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EFFECT OF RISING PUBLIC DEBT ON GROWTH OF AGRICULTURAL AND NON-AGRICULTURAL SECTORS IN NIGERIA

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Abstract

This study explores the growth effect of public debt on the growth of agricultural and non-agricultural sectors as well as the aggregate economy. This investigation is imperative because the rising public debt in Nigeria may not have uniform implication on growth across sectors and the economy at large. The data for the analysis was sourced from the World Bank (WB), World Development indicators (WDI) covering the period of 1980 to 2021. The results using the Fully Modified Ordinary Least Squares (FMOLS) show that public debt, exports, and inflation have a statistically significant negative effect on growth in Nigeria while population growth has a significant positive effect on growth in Nigeria. However, the relationship between imports and GDP in Nigeria is not statistically significant. The result also shows that public debt exerts a significant negative effect on agricultural and industrial growth, while its effect on services growth is not significant. The study submitted that public debt exerts a significant adverse effect on growth in Nigeria. However, when looking at the sector-specific effect, the effect of public debt remains significant and negative for both agricultural and industrial sectors implying that higher levels of public debt are associated with lower growth in these two sector while in the services sector public debt does not show a significant effect. The study recommended the need to implement strong fiscal discipline and progressive tax system rather than borrowing to reduce public debt significantly and promote sectoral development.
Keywords: *Economic growth, Public debt, Agricultural sector, non-Agricultural sector, FMOLS*
Jel Codes: *H63, O13, O14, O47, O55*

1. Introduction

The effect of debt on growth is a topic of great interest and relevance in the current global economic landscape. The rapid rise in global debt levels during the fourth wave of the global debt crisis in 2020 rejuvenates this relationship. In 2020, global debt reached a historic high of $226 trillion with debt as a ratio of GDP of 256 percentages. More than 50% of the increase is accounted for by the government, resulting in a record-high debt as a ratio of GDP of ninety nine percent. The private sector and households' debt stock also skyrocketed (Gómez-Puig, Sosvilla-Rivero & Rosselló-Villalonga, 2022). The surge in public debt affected both the advanced economies and the developing countries. Developed countries accumulated three hundred percentages of their GDP in total debt, while developing countries debt accumulation amount to two hundred and six percent of their GDP. Government debt in advanced economies exceeded 120 percent of GDP, while in less developed nations, it reached 60 percent of GDP (Gómez-Puig et al., 2022).

Nigeria as a developing economy is also grappling with the challenges posed by rising public debt levels. The country has been experiencing economic fluctuations and its public debt levels have been a subject of concern among policymakers and economists. In the country, the economic fallout from the corona virus crisis led to a slowdown in economic activities reduced government revenues, and increased expenditure to address healthcare needs and provide economic stimulus. These factors contributed to a significant increase in public debt levels in Nigeria. Furthermore, Nigeria's economic structure, which is heavily reliant on oil revenues, makes it exposed to shocks from global market such as oil prices. The volatility in oil prices directly impact government revenues and, consequently, the public debt levels (Vargas, Cardozo, & Murcia, 2021).

In the literature, existing studies have focused attention on public debt management, social security, and the relationship between public debt and economic indicators (Silva, Pires & Terra, 2014; Mendonça & Tiberto, 2014). These studies have shown that high levels of public debt may reduce growth by crowding-out private investment and thereby undermine macroeconomic stability. Meanwhile, the specific effect of public debt on economic growth can vary across different sectors (Gómez-Puig & Sosvilla-Rivero, 2013; Silva, Pires, & Terra, 2014; Mendonça & Tiberto, 2014; Gómez-Puig et al., 2022). Furthermore, the global debt crisis of 2020 has raised concerns about the impact of public debt on economic growth, emphasizing the need to explore the heterogeneity of the relationship (Gómez-Puig, Sosvilla-Rivero & Rosselló-Villalonga, 2022). However, literature is lacking on the sector specific growth effect of public debt in developing and Nigeria in particular. Given the importance of public debt and its implications for economic growth in Nigeria, the current study aims to contribute to the existing literature by analysing the sector-specific effects of public debt on agricultural and the non-agricultural sectors.

The rising public debt in Nigeria has significant implications across sectors and the economy, affecting the country's economic growth and the government's efforts to address the issue. The country's public spending structure outpaced government income over the last two decades, leading to negative government balance and increasing reliance on internal and external public debt (Vargas, Cardozo, & Murcia, 2021). The increase in foreign investors' participation in recent years raises questions about the impact of these inflows on the availability of loans in the domestic market (Mendonça & Machado, 2013). Besides, various governments in developing countries with Nigeria inclusive operate at a deficit, leading to fiscal imbalances that can result in an unsustainable path for public debt (Mendonça & Tiberto, 2014).

Previous studies have concentrated on public debt management, social security, and the relationship between public debt and economic indicators in emerging economies (Silva, Pires & Terra, 2014; Mendonça & Tiberto, 2014). However, there is limited evidence on the sector-

specific effect of public debt on economic growth in Nigeria. This study is motivated to address this gap by examining the sector-specific effects of public debt on agriculture, industry, and the service sector.

The aim of this study is to explore the growth effect of public debt on agricultural and non-agricultural sectors while the specific objectives are to:

i. examine the effects of public debt on agricultural sector growth;
ii. examine the effects of public debt on non-agricultural sectors growth; and
iii. analyze the effect of public debt and economic growth in Nigeria;

This study on the effect of public debt on economic growth in Nigeria contributes to the existing literature on public debt-economic growth nexus by addressing the lacuna in the literature on the heterogeneity of the debt-growth relationship across sectors. While previous studies have focused on several aspects of debt-growth relationships using varied methodologies, there is sparse studies on the heterogeneity aspect of the effect of public debt across sectors. By quantifying the heterogeneity of the debt-growth nexus in Nigeria, this study provides a deeper understanding of how public debt affect growth across different sectors. Secondly, the study's findings provides insights for policy-makers and government in Nigeria on the implications of the rising public debt and its impact on economic growth. Understanding the potential negative effects of excessive public debt on economic growth can aid in formulating effective fiscal policies and debt management strategies. The study's insights can help guide decision-making processes to mitigate the adverse consequences of high public debt and promote sustainable economic growth in Nigeria.

2. Literature Review

Debt incurred by a government from both internal and external sources to finance fiscal deficits represents the total amount of money owed by the government, resulting from borrowing to cover deficits. It encompasses both domestic debt, which is owed to creditors within the country, and external debt, which is owed to foreign entities (Gilbert & Guénin, 2022). This debt incurred by the government by borrowing from both internal and external sources to finance fiscal deficits is a critical component of public finance (Bal & Rath, 2014). The public debt is typically financed through the issuance of government bonds, which serve as a promise to repay the borrowed funds with interest (Phelps, 2022). The accumulation of public debt is a core indicator of a government's financial health and sustainability, as it reflects the level of borrowing required to meet its obligations and fund public expenditures (Andreea, 2012). Meanwhile, public debt comprises of both public domestic debt and public external debt. Public domestic debt refers to the debt incurred by a government by borrowing within its own country, typically by issuing bonds or other securities to domestic investors (Bua, Pradelli & Presbitero, 2014). While public external debt are debt incurred by a government by borrowing outside its own country

Public debt management refers to the strategies and measures employ by governments to manage their outstanding debt obligations, including issuing, servicing, and restructuring debt to ensure fiscal stability and minimize default risks (Mendonça, & Machado, 2013). Debt sustainability is a key consideration when analysing public debt. It refers to the ability of a country to manage its debt burden without causing economic instability or jeopardizing the welfare of future generations (Dumitrescu, 2014). Achieving debt sustainability requires a careful examination of the relationship between the level of public debt, fiscal policies, economic growth, and external factors. The sustainability of debt is essential in ensuring that the government can effectively service its debt obligations over the long term. The public debt to GDP ratio indicator is used to assess the sustainability and burden of the public debt, reflecting the ability of the government to repay its debt obligations relative to the size of the economy (Mendonça, & Machado, 2013).

In the literature, there are divergent perspectives on definition of economic growth with different authors emphasising a specific aspects and implications of the concept. Reinhart and Rogoff (2010) define economic growth as a sustained increase in a country's real GDP. Pattillo et al. (2011) view economic growth as the expansion of productive capacities and output in an economy. Lof and Malinen (2014) define economic growth as an increase in potential output and productivity. Woo and Kumar (2015) define economic growth as an increase in real per capita income and output. Gómez-Puig et al. (2022) conceptualised economic growth as an expansion in the overall size of an economy, with a negative relationship between public debt and growth.

Several theories abound in the literature predicting debt-growth nexus and the underlying mechanisms. This study explores the Ricardian equivalence theory, Keynesian theory of public debt, and the Monetarist theory of public debt. Meanwhile this study is anchored on Ricardian equivalence theory. The Ricardian equivalence theory as developed by the British economist David Ricardo in the early 19th century suggests that the method of financing government expenditures whether through taxation or borrowing has no real impact on overall consumption of individuals and economic growth. The theory submitted that the costs of taxation, such as administrative expenses or distortionary effects are negligible. That is, financing of public expenditure through taxation and borrowing is equivalent. This suggests that government borrowing to finance current expenditures will have a neutral effect on aggregate demand or in promoting economic growth in the long run. This is because individuals tends to save more in anticipation of future tax increases to repay the debt. Consequently, the theory challenges the effectiveness of expansionary fiscal policies via increase in government borrowing to stimulate the economy.

Contrary to the Ricardian theory, the Keynesian theory emphasised the role of government intervention and fiscal policy in influencing economic activity. Keynes argued that during periods of economic downturn, increased government spending and deficits can stimulate aggregate demand, boost economic growth, and alleviate unemployment. Keynesian proponents believe that during recessions or economic downturns, the government should engage in deficit spending, even if it requires borrowing, to stimulate economic activity. They argue that increased government spending creates demand and encourages private investment, which can lead to economic recovery. Keynesian theory focuses on the importance of aggregate demand in the economy. It suggests that changes in government spending, investment, or consumption can have significant effects on overall economic activity.

Furthermore, the Monetarist theory of public debt is rooted in the theories developed by economists such as Milton Friedman and his followers. Monetarists emphasize the importance of monetary policy and argued that excessive public debt can have detrimental effects on the economy. Proponents of the Monetarist view, contended that governments should maintain low levels of public debt to avoid inflationary pressures and promote long-term economic stability. Proponents of the theory argued that a sound monetary policy and limited public debt are crucial for maintaining economic stability.

In the review of previous studies, various aspects of the connection between debt and economic growth have been explored. These aspects include how governments manage their debt, the impact of social security systems, and how public debt affects economic indicators. For instance, Sun, Lu, Bao, Li, and Li (2022) investigated how China's economic policy uncertainty affects the debts of countries participating in the Belt & Road Initiative. They used a method called Propensity Score Matching (PSM) and a technique called Difference in Difference (DID) to develop a model for investment decisions. Their findings show that China's economic policy uncertainty influences the level of external debt, with differences between public and private external debt.

Similarly, Tourinho, Mercês, and Costa (2013) looked at whether Brazil's public debt was sustainable between 1991 and 2009. They used a model called Dynamic Stochastic General

Equilibrium (DSGE) calibrated for the Brazilian economy. Their findings indicate that during thd period, Brazil's public debt was sustainable, and this sustainability aligned with inflation targeting. Bua, Pradelli, and Presbitero (2014) focused on the trends and structure of domestic public debt in Low-Income Countries (LICs) from 1971 to 2011. They introduced a new dataset and observed an increase in domestic government debt, a shift toward longer-term debt instruments, and a decrease in borrowing costs. However, they noted that the concentration of the investor base, mainly commercial banks and the Central Bank, might have implications for lending to the private sector. Gomez-Puig, Sosvilla-Rivero, and Martínez-Zarzoso (2022) examined the relationship between public debt and economic growth using data from 115 countries. They used a method called the grouped fixed effect (GFE) estimator to classify countries into different groups based on how debt affects growth and to analyze the factors that explain this variability. Their study aimed to understand how the relationship between a country's public debt-to-GDP ratio and economic growth varies among different groups of countries.

3. Methodology

This study follows the ex post facto research design. The choice of this research is informed by its suitability in analysing the relationship among variables overtime in which the data is already available. By using data on variables in which the values is already determined by forces outside the control of the researcher, the study is able to provide appropriate insights on the relationship between the variables. The theoretical framework incorporates element from both the Keynesian and Monetarist perspectives. The level of aggregate demand (AD) in the economy is a crucial determinant of economic growth. The aggregate demand is a function of consumption (C), investment (I), government spending (G), and net exports (NX):

$$AD = C + I + G + NX \tag{1}$$

The consumption function represents the relationship between disposable income (Yd) and consumption (C). Keynesian theory suggests that consumption is a function of disposable income. This can be presented using a simple linear consumption function:

$$C = c_0 + c_1 * Y_d \tag{2}$$

Where c_0 represents autonomous consumption and c_1 represents the marginal propensity to consume (MPC). Investment (I) is influenced by interest rates (r), expectations of future profitability, and other factors. Thus, investment can be assumed as a function that is negatively related to interest rates:

$$I = I_0 - i_1 * r \tag{3}$$

Where I_0 represents autonomous investment and i_1 represents the sensitivity of investment to changes in interest rates. Government spending (G) is a key component of fiscal policy. The level of government spending can be influenced by the government's budget deficit or surplus, which in turn affects public debt (D). A simple linear relationship between government spending and the budget deficit can be presented as follows:

$$G = G_0 - g_1 * Deficit \tag{4}$$

Where G_0 represents autonomous government spending and g_1 represents the sensitivity of government spending to changes in the budget deficit. The budget deficit is the difference between government spending (G) and tax revenue (T). Public debt (D) represents the accumulated deficits over time. We can assume a direct relationship between the budget deficit and public debt:

$$D = D_0 + d_1 * Deficit \tag{5}$$

Where D_0 represents the initial level of public debt, and d_1 represents the sensitivity of public debt to changes in the budget deficit. Economic growth (Y) can be represented as the change in real GDP over time. A simple relationship between economic growth, aggregate demand, and potential output (Yp) can be presented as:

$$Y = Y_p + \alpha * (AD - Y_p) - \beta * D \tag{6}$$

Where α represents the sensitivity of economic growth to deviations from potential output, and β represents the sensitivity of economic growth to changes in public debt. In this framework, the interplay between consumption, investment, government spending, public debt, and economic growth is captured through functional relations.

In the formulation of the model for this analysis, this study relied on the model used in the study conducted by Bal and Rath (2014) on a reassessment of public debt and economic growth in India where per capital gross domestic product which was used as a proxy for economic growth was the dependent variable, while domestic debt, external debt, debt service payment, total factor productivity and export were the explanatory variables. As a modification to the model, this study expressed economic growth proxy by GDP per capital growth in percentage as a function of public debt proxy by central government debt as a percentage of GDP, inflation, population, capital, export and import. All the values in US Dollar were converted to rate.

The functional relationship to analyze the effect of public debt and economic growth in Nigeria is express as follows:

$$GDP = f(DEBT, INF, POP, GCF, EXPORT, IMPORT) \tag{7}$$

The transformation of the functional relationship into an econometric model yields equation 8

$$GDP = \beta_0 + \beta_1 DEBT + \beta_2 INF + \beta_3 POP + \beta_4 GCF + \beta_5 EXPORT + \beta_6 IMPORT + e \tag{8}$$

To examine the sector-specific effects of public debt on agricultural and non-agricultural sector, the agricultural value added, industrial value added and services value added are the dependent variables while the explanatory variables remained as defined in equation 8

$$V_i = \beta_0 + \beta_1 DEBT + \beta_2 INF + \beta_3 POP + \beta_4 GCF + \beta_5 EXPORT + \beta_6 IMPORT + e \tag{9}$$

V_i = Value added for sector i with i comprising of agricultural value added, industrial value added and services value added

GDP = Economic growth proxy by Gross domestic product (GDP) per capital growth

DEBT = Public debt proxy by central government debt as a percentage of GDP

INF = Inflation proxy by consumer price index in percentage,

POP = Population proxy by population growth rate,

GCF = Capital proxy by gross capital formation in current US Dollar,

EXPORT = Export measure by export of goods and services in constant US Dollar

IMPORT = Import measure by imports of goods and services in constant US Dollar.

β_0 = Intercept coefficient measuring the value of economic growth when all the explanatory variables are zero

$\beta_1 - \beta_6$ = Slope coefficient measuring the size of the effect of the respective explanatory variables on economic growth

e = Error term which account for the effect of other variables and modelling errors on the estimated model

Based on the *a priori* expectations, a positive relationship is expected between economic growth cum sectorial growth and public debt in the short term, indicating that increased public debt may stimulate aggregate demand and boost economic activity in line with the Keynesian expectation. In the long term, a negative relationship is expected between economic growth and public debt, suggesting that excessive public debt may lead to crowding out of private investment, higher interest rates, and reduced economic growth in line with Monetarist expectation.

In this study the data which is secondary in nature were obtained from the World Bank (WB), World Development Indicators (WDI) databases. The variables used in the model for which data were collected are economic growth proxy by GDP per capital growth in percentage as a function of public debt proxy by central government debt as a percentage of GDP, inflation proxy by consumer price index in percentage, population proxy by population growth rate, capital proxy by gross capital formation in current US Dollar, export measure by export of goods and services in constant US Dollar and import measure by imports of goods and services in constant US Dollar. All the values in US Dollar were converted to rate. The data covers the period 1980 to 2021 which is a period of forty two (42) years. The choice of the period is informed by the recent surge in government borrowing and the need to a more robust estimation of the effect of public debt on economic growth.

This study utilizes the Fully Modified Ordinary Least Squares (FMOLS) introduced by Phillps and Donggyu. FMOLS is designed to deal with endogeneity issues commonly encounter in econometrics analysis and it is particularly useful when dealing with economic time series data that exhibits non-stationary behaviour. FMOLS can handle this type of data and produce efficient estimates by accounting for the possibility of serial correlation in the error time that are common in time series data. It accommodates cross sectional dependency which arise when observations across different entities are correlated.

4. Results and Discussion

This study carry-out pre-estimation tests covering descriptive statistics, correlation analysis and unit root test. This analysis combines the descriptive statistics including the mean median, variance and standard deviation for all the variables in tabular form.

Table 1. Descriptive statistics

	Economic growth GDP	Public debt DEBT	Inflation INF	Population POP	Capital GCF	Export EXPORT	Import IMPORT	Agricultural Growth AGRV	Industrial Growth INDV	Services Growth SERV
Mean	3.939462	71.06273	20.03634	2.635385	-0.040766	0.016947	-0.060085	5.651171	0.473852	4.162149
Median	5.015935	68.36000	12.53783	2.628124	0.038912	0.029227	-0.069950	3.792027	1.653214	3.350082
Maximum	15.32916	193.6700	72.83550	2.900872	0.297093	0.413062	0.378454	55.57805	18.05893	19.99840
Minimum	-10.92409	7.280000	5.388008	2.471938	-0.697819	-0.428934	-0.590913	-4.382437	-18.97455	-3.799597
Std. Dev.	5.060614	55.30444	18.37374	0.095835	0.249299	0.197209	0.299713	9.765978	7.084727	4.507964
Skewness	-0.693503	0.499766	1.562434	0.440597	-1.470812	-0.296633	-0.286024	4.237817	-0.293991	1.401327
Kurtosis	4.346785	2.232903	4.108391	2.944292	4.659116	2.775597	1.787042	22.18136	4.083995	6.222837
Jarque-Bera	5.139220	2.182812	15.11583	1.071957	15.68300	0.553192	2.472944	604.6710	2.091054	25.08212
Probability	0.076565	0.335744	0.000522	0.585097	0.000393	0.758361	0.290407	0.000000	0.351507	0.000004
Observations	33	33	33	33	33	33	33	33	33	33

Source: Authors' own calculations, 2023

Table 2 Pairwise Correlation Matrix

	economic growth GDP	Public debt DEBT	Inflation INF	Population POP	Capital GCF	Export EXPORT	Import IMPORT	Agricultural growth AGRV	Industrial growth INDV	Services growth SERV
Public debt (DEBT)	1.000000	-0.344408	-0.272710	0.311521	0.599497	0.067550	0.413021	0.497912	0.677393	0.445130
Inflation (INF)	-0.344408	1.000000	0.602410	-0.612173	-0.330588	-0.029271	0.073822	-0.104262	0.061281	-0.108114
Capital (GCF)	-0.272710	0.602410	1.000000	-0.392331	-0.178583	-0.066773	0.286575	-0.090812	-0.109294	-0.107507
Population (POP)	0.311521	-0.612173	-0.392331	1.000000	0.312123	0.007113	-0.215558	0.198806	-0.045664	0.198212
Export (EXPORT)	0.599497	-0.330588	-0.178583	0.312123	1.000000	0.161598	0.328932	0.221887	0.347436	0.445050
Import (IMPORT)	0.067550	-0.029271	-0.066773	0.007113	0.161598	1.000000	-0.056937	0.112518	0.129941	0.215241
Public debt (DEBT)	0.413021	0.073822	0.286575	-0.215558	0.328932	-0.056937	1.000000	0.195364	0.366168	0.339730
Agricultural growth (AGRV)	0.497912	-0.104262	-0.090812	0.198806	0.221887	0.112518	0.195364	1.000000	0.103488	0.393193
Industrial growth (INDV)	0.677393	0.061281	-0.109294	-0.045664	0.347436	0.129941	0.366168	0.103488	1.000000	0.244395
Service growth (SERV)	0.445130	-0.108114	-0.107507	0.198212	0.445050	0.215241	0.339730	0.393193	0.244395	1.000000

Source: Authors' own calculations, 2023

As shown in Table 1, the mean and median values indicate positive economic growth on average. However, the negative minimum value suggests that there were periods of economic contraction. The low skewness value (-0.693503) indicates a relatively symmetric distribution of economic growth data. The p-value of 0.076565 suggests that the data is approximately normally distributed. This result shows that Nigeria has experienced periods of economic growth and contraction. The distribution of public debt (DEBT) shows that Nigeria has experienced high levels of public debt, as indicated by the mean (71.06) and median (68.36) values. The positive skewness suggests that there are more data points on the lower end of the distribution, meaning there are more instances of moderate public debt levels. The Jarque-Bera test shows that the data may not be perfectly normally distributed, but it approximates normality (p-value: 0.335744).

The distribution of the mean and median values of inflation suggest moderate inflation levels in Nigeria. The positive skewness indicates that the data is slightly skewed to the right, with more frequent occurrences of lower inflation rates. The high kurtosis value suggests the presence of outliers in the data. The Jarque-Bera test shows that the data significantly deviates from normality (p-value: 0.000522). The distribution of population (POP) shows there is a relatively low population growth rate in Nigeria. The negative skewness indicates that the distribution is skewed to the left, with more instances of lower population growth. The high kurtosis value indicates that the distribution has heavy tails and potentially contains outliers. The Jarque-Bera test shows that the data significantly deviates from normality (p-value: 0.000393).

In the Table, the mean and median values of capital formation suggest positive capital formation, but the wide range indicates significant variations in investment levels. The positive skewness indicates that there are more data points on the higher end of the distribution, with instances of high capital formation. The high kurtosis value suggests that the distribution has heavy tails and extreme values. The Jarque-Bera test shows that the data significantly deviates from normality (p-value: 0.000000).

The mean and median values of export suggest positive export performance, but the negative minimum indicates occasional negative trade balances. The low skewness suggests a relatively symmetric distribution of export data. The Jarque-Bera test shows that the data approximately follows normality (p-value: 0.351507). The mean and median values of imports indicate substantial imports into Nigeria. The positive skewness suggests more data points on the higher end of the distribution, indicating instances of high import levels. The Jarque-Bera test shows that the data significantly deviates from normality (p-value: 0.000004). This implies that Nigeria's import dependence raises concerns about trade imbalances and foreign exchange pressures.

The mean and median values of Agricultural Growth suggest a slightly negative trend in agricultural growth, though the values are close to zero. The negative skewness indicates that the distribution is skewed to the left, with more instances of negative agricultural growth rates. The high kurtosis value suggests that the distribution has heavy tails and potentially contains outliers. The Jarque-Bera test shows that the data significantly deviates from normality (p-value: 0.000393). The mean and median values of Industrial Growth suggest relatively low industrial growth rates, though the values are close to zero. The negative skewness indicates that the distribution is skewed to the left, with more instances of negative industrial growth rates. The high kurtosis value suggests that the distribution has heavy tails and potentially contains outliers. The Jarque-Bera test shows that the data significantly deviates from normality (p-value: 0.000393). The mean and median values of services sector growth suggest positive growth in the services sector. The positive skewness indicates that the distribution is skewed to the right, with more instances of higher services growth rates. The Jarque-Bera test shows that the data significantly deviates from normality (p-value: 0.000004).

In summary, the descriptive statistics shows the presence of both positive and negative trends in economic growth, public debt, inflation, population, capital formation, exports, imports, agricultural growth, industrial growth, and services growth. Additionally, the Jarque-Bera test results suggest that some of the data deviates significantly from normality, which indicates that certain variables may be influenced by non-standard economic factors or external shocks.

The result of the pairwise correlation of the relationships between and among all the variables is presented in the Table 2. In Table 2, the correlation coefficients, show a moderate negative correlation (-0.344408) between economic growth (GDP) and public debt (DEBT). This implies that as public debt increases, economic growth tends to decrease, and vice versa. Additionally, there is a moderate negative correlation (-0.272710) between economic growth (GDP) and inflation (INF). This suggests that periods of higher inflation are associated with lower economic growth in the country. Moreover, there is a strong negative correlation (-0.612173) between economic growth (GDP) and capital formation (GCF). This indicates that when capital formation declines, economic growth tends to be higher, and vice versa.

On the other hand, there was a moderate positive correlation (0.311521) between economic growth (GDP) and population (POP). This suggests that as the population grows, economic growth tends to increase as well. Furthermore, there is a strong positive correlation (0.599497) between economic growth (GDP) and exports (EXPORT).

The analysis also reveals that there is a strong positive correlation (0.677393) between public debt (DEBT) and industrial growth (INDV). This suggests that higher levels of public debt are associated with stronger industrial growth. Also, there was a moderate positive correlation (0.497912) between public debt (DEBT) and agricultural growth (AGRV). This indicates that higher levels of public debt are associated with increased growth in the agricultural sector. Additionally, there is a moderate positive correlation (0.445130) between public debt (DEBT) and services growth (SERV). This suggests that higher levels of public debt are associated with increased growth in the services sector.

Table 3 Unit Root Test Statistics

Variables	ADF				PPT			
	Level		First Differ		Level		First Differ	
	T-stat	Prob	Tstat	Prob	T-stat	Prob	T-stat	Prob
public debt DEBT	1.9201	0.0533	-11.9968	0.0000	-3.124	0.0026	-12.7500	0.0000
inflation INF	-0.8228	0.3525	-4.9820	0.0000	-0.8387	0.3456	-4.9274	0.0000
capital GCF	-1.2576	0.1883	-6.0643	0.0070	-1.7223	0.0804	-12.4152	0.0000
population POP	-0.6059	0.4483	-2.7724	0.0000	-1.3899	0.1505	-5.1518	0.0000
export EXPORT	-3.6381	0.0006	-8.6563	0.0000	-3.4759	0.0009	-11.4430	0.0000
import IMPORT	-7.0491	0.0000	-7.5046	0.0000	-7.0770	0.0000	-15.8319	0.0000
public debt DEBT	-6.4836	0.0000	-6.2237	0.0000	-6.4853	0.0000	-24.3974	0.0000
agricultural growth AGRV	-4.2596	0.0001	-7.0780	0.0000	-4.3445	0.0001	-23.2849	0.0000
Industrial growth INDV	-5.2537	0.0000	-9.8780	0.0000	-5.2722	0.0000	-10.8568	0.0000
service growth SERV	-1.2205	0.1989	-9.9160	0.0000	-2.2456	0.0259	-2.2456	0.0259

Source: Authors' own calculations, 2023

The unit root test was conducted without intercept and trend (none) using both the Augmented Dickey Fuller (ADF) and Phillips Peron (PP) unit root tests to ensure the robustness of the test. Looking at the results in Table 3, it is evident that most of the variables exhibit stationarity in their first differenced, as indicated by the ADF and PPT test statistics with very low probability values (close to 0). This means that taking the first difference of these variables eliminates the underlying trend or pattern, making them suitable for analysis in this form. The stationarity of most variables in their first differenced is a positive sign for the economy, indicating that changes in these indicators are not driven by long-term trends.

In order to analyse the effect of public debt on economic growth, the study utilize the fully modified OLS estimation technique and the result is presented as follows:

Table 4 FMOLS Estimates of effect of public debt on economic growth

Dependent Variable: economic growth GDP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
public debt DEBT	-0.082148	0.017912	-4.586242	0.0001
inflation INF	-0.154251	0.033813	-4.561918	0.0001
capital GCF	-3.100477	2.340921	-1.324469	0.1964
population POP	13.92114	4.381965	3.176917	0.0037
export EXPORT	-6.498343	2.501579	-2.597696	0.0150
import IMPORT	1.276822	1.828516	0.698283	0.4910
C	0.102232	0.454153	0.225104	0.8236
R-squared	0.631472			
Adjusted R-squared	0.549577			
Long-run variance	6.380279			

Source: Authors' own calculations, 2023

In Table 4, the negative coefficient for public debt (DEBT) suggests that an increase in public debt is associated with a decrease in economic growth (GDP). The small magnitude of the coefficient indicates that the impact of public debt on economic growth is relatively modest. However, the high level of significance suggests that changes in public debt exerts a statistically significant negative effect on GDP in Nigeria. Similarly, the negative coefficient for inflation (INF) indicates that higher inflation rates are associated with lower economic growth (GDP). The average size of the coefficient suggests that inflation has a relatively moderate impact on economic growth in Nigeria. The high level of significance indicates that inflation has a significant negative effect on economic growth in Nigeria. The negative coefficient for capital formation (GCF) is unexpected, as higher investments are generally expected to drive economic expansion. The lack of significance at a 5% level suggests that capital formation does not significantly affects GDP in Nigeria.

On the other hand, the positive coefficient for population (POP) suggests that population growth has a strong positive impact on economic growth (GDP). The large magnitude of the coefficient indicates that population growth has a significant positive effect on economic expansion in Nigeria.

The negative coefficient for exports (EXPORT) indicates that higher export levels are associated with lower economic growth (GDP) significantly. Nigeria's heavy dependence on oil exports exposes its economy to external shocks, such as fluctuations in oil prices. The positive coefficient for imports (IMPORT) suggests that higher levels of imports are associated with higher economic growth (GDP). However, the small magnitude of the coefficient and

lack of significance indicate that the relationship between imports and GDP in Nigeria is not statistically significant.

In order to analyse the sector-specific effects of public debt on agriculture, industry, and service, the study utilize the fully modified OLS estimation technique and the result is presented as follows:

Table 5. FMOLS Estimates of Sector-Specific Effects of Public Debt

	Dependent Variable: agricultural growth AGRV			Dependent Variable: Industrial growth INDV			Dependent Variable: services growth SERV		
Variable	Coeff.	t-Statistic	Prob.	Coeff.	t-Statistic	Prob.	Coeff	t-Statistic	Prob.
Public debt DEBT	-0.159145	-3.176055	0.0039	-0.098805	-3.846678	0.0007	0.054066	0.947701	0.3524
Inflation INF	-0.137255	-1.450953	0.1592	-0.196809	-4.058680	0.0004	0.030118	0.651156	0.5209
Capital GCF	-10.51251	-1.581121	0.1264	-4.175098	-1.225009	0.2320	3.478200	0.300188	0.7665
Population POP	3.007494	0.245280	0.8082	24.29529	3.865396	0.0007	8.326705	1.682103	0.1050
Export EXPORT	1.039074	0.147821	0.8837	-2.516077	-0.698279	0.4914	4.210779	0.817552	0.4213
Import IMPORT	10.25145	1.998025	0.0567	-1.295883	-0.492715	0.6265	7.568215	1.752705	0.0919
C	0.048912	0.037819	0.9701	-0.002342	-0.003533	0.9972	4.879483	4.808766	0.0001
R-squared	0.213138			0.331238			0.325989		
Adjusted R-squared	0.024291			0.170735			0.164226		
Long-run variance	49.74967			13.07259			29.26412		

Source: Authors' own calculations, 2023

As shown in Table 5 the significant negative coefficients for public debt (DEBT) in the models for agricultural and industrial growth suggest that higher levels of public debt are associated with lower growth in these sectors. However, the insignificant positive coefficient for services growth indicates that public debt has a positive insignificant impact on the services sector's growth. It is important to note that the magnitude of the coefficients is relatively small, implying that the impact of public debt on the growth of these sectors is not very substantial.

The insignificant negative coefficients for inflation (INF) in the models for agricultural and services growth indicate that higher inflation rates are associated with lower growth in these sectors. The significant positive coefficient for industrial growth suggests that inflation has a significant positive impact on the industrial sector's growth. The insignificant coefficients for capital formation (GCF) in the models for agricultural and industrial growth indicate that higher levels of capital formation are associated with lower growth in these sectors. The insignificant positive coefficient for services growth suggests that capital formation has a small positive impact on the services sector's growth. However, the lack of significance for all three coefficients indicates capital formation does not significantly affect growth in these sectors based on this model.

The insignificant positive coefficients for population (POP) in the models for agricultural and services growth indicate that population growth has an insignificant positive impact on growth in these sectors. However, the lack of significance for agricultural growth (AGRV) and services growth (SERV) implies that the effect of population growth on agricultural growth and services growth is not statistically robust based on this model. The significant positive

coefficient for INDV highlights the significant role of population growth in driving industrial growth and job creation.

The insignificant coefficients for exports and imports in the models for industrial growth indicate that higher levels of exports and imports are associated with lower growth in this sector. The insignificant positive coefficients for exports and imports in the models for services growth suggest that these variables have insignificant positive impact on the services sector's growth. However, the lack of significance of exports and imports indicates that the effect of exports and imports on growth across the sectors are not statistically robust. Nigeria's export-oriented economy is heavily reliant on oil exports, making it vulnerable to fluctuations in global oil prices.

5. Conclusion and Recommendations

This study examined the effect of public debt on agricultural and non-agricultural sectors growth in Nigeria. The study specifically analyses the effect of public debt and economic growth in Nigeria and examine the effects of public debt on agricultural sector growth and analyse the effect of public debt on non-agricultural sectors growth. This investigation is imperative because the rising public debt in Nigeria has significant implications across sectors and the economy, affecting the country's economic growth. The country's public spending structure has outpaced government income over the last two decades, leading to negative government balances and increasing reliance on internal and external public debt. Existing literature on the relationship between public debt and economic growth have not pay attention on the sector specific effect of public debt in Nigeria.

The result of the analysis of objective one shows that, public debt, exports and inflation have a statistically significant negative effect on GDP in Nigeria while population growth has a significant positive effect on economic expansion in Nigeria. However, the relationship between imports and GDP in Nigeria is not statistically significant. The analysis of the second objective shows that public debt have a significant negative effect on agricultural and industrial growth suggesting that higher levels of public debt are associated with lower growth in these sectors while public debt does not show a significant effect on services growth indicating that public debt has an insignificant impact on the services sector's growth. Thus, while public debt affect agricultural and industrial growth negatively, it does not show any effect on the services sector growth

The study submitted that public debt have a significant negative effect on economic growth in Nigeria. However, when looking at the sector-specific effect, the effect public debt remains significant and negative for both agricultural and industrial sectors suggesting that higher levels of public debt are associated with lower growth in these two sectors while in the services sector public debt does not show a significant effect.

Based on the findings that public debt has a significant negative effect on economic growth in Nigeria, with a sector-specific effect showing the negative impact on agricultural and industrial sectors while no significant effect on the services sector, the study proffer the following recommendations that can be implemented to manage public debt and support economic growth:

There is a need to implement and maintain strong fiscal discipline to ensure that public debt levels remain sustainable and manageable. Governments should prioritize prudent fiscal policies, control expenditure, and adopt transparent debt management practices. This approach can help prevent excessive public debt accumulation, which could negatively affect economic growth. Also government need to promote sectoral diversification in the economy to reduce dependence on specific sectors, especially those vulnerable to fluctuations in global markets. By investing in and developing non-oil sectors such as manufacturing, technology, and services, countries can create a more balanced and resilient economy, less susceptible to

shocks from changes in commodity prices. Furthermore there is a need to direct public debt towards investments in productive sectors such as infrastructure, education, healthcare, and research and development. Productive investments can enhance the economy's capacity for sustainable growth, create job opportunities, and boost overall economic productivity. Government need to strengthen public investment management to ensure that borrowed funds are channelled effectively into projects with high returns and positive long-term impacts. Prioritizing strategic infrastructure projects and monitoring their implementation can maximize the benefits of public debt-financed investments. Finally, there is a need to encourage private sector participation and investment through favourable policies and incentives. A vibrant private sector can drive economic growth, create jobs, and reduce the burden on public finances. Policies that support entrepreneurship, ease of doing business, and access to finance can attract private investment and stimulate economic activities.

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