PUBLIC DEBTS AND ECONOMIC DEVELOPMENT IN NIGERIA (1980-2023)

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Abstract
The main objective of the study is to examine the effects of public debt on economic development. Human development index was used to proxy economic development while external debt, internal debt and debt servicing were used to proxy public debt. This study employs ex post facto research design using time series data for the periods under study (1980-2023). Data for this study is completely secondary in nature, sourced from various issues of Central Bank of Nigeria (CBN) Statistical Bulletins and World Development Indicator (WDI). The ARDL long-run estimates show that while External Debt (EXD) has a negative but statistically insignificant effect on human development, Debt Servicing (DTS) significantly harms human development by diverting resources from key sectors. Internal Debt (IND) has a small, statistically insignificant positive effect, suggesting it does not meaningfully impact human development on its own. Overall, high debt servicing costs negatively affect long-term growth, indicating a need for better management of both external and internal debt. To address the findings, focus on three key recommendations: 1) Improve management of debt servicing costs to prevent resource diversion from critical sectors like education and healthcare. 2) Reallocate resources to enhance human development by funding essential services despite debt obligations. 3) Increase transparency in debt management to build trust and ensure that debt practices support long-term growth and development.
Keywords: economic development, public debt, external debt, inter debt, debt servicing, Nigeria

Introduction

Governments most times embark on borrowing from different sources in order to finance projects they intend to deliver. Government borrowing is a loan taken that is included in the budget document as capital receipt. Public debt is essentially the total amount of money borrowed by the federal government to pay for public services and benefits. The government announces an annual borrowing program in the Budget because tax and non-tax revenue is insufficient to fund the government's spending program (Economic times, 2020). Government borrowing becomes necessary, according to Abdulkarim and Saidatulakmal (2021), when government revenue sources are insufficient to finance growing government expenditures. Borrowing at a reasonable rate to fund public and infrastructure development is the key to accelerating economic growth and development. However, excessive borrowing without proper investment planning can result in a high debt burden and interest

payments, which can have a number of negative consequences for the economy. Most governments have massive outstanding debts as a result of this process over the years (Joy & Panda, 2020).

Nigeria has struggled with a higher debt service to revenue ratio since the recession in 2016, as revenues have fallen in direct correlation with the drop in oil prices. In 2019, Nigeria's government spent 2.45 trillion Nigerian Naira on debt service, out of total revenue of N4.1 trillion, for debt service to revenue ratio of 59.6 percent. The rising cost of Nigeria's debt profile breached a new milestone with the country's debt service as a percentage of revenue rising to 83 percent in 2020. This suggests that 83 percent of the revenue generated in 2020 was used to meet debt service obligations and this is worrisome. In 2020, the government spent N1.76 trillion to service domestic debt, compared to a budget of N1.87 trillion. A total of N553 billion was spent on foreign debts, compared to a target budget of N805.47 billion. Lower interest rates on foreign borrowing, as well as very limited borrowing from the foreign debt market during the year, are likely to have contributed to the decrease. Instead of the budgeted N272.9 billion, the government only contributed N4.58 billion to the sinking fund. The sinking fund is required to set aside funds that will be used to pay down other loans in the future, such as bonds. The government's constant borrowing from the domestic market was preventing private businesses in need of credit from obtaining financing for expansion and growth (Ogunjimi, 2019). According to Izuaka (2021), Nigeria's debt situation will worsen in 2022, with the government borrowing N5.012 trillion to finance a budget deficit of N6.3 trillion and a budgeted total budget of N16.39 trillion. Complicating the country's debt situation, which is becoming increasingly unmanageable. While the government claims that its debt-to-GDP ratio is within a safe range of 23%, it has spent the majority of its earnings to service mounting debt for years. In the first five months of 2021, the government spent N1.8 trillion on debt servicing, accounting for nearly 98 percent of total revenue generated during the same period. As of March 31, the country's total debt was N33.11 trillion Izuaka (2021).

When a country spends a large portion of its revenue servicing massive debts, it leaves little money to fund critical infrastructure, which has a negative impact on growth and development. Furthermore, according to the National Bureau of Statistics (NBS) 2019 Poverty and Inequality in Nigeria report, 40.1 percent of Nigeria's population, or nearly 83 million people, live below the country's poverty line of N137,430 ($381.75) per year, highlighting the country's low levels of wealth in Africa's largest economy (Abdulkarim & Saidatulakmal, 2021). A nation's road to economic growth and development is hampered by an increasing domestic debt profile. The cost of servicing the debt may rise beyond the economy's ability to cope, posing a threat to the country's ability to meet its fiscal and monetary policy goals (Soludo, 2003).

Nigeria is currently one of the most heavily indebted countries in Sub-Saharan Africa, with a slowed GDP growth rate, slowed export growth, rapidly dwindling income per capita, and rising poverty levels. The majority of these countries, including Nigeria, have been caught in a cycle of hasty and distress borrowing that they are unable to service. Worse still, their primary exports' world prices are deteriorating, necessitating more borrowing (Ogunjimi, 2019). As a result, the purpose of this research is to look into the impact of public debt on Nigeria's economic development.

Borrowing at a reasonable rate to fund public and infrastructure development is the key to accelerating economic growth and development. However, excessive borrowing without proper investment planning can result in a high debt burden and interest payments, which can have a number of negative consequences for the economy. Most governments have massive outstanding debts as a result of this process over the years (Joy & Panda, 2020).

In Nigeria, government debt is clearly increasing, resulting in a large debt with high servicing costs and a negative impact on the economy. In the first five months of 2021, the government spent N1.8 trillion on debt servicing, accounting for over 98 percent of the revenue generated during the same period. The country's total debt was N33.11 trillion as of March 31, and another N5.012 trillion is expected to be borrowed in 2022 to cover an N6.3 trillion budget deficit with a proposed total budget of N16.39 trillion. To Soludo (2003), a rising debt burden may limit the government's ability to invest more productively in infrastructure, education, and public health. According to Nigeria's Poverty and Inequality Report, 40.1 percent of the country's population, or nearly 83 million people, live below the poverty line of N137,430 ($381.75) per year. These are serious issues that require immediate attention, which is why the purpose of this study is to investigate the impact of public debt on economic development in Nigeria.

Based on the above, we therefore put forward the following hypotheses:

H01: External debt have no significant effect on human development index in Nigeria.

H02: Internal debt have no significant effect on human development index in Nigeria.

H03: Debt servicing have no significant effect on human development index in Nigeria.

Conceptual Clarifications

Public Debt

Public debt refers to how much a country owes to lenders outside its shore (Dairu, 2017). Public debt also called national debt includes the totality of debt owed by government of a nation internally and externally. External debts are those obligations

of government to international institutions such as IMF and AfDB (Udoka & Lari, 2011). Internal debts are debt obligations of government owed to residents of the country. The accumulation of debts or borrowings (internal and external) is as a result of accumulation of a country's budget deficits resulting from government spending more than it takes in through the instrumentality of taxation (Orgah, 2013). Joyade and Oni (2016) viewed that while internal debt (borrowing) of a country may not have significant burden on her citizen as payment of the interest and principal to service the debt involves a transfer of purchasing power from a section of the citizens to another and therefore productive, external component of public debt on the other hand is counter-productive involving greater burden as interest charges and repayment of the principal sum involves transfer of resources to creditors/lenders abroad..

External Debt

This involves a country borrowing from another country, for example, Nigeria borrowing money from foreign countries or issuing a Euro bond to finance capital projects. Due to the scarcity of resources and the law of comparative advantage, countries depend on each other to foster economic growth and achieve sustainable economic development (Adepoju *et al*., 2007). The funds can be borrowed either from the foreign government or businessmen and private citizens of the foreign country. External debt is widely believed to enhance economic growth and development (Osinubi *et al*., 2006). That is the basic reason why the debt is usually borrowed in the first place. The necessity for government to borrow in order to finance a deficit budget has led to the development of external debt (Osinubi, *et al*., 2006).

Internal Debt

This consists of government borrowing from within her domestic economy. This type of debt, unlike the external borrowing does not increase the total resources available to that country. There is simply a transfer of resources from one end to the other for public services purpose (Nurudeen & Usman, 2010). Also, the interest payment only transfers resources from the taxpayers to the bondholders. Internal debt only effects a transfer of purchasing power among the citizens of the country, thus there is no giving up of real output to another country. Instruments used for internal debt include treasury bills, treasury certificate, treasury bonds, development stock and Federal Government of Nigeria bonds. The oppressive burden of internal debt has service fostered the initiative to borrow externally at cheaper rates of interest. According to the Debt Management Office, internal debt burden in Nigeria presently, exceeds ₦6tn.

Debt Servicing

Debt service is the amount needed to cover the repayment of principal and payment of interest on a loan for a particular period. Debt servicing are the required payments

of both principal and interest in respect of outstanding debts (International Monetary Fund, 2003). Merriam-Webster (2019) defines debt servicing as the disbursement from the sinking fund of the amount of interest and principal due yearly on long-term loan. Debt servicing is the amount paid in respect of principal and interest due on existing loan (Business Dictionary, 2019). Adesola (2009) defines debt servicing as the amount needed for the redemption of principal and payment of interest due on a loan at certain period of time.

Economic Development

Economic development encompasses progress in providing livelihood on a sustainable basis, access to education and basic healthcare for the majority of the population (Belshaw & Livingstone, 2002:3). The meaning of the term "development" becomes clearer with the understanding of the term "economic growth". By economic growth, economists generally mean the increase over time in a country's real output per capita. Economic growth has over time been regarded as an all-important goal of economic policy with a robust study occasioned to clarify how this aforesaid goal can attained (Fadare, 2010).

The process of developing wealth for the benefit of a community is known as economic development. It's more than an employment program; it's an investment in your community's economic growth and improved wealth and quality of life (California Association for Local Economic Development (CALED), 2021). Economic development strategies used to focus on industrialization and infrastructure, but since the 1960s, they have become more concerned with poverty alleviation (Finnemore, 1996). Improvements in a range of sectors or indicators, such as literacy rates, life expectancy, and poverty rates, are often associated with economic development (Pritchett *et al*., 2013). Economic development is the transformation of simple, low-income national economies into modern industrial economies (Myint & Krueger, 2000). The human development index (HDI), which is published on a regular basis by the United Nations Development Programme (UNDP) in its Human Development Report, is the most well-known indicator of development. The HDI is a composite indicator that ranks countries based on how well they perform across three categories. Specifically, life expectancy, education, and GDP per capita in PPP dollars (UNDP, 2011).

Human Development Index

HDI is an objective metric of human development in that it relies on indicators that can be observed and compared meaningfully across contexts. This distinguishes it from other human development metrics that include indicators of subjective well-being (such as happiness or life satisfaction). The longevity and education components of HDI have substantial theoretical underpinning in Amartya Sen's notion of basic functioning and capabilities, and have been buttressed in more recent theories of human need (Gough, 2015). HDI has been promoted through the United Nations Development Program's annual reports, and has become the single most

widely-used indicator of human development. The principles behind HDI informed the Millennium Development Goals, which were launched in 2000.

Theoretical Review

Ricardo's Public Debt Theory

Ricardo shares Smith's views on the unproductive character of state expenditures and on the notion that their financing via public borrowing decreases the investible product and, therefore, it becomes detrimental to society's capacity to accumulate wealth. Nevertheless, many modern economists attribute to him the idea of the equivalence of the two forms of financing in the so-called Ricardian Equivalence Theorem. This theorem ascribes to Ricardo the view that taxation and public borrowing constitute essentially equivalent forms of financing public expenditures. The rationale behind this view is that the government is expected at some future time to redeem its debt. If we now suppose a closed economy the repayment of debt will take place via increased future taxation, which means that on the basis of the rational expectations hypothesis individuals increase their savings buying the bonds that have been issued by the government. In other words, the amount of savings matches the size of public deficit and, therefore, the interest-rate remains the same, which means that there is no crowding out effect of private investments from public expenditures and, therefore, the overall demand remains the same together with the other real variables of the economy. There is a similar operating mechanism in the case of an open economy, where the redemption of public debt takes place via the sale of assets to international institutional agents. Such a possibility raises, once again, the question of the limited future government income and, hence, the inevitable future increase of taxation (Tsoulfidis, 2007).

Empirical Review

Iheduru et al. (2023) studied public debt and human development in Nigeria covering the period 2003-2021. The study evaluated the effect public debt have on human development in Nigeria. The study disaggregated the variables into total debt, foreign debt, domestic debt and human development index. Data were obtained from Central Bank of Nigeria Statistical Bulletin and United Nations Development Programme (UNDP) Human Development Report for the concerned period. The Augmented Dickey Fuller test of stationarity and Johansen co-integration test which were conducted revealed that the annual time series data were stationary and had long causality among the variables. Statistical result from Vector Error Correction Model indicated that Total Debt have positive but insignificant effect on Human Development, Foreign Debt have positive and significant effect on Human Development, while Domestic Debt have negative and insignificant effect on Human Development in Nigeria.

Eke and Akujuobi (2021) carried out an empirical study of the effect of public debt on economic growth in Nigeria for a period of 38 years, covering 1981 to 2018. The

ex-post facto research design with a co-integration approach was used in analyzing the data. The study revealed that a positive significance exists in the short run between public debt and economic growth. In addition, it was revealed that external debts have a negatively significant effect on economic growth. Furthermore, the study revealed that eternal borrowings in Nigeria are not optimally used for infrastructural development in Nigeria that will stimulate economic growth.

Abdulkarim and Saidatulakmal (2021) evaluated the influence of government debt on Nigeria's economic growth. Using annual data from 1980 to 2018 and the Autoregressive Distributed Lag approach, Real GDP, domestic debt, external debt, debt service payment, foreign reserve position, interest rate, gross fixed capital creation, and foreign direct investment were the variables of research. External debt was found to be an obstacle to long-term growth while having a growth-enhancing effect in the short run. Domestic debt had a large favorable long-term influence on growth while having a negative short-term impact. Debt service payments slowed growth both long and short term, proving the debt overhang effect. According to the conclusions, the government should invest the borrowed monies in diversifying the economy's productive base.

Sylvester (2020) carried out a study on external debt and economic growth nexus: Empirical evidence from Nigeria. The aim was to examine the relationship between external debt and economic growth for policy analysis on public finance and public debt management. Data collected on the country's external debt and GDP growth rate were analyzed using root test and cointegration long run tests. The results showed that debt overhang variable and crowding out effect variable depress the level of investment affecting adversely, the economic growth of the country.

Ajayi and Edewusi (2020) examined the effect of public debt on economic growth of Nigeria. Specifically, the study determined the impact of domestic debt on the economic growth of Nigeria; assessed the effect of external debt on the economic growth of Nigeria and analyzed the relationship between public debt and the economic growth of Nigeria. Secondary time series data spanning thirty-seven years (1982- 2018) was gathered in the study. Data gathered in the study was estimated using descriptive statistics, unit root test, Johansen co-integration test and vector error correction model. Findings from the study suggests that external debt exerts a negative long run and short run effect on economic growth of Nigeria and domestic debt was ascertained to exert positive long run and short run effect on economic growth of Nigeria. Based on these findings, the study suggested that policy makers should integrate appropriate measures towards ensuring suitable management of domestic debts; government should ensure that contracted national debts are directed towards encouraging investment in the country and government through necessary monitoring committees should ensure that national debts are directed toward the

provision of basic amenities and services required for the development of communities and societies of the nation.

Omodero (2019) tried to find out the effect of external debt on the Nigeria's economic growth. The relevant variables used in the study were nominal GDP, external loan stock, external debt servicing, inflation rate, and exchange rate. The study period covers 1997 to 2017 and the ordinary least square estimation technique of multiple regressions was used for the purpose of data analysis. It was found that the external loan exerts a significant negative effect on economic growth, while the foreign loan servicing has a strong and positive significant effect on GDP growth. Momodu (2015) x-rayed the correlations between loan servicing and growth in GDP of Nigeria. The study adopted ordinary least square multiple regression technique and found that debt servicing has significant impact on economic growth. The study also revealed that debt services to Paris club of creditors, and that debt services to promissory notes holders were positively related to GDP, while debt services to London club of creditors and other creditors showed a negative significant relation to economic growth.

Mhlaba et al. (2019) found a significant negative impact of public debt on economic growth. Saungweme and Odhiambho (2019) study indicated a unidirectional causal relationship from economic growth to public debt in Zambia. Alagba and Eferakeya (2019) found that domestic debts of the Federal government of Nigeria is positive and statistically significant to economic growth of Nigeria while foreign debts contribute less to the economic growth of the country. Cost of debts servicing is significant and has a negative effect on economic growth.

Methodology

This study employs ex post facto research design using time series data for the periods under study (1980-2023). Data were sourced from various issues of Central Bank of Nigeria (CBN) Statistical Bulletins and World Development Indicator (WDI).

Model Specification

HDI = a0 + a1EXDit + a2INDit + a3DTSit + eit

Where;

HDI = Human Development Index
EXD = External Debt
IND = Internal Debt
DTS = Debt Servicing
ào = constant Terms
a1...a3 = coefficient Terms
i = No of Firms
t = Time Period ranging from 1980 – 2023.

The study's parameter estimation will be done based on the Autoregressive Distributed Lag (ARDL) model. Pesaran, Shin and Smith (2001) developed the ARDL bounds testing approach to investigate long-run cointegration relationships among variables. This flexible model, also known as the Autoregressive Distributed Lag (ARDL) approach, involves estimating the following equation to determine the relationship between variables. The bounds testing approach involves estimating the following equation as postulated by Epor (2024):

$$\Delta HDI = \alpha_0 + \alpha_1 HDI_i + \alpha_2 EXD_{t-i} + \alpha_3 IND_{t-i} + \alpha_4 DTS_{t-i} + \sum_{i=1}^{a} \beta_i \Delta HDI_{t-i} + \sum_{i=0}^{b_1} \partial_j \Delta EXD_{t-j} + \sum_{i=0}^{b_2} \varphi_k \Delta IND_{t-k} + \sum_{i=0}^{b_3} \theta_l \Delta DTS_{t-l} + \mu_t$$

where, the terms associated with the summation signs in the above models above (ie, β_i, ∂_j, φ_k, θ_l) represent the short-run dynamic coefficients; whereas $\alpha_1, \alpha_2, \alpha_3, \alpha_4$ are the long-run coefficients, and are the optimum lag lengths and is the white noise error term. In this study, the appropriate lag order of each series of the ARDL model is determined using the Akaike information criterion (AIC).
The hypothesis of the bounds test is specified as:

$$H_0: \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = \alpha_7 = \alpha_8$$
$$H_1: \alpha_1 \neq \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq \alpha_5 \neq \alpha_6 \neq \alpha_7 \neq \alpha_8$$

According to Pesaran, Shin and Smith (2001), The ARDL bounds test, using the Wald test (F-statistic), can be used to determine cointegration or inconclusiveness. If the F-statistics fall below the lower bound critical value, the null hypothesis is accepted, if it exceeds the appropriate upper bound critical values, the null hypothesis is rejected.

Long-run and Short-run ARDL Estimation

Once cointegration is established between public debt and investment, the conditional ARDL long-run model can be estimated as specified:

$$\Delta HDI_v = \alpha_0 + \alpha_1 HDI_{t-i} + \alpha_2 EXD_{t-i} + \alpha_3 IND_{t-i} + \alpha_4 DTS_{t-i} + \epsilon_t$$

Where,

ω_0	=	intercept
α_1–α_4	=	coefficients of long-run estimates
ϵ_t	=	error term of long-run estimates

In the next step, we will obtain the short-run dynamic parameters by estimating an error correction model associated with the long-run estimates. This is specified as follows:

$$\Delta HDI_v = \alpha_0 + \sum_{i=1}^{a} \beta_i \Delta HDI_{t-i} + \sum_{i=0}^{b_1} \partial_j \Delta EXD_{t-j} + \sum_{i=0}^{b_2} \varphi_k \Delta IND_{t-k} + \sum_{i=0}^{b_3} \theta_l \Delta DTS_{t-l} + \boldsymbol{\Omega} ECT_{t-1} + \psi_t$$

Where,

ECT	=	error correction term derived from equation 4, and
Ω	=	the speed of adjustment.
ψ_t	=	error term of the short-run model

The error correction model shows the speed of adjustment needed to restore the long run equilibrium following a short run shock. The **Ω** is the coefficient of the error correction term in the model and must be negative and significant for the return back to long-run equilibrium to hold (Pesara, Shin & Smith, 2001).

Data Analysis and Results

The data employed for this study have been summarized below using descriptive analysis in the form of mean, standard deviation, minimum and maximum. The number of observations (43) represent the years covered by the study. The provided data presents a detailed view of four economic indicators: Human Development Index (HDI), External Debt (EXD), Debt servicing (DTS), and Internal debt (IND), each with distinct statistical characteristics. Human Development Index (HDI), with a mean of 2.51 and a median of 2.29, reflects a generally low level of human development across the observations. The range from 0.57 to 7.05 highlights considerable variation in HDI scores, with a standard deviation of 1.53 indicating moderate dispersion around the mean. The positive skewness of 0.94 suggests that while most HDI values are clustered around the lower end, there are a few higher values that extend the distribution's tail. The kurtosis of 3.43, close to the normal distribution's kurtosis of 3, implies a relatively normal peak, though the Jarque-Bera statistic of 6.70 indicates some deviation from normality, suggesting a distribution that is not perfectly symmetrical.

External Debt (EXD) data show a mean of 16.06 and a median of 9.21, with values ranging from 1.06 to 50.61. The high standard deviation of 15.47 reflects significant variability in external debt levels. The skewness of 0.79 indicates a right-skewed distribution, meaning that there are a few exceptionally high debt values stretching the tail of the distribution. The kurtosis of 2.30 is below the normal level, pointing to a flatter distribution with fewer extreme values. The Jarque-Bera statistic of 5.38 suggests that the distribution deviates from normality, though not as markedly as some other variables.

Table 1: Descriptive statistics

	HDI	EXD	DTS	IND
Mean	2.51	16.06	0.46	10.18
Median	2.29	9.21	0.04	9.50
Maximum	7.05	50.61	3.38	22.99
Minimum	0.57	1.06	0.00	5.02
Std. Dev.	1.53	15.47	0.82	3.74
Skewness	0.94	0.79	2.12	1.01
Kurtosis	3.43	2.30	6.85	4.37
Jarque-Bera	6.70	5.38	58.85	10.63
Observations	43	43	43	43

Source: Authors' computation from CBN Statistical Bulletin

The Debt servicing (DTS) exhibits a mean of 0.46 and a median of 0.04, with a maximum of 3.38 and a minimum of 0.00. This variable shows a high degree of right skewness (2.12), indicating that while most observations are clustered around the lower end, there are a few very high ratios that heavily influence the distribution. The standard deviation of 0.82 underscores the high variability, and the kurtosis of 6.85 reveals a distribution with heavy tails and a pronounced peak, suggesting that extreme values are more common than in a normal distribution. The Jarque-Bera statistic of 58.85 confirms significant deviations from normality, highlighting the presence of a skewed and leptokurtic distribution. Internal debt (IND), with a mean of 10.18 and a median of 9.50, ranges from 5.02 to 22.99. The standard deviation of 3.74 indicates a notable spread in production levels. The skewness of 1.01 points to a moderate right skew, with a distribution that has more values clustered around the lower end but some higher values stretching the tail. The kurtosis of 4.37 suggests a distribution with a higher peak and heavier tails compared to a normal distribution. The Jarque-Bera statistic of 10.63 indicates that the data deviates from normality, though the deviations are less extreme compared to DTS.

Overall, these indicators reveal varying degrees of distributional characteristics, with DTS showing the most pronounced deviations from normality due to its high skewness and kurtosis, while HDI and EXD exhibit relatively more stable distributions with moderate deviations from normality.

Correlation Analysis

The correlation analysis provides insights into the relationships among Human Development Index (HDI), External Debt (EXD), Debt servicing (DTS), and Internal debt (IND). The correlation between HDI and External Debt is 0.4039, indicating a moderate positive relationship. This suggests that higher levels of external debt are somewhat associated with better human development outcomes, although the correlation is not particularly strong. A similar moderate positive

correlation of 0.4136 exists between HDI and Debt-to-Savings Ratio (DTS), implying that as the debt-to-savings ratio increases, there is a tendency for HDI to also rise. This suggests a somewhat positive association, although the strength of this relationship is moderate. However, the correlation between HDI and Industrial Production (IND) is weaker at 0.2396, showing only a slight positive relationship. This indicates that while there is some association between higher human development and increased industrial production, it is relatively weak.

Table 2: Correlation analysis of variables for Nigeria

Correlation Probability	HDI	EXD	DTS	IND
HDI	1			
EXD	0.4039	1		
DTS	0.4136	0.0451	1	
IND	0.2396	0.5075	0.3052	1

Source: Authors' computation from CBN Statistical Bulletin

When examining External Debt (EXD), it shows a very weak correlation of 0.0451 with the Debt-to-Savings Ratio (DTS), suggesting that changes in external debt have minimal impact on the debt-to-savings ratio. In contrast, EXD and IND exhibit a more substantial connection with a correlation coefficient of 0.5075. This moderate to strong positive correlation indicates that as external debt increases, industrial production tends to rise as well, reflecting a more pronounced relationship compared to other variables. Lastly, the correlation between Debt servicing (DTS) and Industrial Production (IND) is 0.3052. This suggests a weak to moderate positive relationship, indicating that higher debt-to-savings ratios are modestly associated with increased industrial production, but the association is not very strong.

Overall, the analysis reveals that EXD and IND have the strongest relationship among the variables, indicating a notable connection between external debt and industrial production. In contrast, the relationships involving HDI show moderate correlations with both EXD and DTS, and weaker connections with IND. The minimal correlation between EXD and DTS suggests little interaction between these two financial metrics.

Stationarity Tests:

The ARDL models don't require pre-testing for unit root problems, as they can accommodate I(0) and I(1) variables or mutually cointegrated variables. However, they don't accommodate series of order 2, necessitating unit root tests (Epor, 2024).

The order of integration of time series was investigated using the Augmented Dickey and Fuller test.

Table 3: Stationarity Tests at Levels and First Difference

Variables	ADF Tests: Levels		ADF Tests First		Order of Integration
	ADF Test Statistic	p-values	ADF Test Statistic	p-values	
HDI	-2.9704	0.1524	-7.7801	0.0000***	*I(1)*
EXD	-3.1070	0.1189	-6.5318	0.0000***	*I(1)*
DTS	-9.3707	0.0000***			*I(0)*
IND	-1.6311	0.7634	-3.5801	0.0007***	*I(1)*

*, **, *** are significance at 10%, 5% and 1%

Source: Authors' computation from CBN Statistical Bulletin

The ADF tests represented in table 3 rejected the null hypothesis of the presence of unit root at levels for debt servicing because its test statistic was greater than 3.0 and produced a probability less than 5%. So DTS series is integrated of order zero, that is *I*(0). On the other hand, the ADF test fails to reject the null hypothesis of no unit root for HDI, EXD and IND at levels. However, they became stationary at first difference, making them integrated of order one, that is *I*(1).

It has been established by Pesaran, Shin and Smith (2001) that the bounds technique allows a mixture of I(1) and I(0) variables as regressors. Based on this ground, we proceed to perform the ARDL bounds test for cointegration.

ARDL Bounds Test for Cointegration

In this section, we proceed to investigate long-run cointegration, where public debt and human development index are tested as the dependent variable. The calculated F-statistics report is in Table 4. The estimated F-statistics of the ARDL bound testing to be compared with the critical value proposed by Pesaran, Shin and Smith (2001).

Table 4: ARDL Bounds Tests for Public investment-public debt models in Nigeria

F-statistic	5.306198	I(0)	I(1)
Sig. level	10%	2.97	3.74
	5%	3.38	4.23
	2.5%	3.8	4.68
	1%	4.3	5.23

Source: Authors' computation from CBN Statistical Bulletin

The study reveals that the public debt-human development model has long-run cointegration, with all F-statistics exceeding critical values from ARDL bounds

tests. When human development was used as the dependent variable, the model provided higher F-statistics values at the 5% significance level (5.306198 > 4.23), indicating that government debts have long-term linkages with human development during 1980-2023.

ARDL Short-run Error Correction and Long-run Model Estimates

The ARDL ECM model output provides valuable insights into the short- and long-run dynamics of the variables in question. The constant (C) is highly significant with a coefficient of 4.8521, indicating a positive baseline effect on the dependent variable when all other variables remain unchanged. This suggests a strong underlying relationship in the data, potentially related to economic or developmental factors, depending on the specific model. The lags of the Human Development Index (HDI) show mixed results. While the first lag (D(HDI(-1)0)) is insignificant, with a probability value of 0.5950, the second and third lags are significant at the 1% and 5% levels, respectively. This indicates that changes in HDI from two and three periods ago positively and significantly impact the dependent variable, with the second lag having a larger effect (0.4061) than the third (0.2829). This delayed effect suggests that improvements in human development take time to influence economic outcomes or other key indicators captured by the dependent variable.

Table 5: The ARDL-ECM for public debt-human development model

ARDL ECM Estimates			ARDL Long-run Estimates		
Variable	Coefficient	Prob.	Variable	Coefficient	Prob.
C	4.8521	0.0000***	EXD	-0.0221	0.3455
D(HDI(-1))	0.0703	0.5950	DTS	-1.8783	0.0122**
D(HDI(-2))	0.4061	0.0036***	IND	0.0459	0.4932
D(HDI(-3))	0.2829	0.0304**	@TREND	-0.1887	0.0001***
D(EXD)	0.0249	0.0307**			
D(DTS)	1.8682	0.0016***			
D(DTS(-1))	1.2090	0.0609*			
ECT(-1)*	-0.6674	0.0000***			
R-squared	0.6552				
Adjusted R-squared	0.5774				
Prob(F-statistic)	0.0000				
Durbin-Watson stat	2.1495				

Source: Authors' computation from CBN Statistical Bulletin

Changes in external debt (EXD) also have a statistically significant positive effect on the dependent variable, though the magnitude is small (0.0249). This could imply that increases in external debt are associated with modest short-term improvements, potentially due to the inflow of foreign capital or investment. Debt servicing (DTS) shows a much more pronounced effect, with the current changes (D(DTS)) being highly significant and having a large positive coefficient (1.8682). The one-period

lag of DTS also has a positive impact, though its significance is marginal at the 10% level. These findings suggest that domestic trade is a key driver of short-term changes in the dependent variable.

The error correction term (ECT(-1)) is highly significant and negative (-0.6674), confirming the existence of a long-run equilibrium relationship between the variables. The coefficient indicates that approximately 67% of any deviation from this long-run equilibrium is corrected in the next period, reflecting a relatively quick adjustment process. This suggests that while short-run fluctuations occur, the system tends to revert to its long-run path fairly quickly. The model itself appears to fit the data well, with an R-squared value of 0.6552, meaning that the model explains about 65.52% of the variation in the dependent variable. The adjusted R-squared, which accounts for the number of predictors, remains high at 57.74%, indicating the robustness of the model. The highly significant F-statistic further supports the overall significance of the model, while the Durbin-Watson statistic (2.1495) suggests no serious issues with autocorrelation in the residuals. Overall, the ARDL ECM model highlights the importance of human development, external debt, and debt servicing in influencing the dependent variable, both in the short run and in maintaining long-run equilibrium. The model's strong fit and quick adjustment to long-run equilibrium provide confidence in its explanatory power.

Diagnostic Tests

To ensure the validity of the estimates of the parsimonious models above, tests to verify the extent of the affirmation or violations of the assumptions of Least Squares estimates (of which the ARDL is part of) were carried out. They include the Breusch-Godfrey Serial Correlation LM, Heteroscedasticity and Jarque-Bera Normality tests.

Diagnostic Tests

Test statistics	p-values	Decision
Jarque-Bera test for Normality	0.6366	Nomarlly distributed
Breusch-Godfrey Breusch-Godfrey Serial Correlation LM Test	0.7803	No serial correlation
Breusch-Pagan-Godfrey Heteroskedasticity Test	0.0577	Homoskedastic distribution

Source: Authors' computation from CBN Statistical Bulletin

Since the p-values of the Jarque-Bera statistics for the public debt-human development model is greater than 0.05 (ie, 0.6366 > 0.05), we conclude that there is no statistical evidence of the presence of no normality in the public debt-human development for Nigeria. Similarly, as the p-value of the Breusch-Godfrey Serial Correlation LM test statistics for the public debt-human development model is greater than 0.05 (ie, 0.7803 > 0.05), we conclude that there is no statistical evidence of the presence of serial correlation in the public debt-human development model

for Nigeria. And finally, as the p-values of the Breusch-Pagan-Godfrey Heteroskedasticity Test statistics for the public debt-human development model is greater than 0.05 (ie, 0.0577 > 0.05), we conclude that there is no statistical evidence of the presence of heteroskedasticity in the public debt-human development model for Nigeria.

Findings

The discussion of findings will be based on the ARDL long-run estimates. The ARDL long-run estimates presented provide insights into the long-term relationships between the human development and public debt variables. In the first, **External Debt (EXD)** has a negative coefficient (-0.0221), suggesting that, in the long run, an increase in external debt slightly reduces the human development variable, though this effect is statistically insignificant with a probability value of 0.3455. This implies that external debt does not have a significant long-term impact on the dependent variable in this model. The negative effect agrees with the earlier finding of Omodero (2019). The fact that external debt (EXD) is statistically insignificant implies that, in the long run, external borrowing does not have a major impact on the dependent variable. This could indicate that Nigeria's debt-financed expenditures may not be effectively translating into productive investments or growth. It highlights the need for better management and utilization of external funds to ensure that borrowing is directed toward growth-enhancing projects.

Debt servicing (DTS) shows a significant negative effect on the dependent variable, with a coefficient of -1.8783 and a probability value of 0.0122, which is significant at the 5% level. This indicates that, in the long run, an increase in domestic trade or supply negatively affects the dependent variable. The relatively large coefficient suggests that debt servicing exerts a strong and adverse influence over time, possibly indicating inefficiencies or structural issues within domestic markets that negatively impact long-term growth or development. This agrees with Ajayi and Edewusi (2020) and Omodero (2019). The significant negative effect of debt servicing on human development in Nigeria suggests that a large portion of government revenue is being diverted away from critical sectors like education, healthcare, and social welfare, limiting investment in human capital. This underinvestment stunts economic growth, exacerbates poverty, and increases inequality, as fewer resources are available to improve education and health outcomes. Over time, this leads to a less productive workforce and weakens long-term development prospects. Additionally, high debt servicing costs constrain the government's ability to implement pro-growth policies, creating a cycle where debt hampers both short-term social welfare and long-term economic competitiveness.

Internal debt (IND) has a small positive coefficient (0.0459) but is statistically insignificant with a probability value of 0.4932. This indicates that internal debt has no significant long-run impact on the dependent variable. The insignificance may suggest that internal debt, as measured in this model, does not play a crucial role in long-term changes or may be influenced by other intervening factors not captured here. This finding is in variance with Abdulkarim and Saidatulakmal (2021). The insignificant positive effect of internal debt on human development in Nigeria suggests that domestic borrowing has not translated into meaningful improvements in areas like education, healthcare, and living standards. This may indicate inefficient use of borrowed funds, with resources not being directed toward sectors that directly enhance human capital. The positive sign, though insignificant, hints that internal debt could have potential benefits if managed effectively, such as reducing reliance on external borrowing and financing social programs. However, the insignificance implies that internal debt alone is insufficient to drive substantial improvements in human development without broader fiscal reforms and effective resource allocation.

Trend is highly significant with a negative coefficient of -0.1887 and a probability value of 0.0001, significant at the 1% level. This implies that over time, there is a general declining trend in the dependent variable. This trend could be driven by various structural factors or external shocks that systematically affect the dependent variable negatively in the long run.

Conclusion

The main objective of the study is to examine the effects of public debt on economic development. Human development index was used to proxy economic development while external debt, internal debt and debt servicing were used to proxy public debt. This study employs ex post facto research design using time series data for the periods under study (1980-2023), it allows for data collection and analysis all aimed at providing solution to the problem under investigation. Data for this study is completely secondary in nature. Data were sourced from various issues of Central Bank of Nigeria (CBN) Statistical Bulletins and World Development Indicator (WDI). The study's parameter estimation will be done based on the Autoregressive Distributed Lag (ARDL) model.

The ARDL long-run estimates show that while External Debt (EXD) has a negative but statistically insignificant effect on human development, Debt Servicing (DTS) significantly harms human development by diverting resources from key sectors. Internal Debt (IND) has a small, statistically insignificant positive effect, suggesting it does not meaningfully impact human development on its own. Overall, high debt servicing costs negatively affect long-term growth, indicating a need for better management of both external and internal debt.

Recommendations

Based on the study's findings, the following recommendations are made. (i) Improve Debt Servicing Management. Implement strategies to better manage debt servicing costs, ensuring that a significant portion of resources is not diverted away from critical sectors like education and healthcare. This could involve negotiating better terms with creditors and prioritizing efficient use of funds. (ii) Optimize Resource Allocation. Reallocate resources towards sectors that directly contribute to human development, such as education and healthcare, to counteract the negative impacts of debt servicing. This will help ensure that essential services are adequately funded despite debt obligations. (iii) Enhance Debt Transparency. Increase transparency in debt management practices to foster trust and ensure that both external and internal debts are managed in a way that supports long-term growth and human development. Regularly report on the impact of debt on development outcomes to keep stakeholders informed.

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