, 2020). Internal or external debts are the two major types of public debt. To put it another way, the government may incur debts by borrowing from local or international markets to fund a nation's domestic investment.

Researchers have continually shown a great deal of interest in the connection between governmental debt and economic growth. Howbeit, their outcomes have not been conclusive and these studies are presented in this section categorized into foreign literature, cross-country studies, and studies conducted in Nigeria prioritizing only recent studies. For instance, Pegkas (2018) conducted a study in Greece and revealed that debt impedes growth. In a separate study, Al Kharusi and Mbah (2018) examined the impact of external debt on Oman's economic expansion using the ARDL method, ultimately revealing that growth is undermined by public borrowing. Chkiriba and Oumansour (2019) conducted a study in Morocco using the ARDL method to uncover the influence of Morocco's foreign borrowing on its economic expansion and established a negative connection between both variables. Similarly, Al-Dughme (2019) highlighted via the investigation in Jordan that debt considerably hinders growth. In South Africa, Mhlaba and Phiri (2019) concluded that growth is being hampered by public borrowing. Relatedly, Barik and Sahu (2020) reported that debt undermines India's economic growth. Saungweme and Odhiambo (2020) appraised the influence of national borrowing on Zimbabwe's economic expansion and revealed that public debt, both disaggregated and aggregated, as well as foreign and internal debt weakens Zimbabwe's economic growth. In Bangladesh, Dey and Tareque (2020) achieved a similar result.

This strand of studies documents cross-country evidence. For instance, in their research, Lartey et al. (2018) utilized data from African economies to appraise how debt influences growth. Data collected from 50 African countries showed that public debt had a detrimental effect on growth. Similarly, Ndieupa (2018) conducted a study focusing on selected African economies to explore the connection between national borrowing and growth and reported that debt undermines growth. A study conducted by Shittu, Hassan, and Nawaz (2018) for five Sub-Saharan African (SSA) countries indicated a negative correlation between foreign debt and economic expansion. Similar findings were found in Senadza, Fiagbe, and Quartey's (2018) study, which showed that debt harms economic expansion in 39 SSA nations.

In a study conducted by Arsić, Mladenović, and Nojković (2019), they analyzed a sample of 10 emerging European economies and revealed that public debt hinders economic growth. Similarly, Edo, Osadolor, and Dading (2019) assessed the connection between foreign debt and economic expansion in eight SSA nations and concluded that external debt stimulates economic expansion in the short term but hinders growth in the long term. In a study

conducted by Swamy (2019), using data from 76 countries showed that debt and growth were inversely connected. Additionally, Onafowora and Owoye (2019) examined a group of five Caribbean countries and highlighted that reduced economic expansion is linked to increasing governmental debt levels. In a sample of 46 SSA nations, Sani, Said, Ismail, and Mazlan (2019) demonstrated that economic growth is negatively influenced by public debt particularly when weak institutional quality is prevalent. A study conducted by Guei (2019) in 13 emerging economies highlighted that in the long run, there is no considerable impact of foreign debt on economic growth. However, both variables have a negative and substantial connection over the short term. Similarly, Gunarsa, Makin, and Rohde (2019) examined a group of 25 Asian nations and discovered that public debt hampers economic growth.

This paragraph focuses on Nigerian studies. For instance, using ARDL and data from 1981 to 2014, Onakoya and Ogunade (2017) discovered that Nigeria's economic expansion is not driven by foreign debt. Ugwu (2017) utilized the Ordinary Least Squares (OLS) to examine the correlation between domestic debt and economic growth in Nigeria and revealed that internal debt promotes growth. Similarly, Ndubuisi (2017) conducted a study using OLS and reported that economic growth is positively driven by foreign debt. In their study, Elom-Obed, Odo, Elom, and Anoke (2017) found that both Nigeria's economic growth is significantly hampered by public borrowing. Conversely, Onafowora and Owoye (2017) discovered that shocks to foreign debt undermines Nigerian economic growth. Isibor, Babajide, Akinjare, Oladeji, and Osuma (2018) reported that foreign debt hampers growth, whereas domestic debt stimulates growth. Odubuasi, Uzoka, and Anichebe (2018), on the other hand, found that external debt boosts Nigeria's economic growth. In a study conducted by Ezema, Nwekwo, and Agbaji (2018) using OLS, they discovered that while foreign debt promotes growth servicing foreign debt impedes Nigeria's economic growth.

In their research, Alagba and Eferakeya (2019) uncovered the effect of public debt on Nigeria's economic expansion and obtained that internal debt promotes growth while external debt hinders it. Similarly, Omodero and Alpheaus (2019) employed the OLS to evaluate the impact of Nigeria's foreign debt on the country's economic expansion. The researchers confirmed that foreign debt impedes Nigeria's economic growth. In their research, Ibrahim and Shazida (2019) uncover the effects of internal debt on the Nigerian economy. The study revealed that internal debt positively influenced economic growth in Nigeria. Conversely, Festus and Saibu (2019) discovered that Nigeria's economic expansion is hampered by foreign debt. Shobande and Adedokun (2019) reported that Nigeria's external debt is acting as a hindrance to economic advancement. Conversely, Didia and Ayokunle (2020) highlighted that internal debt promotes growth while foreign debt stifles it. Additionally, Ajayi and Edewusi (2020) found that external debt hampers economic growth whereas domestic debt encourages it.

3. Methodology

3.1. Theoretical Framework

The neoclassical growth model, first put forth by Swan and Solow in 1956 and utilized by Ahlborn and Schweickert (2015) in the context of the public debt framework, is adopted as the theoretical framework. The neoclassical framework is preferred to other growth models due to its ability to provide an overall production function that primarily explains the role of capital (both public and private) and labour supply (determined by population growth, which is an exogenous factor to the model). The neoclassical growth model is particularly suitable due to its assumption of inelastic labour supply and constant return to scale, making it a convenient framework for the application of Newton's first law of debt.

Building upon the works of Barro and Sala-i-Martin (1995) and Arčabić, Tica, Lee, and Sonora (2018), the neoclassical aggregate production function will be formulated subsequently:

$$Y_t = \Omega K_t^{\alpha} L_t^{1-\alpha} \tag{1}$$

Where:

Y symbolizes the output or GDP, Ω denotes the total factor productivity, K represents physical capital, L signifies labor, and α represents the output elasticity of capital.

Now, suppose that long-term overall factor productivity (A) is impacted by public debt. We can represent this relationship as follows:

$$\Omega = \Omega_0 + (1-\phi)D_t \tag{2}$$

Where:

Ω_0 is the initial level of total factor productivity, is the parameter representing the influence of government borrowing on overall factor productivity, and D signifies the national debt as a portion of GDP.

Substituting 2 into 1 yields:

$$Y_t = [\Omega_0 + (1-\phi)rD]K_t^{\alpha} L_t^{1-\alpha} \tag{3}$$

Simplifying Equation 3 yields:

$$g_t = \left(\frac{\Omega_0}{1-\phi}\right)rD + \frac{\alpha}{1-\phi}k_t + \frac{\alpha}{1-\phi}k_t \tag{4}$$

If the Ricardian equivalence, which suggests that changes in public debt do not affect the real sector, does not hold, Equation 4 demonstrates that variations in the public debt ratio (the growth rate of the country's output, Y, would be affected by the public borrowing (D) and debt interest obligations (r) in a non-zero way). While Barro and Sala-i-Martin (1995) argue from an immediate equilibrium perspective that national borrowing would promote aggregate output due to demand-driven effects in the short term, Equation 4 indicates that increasing public debt could eventually lead to a diminishing impact on long-term economic expansion.

3.2. Model Specification

3.2.1. Impact of public debt on economic growth in the tradable sector of the Nigerian economy

Notice that Equation 4 explicitly shows the presence of a functional connection between economic expansion and government debt. This relationship has been largely studied, both in Nigeria (Okon & Onoja, 2017; Onafowora & Owoye, 2017; Isibor et al., 2018) and elsewhere (Pegkas, 2018; Saungweme & Odhiambo, 2020). However, most of these studies emphasized on aggregate economic effect. Dwyer (1992) and Eliasson and Hansson (2016) emphasized that the tradable and non-tradable sectors of the economy, more often than not, exhibit asymmetric behaviours. This suggests that gaining a more comprehensive understanding of the implications of government debt on economic growth may necessitate a differentiated approach that distinguishes between the effects on the tradable and non-tradable sectors. The tradable sector is characteristically defined as the internationally competitive sectors of the economy which includes all sectors containing all those production activities in which industries are exposed to international competition (such as manufacturing, agriculture, extractive sector, etc.). In this regard, we rewrite Equation 4 as follows:

$$Y_t = [\Omega_0 + (1-\phi)rD]K_t^{\alpha} L_t^{1-\alpha} \tag{5}$$

Suppose we set $Y^{notrad} = 0$, $\frac{(1-\tau)}{\Phi+\tau+\Psi} = \beta_1$ and $rD = D$ (this equation assumes that the interest obligation can be considered insignificant or negligible)

Equation 6 will therefore be:

$$Y^{trad} = \beta_0 + \beta_1 D \tag{6}$$

Once again, Ahlborn and Schweickert (2015) and Arčabić et al. (2018) have observed that public debt can arise from both external debt corridors (EXD) and domestic sources such as banks (BD) and non-bank entities (NBD). In light of Arčabić et al. (2018) suggest that economic growth may be affected differently by foreign and non-external debt sources. Hence, equation 6 is modified as presented below:

$$Y^{trad} = \beta_1 EXD + \beta_{12} BD + \beta_3 NBD \tag{7}$$

Introducing time horizon and dividing both sides by Y_{t-1}^{trad} yields:

$$Y_t^{trad} \cdot \frac{1}{Y_{t-1}^{trad}} = \frac{1}{Y_{t-1}^{trad}} (\beta_1 EXD_t + \beta_{12} BD_t + \beta_3 NBD_t) \tag{8}$$

$$tradg_t = \beta_1 exd_t + \beta_{12} bd_t + \beta_3 nbd_t \tag{9}$$

Where,

$Y_t^{trad} \cdot \frac{1}{Y_{t-1}^{trad}} = tradg$ = tradable sector growth

$\frac{EXD_t}{Y_{t-1}^{trad}} = exd_t$ = ratio of external debt to tradable sector output

$\frac{BD_t}{Y_{t-1}^{trad}} = bd_t$ = ratio of bank-sourced debt to tradable sector output

$\frac{NBD_t}{Y_{t-1}^{trad}} = nbd_t$ = ratio of non-bank-sourced debt to tradable sector output

In other to link Equation 9 to the economy-wide macroeconomic dynamics, we introduce other macroeconomic variables that influence economic growth in the tradable sector. Following Okon and Onoja, 2017; Onafowora and Owoye (2017); Isibor et al. (2018); Pegkas (2018), and Saungweme & Odhiambo (2020) we introduce Gross capital formation (GCF), oil revenue(OILR), debt servicing (DES) and inflation (INFR) into the model. Using the Generalised Linear Model (GLM), Equation 9 is re-specified as follows:

$$Y^{trad} = \beta_1 EXD + \beta_{12} BD + \beta_3 NBD \tag{10}$$

Where all variables are as earlier defined, β_0=intercept parameter, $\beta_1, \beta_2 ... \beta_7$ are slope parameters and ε_1 = stochastic error term for model 1.

3.2.2. Effect of public debt on economic growth in the non-tradable sector of the Nigerian economy

The reasoning concerning the non-tradable sector is interconnected with that of the tradable sector. If we assume that the characteristics of the tradable sector mirror those of the non-tradable sector, we can make the following adjustments to Equation 10. First, we substitute tradg with nontradg (nontradg refers to the growth rate of the non-tradable sector). However, Gukat and Ogboru (2017) and Onifade et al. (2020) noted that government spending (goex) is a critical variable in the non-tradable sector. Thus, using GLM, we have:

$$nontradg_t = \beta'_0 + \beta'_1 exd_t + \beta'_{12} bd_t + \beta'_3 nbd_t + \beta'_4 gcf_t + \beta'_5 goex_t + \beta'_6 oilr_t + \beta'_7 des_t + \varepsilon_{2t} \quad (11)$$

Where β'_0=intercept parameter, $\beta'_1, \beta'_2, ..., \beta'_7$ are slope parameters and ε_2 = stochastic error term for model 2.

3.3. Data

Tradable sector growth (TRADG) is the dependent variable of Model 1. TRADG was computed as the annualized growth of the real GDP of the tradable sector. Non-tradable sector growth (NOTRAG) is the dependent variable of model 2. NONTRADG was computed as the annualized growth of the real GDP of the non-tradable sector. External debt (Exd) is derived from multilateral and bilateral sources. Domestic debt which usually emanates from the domestic economy can be sourced from bank-sourced debts (BD) and non-bank-sourced debt (NBD). The stock of loans borrowed from these sources is expected to boost economic activities in both the tradable and non-tradable sectors. The study introduced several control variables such as oil revenue, debt servicing, government expenditure, inflation, and capital to make the models robust. The data used in this study were gathered from the Central Bank of Nigeria (CBN) and World Development Indicator (WDI) and cover the period from 1981 to 2020.

3.3. Estimation Technique

McCullagh and Nelder (1989) popularized the Generalized Linear Model (GLM) which is a larger class of models. The generalized linear model (GLM) is an adaptable statistical framework that expands upon the traditional linear regression model to accommodate a wider range of response variables. Its popularity stems from its flexibility in handling different types of data distributions and relationships with the response variable. The GLM is useful in situations where the assumptions of normality, linearity, and homoscedasticity, which underlie ordinary least squares regression, may not be met. It allows for the analysis of response variables that have non-normal distributions, such as skewed continuous variables, as well as binary, ordinal, and count variables. In sum, the GLM provides a strong and adaptable framework for modelling a variety of response variables. The method was utilized in this study due to its adaptability, flexibility, and simplicity of interpretation. However, before conducting the GLM estimation, the time-series characteristics of the data were examined.

4. Results

4.1. Time Series Properties of the Research Variables

In this subsection, we assess the stochastic properties of the time series by conducting unit root tests and cointegration tests. The stationarity or unit root test was performed using both the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) techniques.

Table 1. Summary of Results of Unit Root Test

Variable	ADF Test		Philip-Perron Test	
	ADF statistics	Order of Integration	PP statistics	Order of Integration
Oil Revenue (OILR)	-5.463***	I(0)	-9.619***	I(0)
Inflation (INF)	-4.929***	I(1)	-4.929***	I(1)
Tradable sector growth (TRADG)	-7.428***	I(1)	-7.403***	I(1)
Non-tradable sector growth (NONTRADG)	-6.837***	I(0)	-3.425**	I(0)
Government expenditure (GOEX)	-4.278***	I(1)	-16.479***	I(1)
Debt Servicing (DES)	-4.599***	I(1)	-5.139***	I(1)
External debt (EXD)	-4.548***	I(1)	-4.380***	I(1)
Bank-sourced debts (BD)	-8.027***	I(1)	-8.109***	I(1)
Non-bank-sourced debts (NBD)	-26.355***	I(1)	-25.872***	I(1)
Gross Fixed Capital Formation (GCF)	- 8.578***	I(1)	-4.554***	I(1)

Source: Researchers' estimations

****, **, * indicate significant at 1%, 5% and 10% significance level*

The use of two methods of stationarity test is aimed at obtaining sufficient assurance that the result is reliable. Fundamentally, the test of unit root is carried out to ascertain the order of integration of time series. Put differently, it assesses whether or not a unit root exists in the time series. If a time series has a unit root, it is considered non-stationary. Conversely, a time series is considered stationary when there is no evidence of systematic mean or variance changes and there are no strictly periodic patterns. In other words, the mean and auto covariance of a stationary process is time-invariant. As shown in Table 1, both ADF and PP procedures yield similar outcomes. The results obtained indicate that Oil revenue (OILR)and Non-tradable sector growth (NONTRADG) are integrated of order zero (that is, I[0]). This implies that OILR and NONTRADG are stationary at levels. Other variables; including inflation (INF), tradable sector growth (TRADG), government expenditure (GOEX), debt servicing (DES), external debt (EXD), bank-sourced debts (BD), non-bank-sourced debts (NBD), and gross fixed capital formation (GCF); are integrated of order one (that is, I[1]).

Table 2. Summary of Results of the Cointegration Test

Test Statistic	Value	K
F-statistic	8.056522	11
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	4.04	4.78
5%	4.94	5.73
1%	6.84	7.84

Source: Researchers' estimations

In the same vein, the cointegration result is summarized on Table 2. Given that the time series are integrated of different orders, the bound test was employed. According to Davidson and MacKinnon (2005), the bound test is usually preferred when time series are integrated of different orders. In the bound test, the null hypothesis states that the time series are not cointegrated. If the F-statistic exceeds the upper bound statistics, the null hypothesis is rejected. All tests of the hypothesis are evaluated at a 5% significance level.

From the result shown on Table 2, the F-statistics (8.0565) exceeds the upper bound statistics (5.73), indicating that the time series are cointegrated. In simpler terms, this means that there is a long-term relationship among the variables being studied. Additionally, it suggests that conducting a regression analysis on these variables would not produce misleading or false results.

Davidson and MacKinnon (2005) also noted that if stochastic processes are cointegrated, then, an error correction model can be estimated to ascertain the adjustment mechanism of the model variables. In other words, since long-run equilibrium exists, there must be a mechanism for correcting short-run disequilibrium before attaining the long-run equilibrium.

In Table 3, the error correction term (that is, ECM(-1)) is negative and significant for both TRADG and NOTRADG. This suggests that short-run disequilibrium is corrected before converging to the steady-state equilibrium in both equations. The ECM term -0.102 and -0.448 for TRADG and NOTRADG respectively indicates that 10.2% and 44.8% of the deviations in TRADG and NOTRADG are corrected in the current period. This indicates that the rate at which adjustment occurs is slow for the TRAD and moderate for the NOTRADG.

Table 3. Summary of Error Correction Results

	TRADG		NOTRADG	
	Coefficient	Std. Error	Coefficient	Std. Error
D(TRADG(-1))	0.130	0.128		
D(OILR(-1))	-0.488***	0.191	-0.390***	0.078
D(EXD(-1))	-0.804	0.549	0.074**	-0.034
D(BD(-1))	-0.672	0.548	-0.137***	0.024
D(NBD(-1))	0.000**	0.000	0.090***	0.017
D(GCF(-1))	-1.405***	0.391	-0.103***	0.029

	TRADG		NOTRADG	
	Coefficient	**Std. Error**	**Coefficient**	**Std. Error**
D(GOEX(-1))			-0.109***	-0.034
D(DES(-1))	-0.038	0.133	-0.019	-2.648
D(EXD(-2))	0.642***	0.138	0.008	0.065
D(GOEX (-2))			0.130***	0.005
ECM(-1)	-0.102***	0.024	-0.488***	0.043

Source: Researchers' estimations

****, **, * indicate significant at 1%, 5% and 10% significance level*

4.3. Evaluation of the Research Objectives

To evaluate the research questions, the models specified in Equations 14 and 15 are estimated using the generalized linear model as proposed. In all estimations, a quadratic hill climbing optimization algorithm was employed. A generalized linear model utilizes a maximum likelihood estimation protocol and an iteration procedure is used to achieve optimal convergence.

4.3.1. Effect of Public Debt on Tradable Output Growth

To ascertain the influence of public debt on the tradable sector, the model specified in Equation 14 was estimated and the results are summarized on Table 4.

Table 4. Summary of Results for Tradable Sector Equation

Variable	Coefficient	Std. Error	z-Statistic	Prob.
EXD	0.086400	0.008005	10.79325	0.0000
BD	-0.325370	0.064972	-5.007823	0.0000
NBD	0.061965	0.028085	2.206320	0.0311
GCF	0.014232	0.002037	6.986750	0.0000
OILR	0.075000	0.014208	5.278650	0.0000
INF	-0.154503	0.024222	-6.378650	0.0000
DES	-0.110897	0.0120786	-9.181279	0.0000
C	0.011579	0.054432	0.212725	0.8333

Source: Researchers' estimations

The results suggest that an increase in external debt by one unit will lead to a 0.086 unit increase in tradable sector growth. Put differently, if external debt is doubled, tradable sector growth will increase by 8.6%. The tradable sector comprises industries that manufacture goods or provide services for export or to compete with imports. An elevated level of growth in the tradable sector signifies heightened economic activity in sectors that possess the capability to generate foreign exchange earnings and contribute to overall economic growth. The finding implies that external debt can act as a catalyst for financing projects and investments in the tradable sector, resulting in its expansion and potentially fostering positive effects on economic growth. Additionally, the study suggests that increasing the size of the tradable sector through borrowing money from foreign sources can help increase the nation's

capacity for production and foster economic growth. Lastly, the indication of a positive association between external debt and the growth of the tradable sector emphasizes the importance of carefully managing debt by maximizing its potential advantages while mitigating the risks associated with accumulating debt. This involves aligning borrowing strategies with the country's capacity to generate foreign exchange earnings and ensuring that investments funded by external debt yield positive returns.

Similarly, the results obtained show that the coefficient of non-bank debt is 0.062 suggesting that raising nonbank debt by one unit will lead to an increase in tradable sector growth by 0.062 units. Contrary to expectations, the result shows that tradable sector growth is a negative function of bank debt. To be precise, tradable sector growth declines by 0.325 units following a unit increase in bank debt. This outcome may not be unconnected with the crowding out hypothesis. Similarly, with a coefficient of -0.110897, debt servicing appears to exert a negative effect on tradable sector growth. The coefficient indicates that increasing debt servicing by one unit will engender a 0.11 unit decline in tradable sector growth. Another interesting finding is that tradable sector growth is a negative function of inflation. Particularly, the coefficient inflation shows that increasing inflation by one unit will reduce tradable sector growth by 0.1545 units. In the same vein, the coefficients of capital accumulation and oil revenue are 0.0142 and 0.075 respectively.

4.3.2. Impact of Public Debt on Non-Tradable Sector Growth

The outcome on Table 5 shows that non-tradable sector growth is a positive function of external debt, bank debt, and nonbank debt with the following respective coefficients: 0.0654, 0.0612, and 0.0402. This suggests that increasing external debt, bank debt, and non-bank debt by one unit will lead to an increase in the non-tradable sector growth by 0.065 units, 0.061 units, and 0.040 units respectively. Note that the response of tradable sector growth and non-tradable sector growth to non-bank debt are asymmetric. In the same vein, capital accumulation (0.0364), and government expenditure (9.2449) exert a positive effect on non-tradable sector growth. However, debt servicing with a coefficient of -0.122391 appears to exert a negative effect on non-tradable sector growth.

Table 5. Summary of Results for Non-Tradable Sector Equation

Variable	Coefficient	Std. Error	z-Statistic	Prob.
EXD	0.065398	0.032403	2.018270	0.0481
BD	0.061217	0.034597	1.769403	0.0873
NBD	0.040243	0.005913	6.805852	0.0000
GCF	0.036401	0.007573	4.806750	0.0001
GOEX	0.244884	0.044604	5.490230	0.0000
OILR	0.272063	0.111247	2.445572	0.0175
DES	-0.122391	0.021825	-5.60785	0.0000
C	0.897677	0.534760	1.678655	0.1320

Source: Researchers' estimations

4.4. Discussion of Findings

This study analyzes the influence of public debt on both the tradable and non-tradable sectors of the economy. The results presented and analyzed in the foregoing subsection are very revealing. First, results suggest that external debt and nonbank-sourced domestic debt exert a significant positive effect on economic growth in both the tradable and non-tradable sectors. This finding corroborates Al-Zeaud (2014) and Ibrahim and Shazida (2019). According to the Keynesian school of macroeconomics, public debt is believed to stimulate economic expansion by raising total demand.

Ajayi and Edewusi (2020) argued that when economies finance their deficit budget through borrowing, such fiscal lever could engender the growth of national income which was linked to the increase in employment and production as a consequence of the increase in the level of government effective demand supported by public debt. Elmendorf and Mankiw (1999) also show that economic growth can be promoted by public debt through its effect on social programs. To put it another way, if public debts are used to fund educational programs and social welfare, they can boost growth by lowering social conflict and developing technological and human capital for future economic activities. This will ensure that the future benefit of public debt outweighs the future costs.

Regarding nonbank financed domestic debt, when the government finances deficit by selling bonds to the public, the purchase of such bonds by the public increases their investment portfolio. From the standpoint of private investment, this could lead to an increase in private domestic investment. In addition, as private investment rises, the households (who are the ultimate owners of investment capital) seem to acquire increased capacity for either smoothing their consumption expenditure or raising their consumption due to the expectation of future returns on investment. Asteriou et al. (2020) note that an increase in expectation of future return on investment could bulge the household budget constraint, indicating increased household consumption in the current period. Overall, both long-run consumption expenditure and investment demand increase, hence causing an increase in economic growth.

As per Adepoju et al (2007), foreign debt is seen as a means of injecting funds into the economy. It serves as a fiscal lever used by nations to bridge budget gaps and finance economic ventures that aim to boost citizen's quality of life, as well as foster long-term growth and development. According to Guei (2019), external borrowing should be utilized to stimulate economic growth in cases where domestic financing is insufficient. Additionally, external debt has the potential to enhance total factor productivity by increasing output, thus fostering growth in both the tradable and non-tradable sectors.

According to Ajayi and Khan (2000), the dual gap hypothesis provides a rationale for prioritizing external financing as a method to ensure continuous output growth instead of solely relying on domestic borrowing. The theory avers that there is a relationship between investment and savings, and in developing nations, domestic savings are inadequate to fund the capital necessary for economic expansion. Hence, it makes sense to utilize external goods and services as a complement to bridge this gap and support economic development.

However, the results show that debt servicing in both the tradable and non-tradable sectors exerts a negative effect on economic growth. Numerous theoretical contributions have concentrated on the negative economic effect of debt servicing and the conditions in which this impact occurs. The term "debt overhang" was introduced by Krugman (1988) to depict a scenario where a country's projected capacity to repay its foreign loan falls short of the manner that meets the contractual requirements. Debt servicing, in this context, represents a burden carried by the current generation due to past debts incurred. If it is paid on external loans, it represents foregone domestic expenditure. In other words, the opportunity cost of debt servicing on external debt is the foregone critical domestic spending.

According to Krugman's (1988) debt overhang hypothesis, when countries engage in excessive borrowing, it leads to high levels of indebtedness, debt traps, and a deceleration in economic progress. Consequently, increasing debt levels impose a greater tax burden on future output, which in turn discourages investment from the private sector and crowds it out. This shows that because of the heavy debt load, potential investors would be put off by the idea that the government would fulfill its debt commitments by levying high taxes, which would further impede the nation's economic progress.

As Ayadi and Ayadi (2008) point out, rising debt servicing costs imply reduced spending on economic and social infrastructure, limiting private sector investment and growth through lost externalities. Because public investment accounts for a considerable portion of overall investment in the nation, overall investment has decreased. Furthermore, Ademola, Olaleya, and Olusiyi (2013) observed that the debt Laffer curve can describe the effect of debt servicing on economic growth.

The debt Laffer curve highlights the connection between debt repayment amount and debt size. The debtor is considered to be in the unfavorable or undesirable region of the Laffer curve when the impact of the effect is particularly strong. The Laffer curve also suggests that the amount of debt that can be taken on to boost growth has a limit. Once debt levels reach a certain point, it becomes burdensome as the costs associated with servicing the debt strain the available resources for productive activities. This can lead to a crowding-out effect, where investment is hindered, subsequently slowing down economic growth. The findings of this study corroborate Kabadiya, Uzun, and Karakoyi (2012) and Ibi and Aganyi (2015).

The results obtained also show that public debt financed through direct borrowing from the domestic banking market exerts a significant negative impact on tradable sector growth. This outcome could suggest the prevalence of the crowding out effect. High levels of public borrowing, according to monetarists, cause 'crowding out'. According to this theory, as the federal budget deficit rises, the government's demand for "loanable" funds from the private sector rises as well, with the government looking to borrow money from both domestic and foreign investors. This indicates that in a thriving economy, the government and private borrowers compete for limited savings, leading to increased interest rates. As a consequence, private-sector investments in plants and equipment may decline, a phenomenon known as "crowding out". This reduction in investment signifies a decrease in the overall capital stock available for economic activities, ultimately resulting in lower rates of future growth (Okafor et al., 2022).

However, there is a divergent effect in the non-tradable sector. In the non-tradable sector, bank-financed debt appears to have a weak positive effect on the tradable sector. Statistically, the coefficient of bank debt is only significant at a 10% significance level. This might be accounted for by the nature of debt effect dynamism in the non-tradable sector. As defined by Nkwagu (2020), the non-tradable sector includes the government/public sector, healthcare sector, educational sector, construction sector, and other domestically-traded sectors. In the government sector, the borrowed fund is expected to generate a positive growth effect through an increase in government spending which is a part of total demand.

However, in other non-traded sectors, an increase in bank-sourced debt indicates a shortage of loanable funds (and a concomitant increase in interest rate) for the healthcare, educational, construction, and other non-tradable sectors. Thus, like in the tradable sector, bank-sourced debt crowds out investments in healthcare, education, construction, and other non-tradable sectors. However, the overall effect is the net effect from the two opposing forces: growth increase in the government sector and growth decline in the other non-tradable sectors.

Finally, the behavior of inflation (which was employed as the study's control variable) is worth discussing. The outcome demonstrates that inflation has a negative relationship with economic growth. According to Datta and Mukhopadhyay (2011), if inflation is kept under control and at reasonable levels, the economy will benefit from increased employment, household income, and consumption. Consumers have more resources to spend on goods and services, which benefits and grows the economy. In other words, mild inflation could bolster economic recovery. However, high inflation could be rather deleterious to the economy.

For example, Anidiobu, Okolie, and Oleka (2018) emphasized that inflation reduces the amount of resources accessible for domestic investment. Both businesses and households are reducing their savings, and a large portion of these savings are being directed towards

foreign investments rather than domestic ones. At the same time, there is a discouragement in the inflow of capital from other countries. Additionally, Anidiobu et al. (2018) recognize that a considerable proportion of the decreased allocation of resources toward domestic investment is redirected to activities that are not deemed socially essential, such as accumulating excessive inventories (due to the diminishing value of money as a reliable store of wealth). It may also cause savings to be diverted away from capital markets, where investment decisions are more influenced by longer-term economic criteria.

As depicted in Olu and Idih (2015), a good example of this scenario is the redirection of resources from economically beneficial applications for the whole economy to the construction of owner-occupied dwellings for very few affluent individuals. Overall, the high inflation rate (as we have today in Nigeria) impedes the realization of the desired growth rate in both the tradable and non-tradable sectors.

5. Conclusion and Recommendations

The discussion surrounding the nexus between public borrowing and economic expansion has persisted without waning over time. While debt desirability proponents argue that public debt is purely growth-enhancing, others argue that public debt causes more economic harm than good. In recent times, the increase in public debt in Nigeria (as of March 2021, the total public debt stood at N33.107 trillion or USD87.239 billion), has continued to raise increased concern regarding its desirability. Although several studies have been carried out in this regard, there is hardly any study that examines the public debt-growth nexus in the context of the tradable and non-tradable sectors. Second, there is hardly any study that disaggregates bank-sourced debt from non-bank-sourced debt. Thus, this study aims at extending the frontier of knowledge along these identified lines.

In search of reliable answers to the research questions, several long-run models were estimated. However, before the models' estimation, the time series features of the data were explored. First, ADF and PP were employed for the unit root test. The result obtained shows that the time series represents the realization of integrated processes. Second, the cointegration test was implemented using a bound test procedure. The result obtained shows that the time series are cointegrated, suggesting that long-run connections exist among the series.

Furthermore, the findings estimated for both the tradable and non-tradable sectors indicate that throughout the study period, external debts and debts obtained from non-bank sources have a positive impact on economic growth in both sectors. In contrast, the growth of the tradable sector seems to be negatively affected by bank-sourced debts and debt-servicing. Conversely, in the non-tradable sector, while debt-servicing also has a negative impact on growth, the effect of bank-sourced debt on growth was found to be insignificant.

The result obtained therefore shows that public debt could be desirable or undesirable depending on its utilization and aggregate level. In this regard, the following recommendations are suggested. Given the negative effect of bank-sourced debt on the tradable sector and to minimize the detrimental impact of debt obtained from banks on the tradable sector, policymakers have the option to promote diversification in financing sources. This can be accomplished by encouraging alternative avenues such as foreign direct investment (FDI), public-private partnerships, or venture capital. By broadening the array of possible financial options, the tradable sector can access funding that is less likely to hinder its growth.

Additionally, policymakers can implement measures aimed at improving credit access for the tradable sector, thereby reducing reliance on bank-sourced debt. This could involve implementing targeted initiatives to enhance financial inclusion, establishing specialized lending programs specifically designed for small and medium-sized enterprises (SMEs) within the tradable sector, or offering guarantees or credit enhancement mechanisms to lower borrowing costs. Another avenue is to enhance access to credit from non-bank financial institutions, which can provide the tradable sector with more favourable lending terms.

The inquiry also identifies prospective areas for further investigation. This study could be expanded by investigating the importance of governance infrastructure on the nexus between public debt and tradeable and non-tradeable growth. Analogously, this research could be replicated in panel studies, particularly in sub-Saharan Africa where there is a high debt level and low economic growth.

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