(RESEARCH ARTICLE)

# Pathways to sustainable human development in Nigeria: The role of governance and disaggregated domestic debt

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## Abstract

Research that explicitly focuses on sustainable human development, an integrative approach that captures economic, social, and environmental dimensions remains limited. Most prior studies have examined human development through a narrow lens, often excluding the environmental sustainability component that is vital for intergenerational equity and long-term resilience. This study addresses this gap by employing the Sustainable Human Development Index (SHDI), thereby aligning the analysis with the broader objectives of the Sustainable Development Goals (SDGs). Moreover, while existing literature on public debt has largely centered on external debt, this study shifts focus to domestic debt, which now constitutes a dominant share of Nigeria's total public debt. Recognizing the structural distinctions between debt types, the analysis further disaggregates domestic debt into bank-based and nonbank-based components to assess their differentiated effects. Using quarterly data from 1996 to 2022 and the Nonlinear Autoregressive Distributed Lag (NARDL) model, the study explores both symmetric and asymmetric relationships between public debt, governance quality, and sustainable human development. The findings reveal that positive changes in domestic bank-based debt reduce sustainable human development, whereas negative changes improve it. Conversely, positive shocks to domestic nonbank-based debt enhance sustainable human development outcomes, while negative shocks have a detrimental effect. Governance quality significantly improves sustainable human development, and its interaction with nonbank-based debt both independently and jointly amplifies this positive effect. The study recommends strengthening governance institutions to enhance the developmental impact of public debt and promoting a strategic shift toward nonbank-based domestic borrowing, which has demonstrated a more consistent contribution to sustainable human development.

**Keywords:** Domestic debt; NARDL; domestic bank-based debt; domestic non-bank-based debt; Nigeria; Sustainable human development; SDGs

## 1. Introduction

The pursuit of sustainable human development has become a pressing goal for governments and international institutions alike, as the world confronts a convergence of social, economic, and environmental challenges (Zhang et al. 2023). Sustainable human development refers to a process that enlarges people's choices and improves their quality of life, not only in the present but also for future generations. It extends beyond economic growth to include health and education, as captured in the Human Development Index (HDI), and further extends to environmental sustainability in the more inclusive Sustainable Human Development Index (SHDI) (Verma et al., 2023). However, the realization of this multidimensional development agenda is often constrained by inadequate financial resources and weak institutional capacity, particularly in developing countries (Samour et al., 2024; Nwani et al. 2025; Okere et al., 2025a)

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Domestic debt has increasingly become a key instrument for financing development, especially as access to external credit tightens and global economic uncertainties persist (Nwokoye et al., 2024; Dimnwobi et al., 2025). Governments resort to domestic borrowing to fund infrastructure, health, education, and other social investments necessary for advancing human development (Onuoha et al., 2023a; Onuoha et al., 2023b). Yet, the effectiveness of domestic debt in driving development outcomes remains a subject of debate (Dimnwobi et al. 2023a). On one hand, it can serve as a crucial lifeline for bridging financing gaps; on the other, it can lead to debt overhang, crowding out private investment, distorting interest rates, and triggering macroeconomic instability if not managed prudently (Okere et al., 2023a; Ezenekwe et al., 2023a). At the same time, governance quality plays a vital mediating role in determining whether borrowed funds are efficiently and equitably deployed (Metu et al. 2020). Strong institutions, characterized by transparency, rule of law, accountability, and effective public service delivery, can enhance the development impact of domestic debt by ensuring that resources are allocated to priority sectors and leakages are minimized (Dimnwobi et al. 2023b). Conversely, weak governance may foster corruption, mismanagement, and the diversion of public funds, thereby undermining the intended benefits of debt-financed development programs (Okere et al., 2023b)

Nigeria presents a compelling case study for examining the impact of public debt and governance quality on sustainable human development, given its persistent and multifaceted development challenges. Key indicators reveal a deeply troubling picture. Life expectancy in Nigeria currently stands at just 54 years, significantly below the Sub-Saharan African (SSA) average of 61 years and the global average of 72 years (World Bank, 2023). The country also grapples with high infant and maternal mortality rates, 69 per 1,000 live births for infants, compared to SSA and global averages of 49 and 28, respectively. Maternal mortality is even more alarming, with 1,047 deaths per 100,000 live births, nearly double the SSA average of 536 and almost five times the global average of 223 (World Bank, 2023). Nigeria's health financing system is notably fragile. Out-of-pocket expenditure accounts for 76% of total health spending, the highest rate globally. This starkly contrasts with the SSA average of 30% and the global average of 17%, highlighting deep inequities in access to affordable healthcare services (World Bank, 2023). Economically, Nigeria's performance remains sluggish. The GDP per capita growth rate is just 0.4%, far below the global average of 1.8% (World Bank, 2023), undermining poverty reduction efforts and limiting investments in critical human development sectors. Environmental degradation adds another layer of complexity. Carbon dioxide emissions in Nigeria have risen markedly from 72,769 kilotons in 1990 to 111,978 kilotons in 2020, indicating escalating pollution and mounting environmental pressures (World Bank, 2023). This upward trend poses a serious threat to environmental sustainability and has far-reaching implications for achieving several Sustainable Development Goals (SDGs), particularly SDG 13 (Climate Action), SDG 3 (Good Health and Well-being), and SDG 11 (Sustainable Cities and Communities) (Okere et al., 2025b; Okere et al., 2025c). The growing levels of $CO_2$ emissions contribute to global warming, degrade air quality, and increase the prevalence of climate-related health issues such as respiratory diseases and heat-related illnesses (Dimnwobi et al. 2021; Aladejare & Dimnwobi; 2025; Hammami et al. 2025). In addition, environmental degradation undermines agricultural productivity, food security, and access to clean water critical components of SDGs 2 (Zero Hunger) and 6 (Clean Water and Sanitation) (Dimnwobi et al. 2022a; Dimnwobi et al. 2022b; Okere et al. 2024a). If left unaddressed, these environmental challenges will not only compromise ecological resilience but also hinder Nigeria's broader efforts to achieve inclusive and sustainable human development (Omoju et al. 2024).

Governance quality remains weak, marked by institutional inefficiencies, limited accountability, and widespread public mistrust. Within this context, public debt emerges as a vital financing mechanism for sustainable development. As of September 2023, Nigeria's total public debt stood at ₦87.91 trillion, with domestic debt comprising 63.62% and external debt 36.38% (Debt Management Office, 2023). These figures highlight not only the growing fiscal pressures but also the strategic importance of effective debt utilization in addressing Nigeria's developmental gaps (Ezenekwe et al. 2023a; Nwokoye et al., 2024)

Despite increasing scholarly interest in the nexus between public finance and institutional quality, empirical studies that jointly assess the impact of domestic debt and governance on sustainable human development remain notably scarce. The existing literature predominantly concentrates on either the debt-growth relationship or governance and development separately, often neglecting the potential interaction between these two critical variables. This study addresses this gap by investigating both the independent and interactive effects of domestic debt and governance quality on sustainable human development. By doing so, it offers evidence-based insights to inform more prudent domestic borrowing strategies and to support governance reforms that enhance long-term societal well-being. Furthermore, research that explicitly focuses on sustainable human development, an approach that integrates economic, social, and environmental dimensions is still limited. Most prior studies tend to examine human development from a narrow lens, often omitting the environmental sustainability component that is crucial for intergenerational equity and resilience. This study broadens the analytical scope by incorporating the Sustainable Human Development Index (SHDI), thereby aligning more closely with global development priorities such as the Sustainable Development Goals (SDGs). In addition, much of the empirical literature on public debt has emphasized external debt, frequently

overlooking the growing role of domestic debt. This oversight is particularly concerning in contexts like Nigeria, where domestic debt accounts for a significant 63.62% of total public debt as of September 2023 (Debt Management Office, 2023). Recognizing the structural and operational differences between domestic and external debt including their varying costs, risks, and macroeconomic implications it is essential to assess their distinct impacts on development outcomes (Nwokoye et al., 2024). To this end, we further disaggregate domestic debt into bank-sourced and non-bank-sourced components to capture the nuanced effects of different financing channels. Lastly, the study employed the Nonlinear Autoregressive Distributed Lag (NARDL) model to capture potential asymmetries in the relationship between domestic debt, governance, and sustainable human development. This methodological approach allows for a more nuanced analysis of nonlinear and directional effects, which conventional linear models may fail to detect.

The remainder of this study is structured as follows: Section 2 reviews the relevant literature. Section 3 outlines the methodology and data. Section 4 presents and discusses the empirical results. Finally, Section 5 concludes with key policy recommendations.

## 2. Literature Review

Empirical research on the relationship between public debt, governance quality, and development outcomes has expanded over the years, yet significant gaps remain, particularly regarding the joint and disaggregated effects of debt on sustainable human development. This section reviews key studies in this domain, identifying both consistencies and contradictions, while highlighting areas where further investigation is warranted.

Tamunonimim (2014) examined the correlation between domestic debt and poverty in Nigeria and concluded that domestic debt significantly exacerbates poverty. This finding suggests that domestic borrowing, rather than serving developmental goals, may contribute to worsening living conditions when not effectively managed. Contrastingly, Omodero (2020), analyzing data from 2000 to 2018, found that while external debt had a detrimental impact on per capita income, domestic debt exerted a positive influence. However, this conclusion was challenged by Onyenwife et al. (2022), whose findings indicate that domestic debt had no significant effect on per capita income, whereas external debt positively impacted it. These conflicting outcomes underscore the need for a more nuanced analysis of debt categories and their specific developmental impacts. Furthering the discourse, Ezenekwe et al. (2023b) adopted a broader approach by exploring the link between public borrowing and environmental quality in Nigeria from 1981 to 2021. Their findings suggest that both domestic and external debt contribute to environmental sustainability by reducing environmental degradation. This position aligns with the view that public debt, when efficiently allocated, can facilitate ecological improvements. Nonetheless, this result appears to contradict earlier findings that associate public debt with worsening poverty or declining human development. Nwokoye et al. (2024) offered a more comprehensive investigation into how domestic and external debt affect human development in Nigeria from 1990 to 2021. Using the fully modified ordinary least squares (FMOLS) method, the study found that both types of debt positively influence human capital development. However, the study did not disaggregate domestic debt into its institutional sources, nor did it examine the environmental sustainability component of development, leaving critical gaps in our understanding of debt's role in promoting sustainable human development.

Regarding the role of governance, the empirical literature has consistently underscored its significance in shaping development outcomes. Rahman et al. (2025) found that governance quality positively affects human development in developing countries. Similarly, Pradhan (2011) emphasized that strong institutions and governance frameworks are vital for promoting human development in India. On a global scale, Helliwell et al. (2018) analyzed 157 countries from 2005 to 2012 and revealed that improvements in governance quality lead to measurable gains in life evaluations and overall well-being. Güney (2016) reinforced this position, finding a significant and positive link between governance and sustainable development across 121 countries.

Despite these valuable contributions, the existing literature exhibits three major shortcomings. First, no study has disaggregated public debt especially domestic debt into its constituent components (such as bank-sourced vs. non-bank-sourced debt) to assess their distinct effects on development. Second, the joint and interaction effects of public debt and governance on sustainable human development remain largely unexplored. Most studies analyze these variables in isolation, potentially missing the synergies or trade-offs between fiscal and institutional dynamics. Third, while many studies rely on the Human Development Index (HDI) as a proxy for development, no study have explicitly adopted the more comprehensive Sustainable Human Development framework, which incorporates environmental considerations alongside health and education indicators. In light of these gaps, this study contributes to the literature by examining how domestic debt (disaggregated by source) and governance quality, both independently and interactively, influence sustainable human development. By employing a nonlinear modelling approach, this study

offers fresh insights into how institutional and fiscal instruments can be leveraged to foster inclusive, long-term well-being in Nigeria and similar contexts.

## 3. Methodology

### 3.1. Model Specification

As emphasized by Farooq et al (2023), understanding the impact of domestic debt on sustainable human development is essential as domestic debt levels can significantly influence a country's economic stability, social welfare programs, and overall development trajectory. Thus, our empirical model is specified as follows:

$$SHD_t = \Omega_0 + \Omega_1 OPW_t + \Omega_2 PGR_t + \Omega_4 KPW_t + \Omega_5 DSC_t + \Omega_6 SPW_t + \Omega_7 DD \qquad 1$$

Where DD = domestic debts

Domestic debt could be financed from banks or through the issuance of securities to the public (nonbank-based debts). Disaggregating domestic debts into bank-based debts (DBD) and nonbank-based debts (DND) is important because it provides insights into the sources and implications of debt financing. Bank-based debts, such as loans from financial institutions, can impact interest rates, credit availability, and financial stability. Nonbank-based debts, including bonds and treasury bills, can influence government spending, inflation, and public debt sustainability. By analyzing these components separately, one can assess the specific effects of different types of domestic debt on human development indicators and design targeted policies to enhance development outcomes effectively. Adding governance quality as argued earlier, Equation 1 becomes:

$$SHD_t = \Gamma_0 + \sum_{j=0}^{p} \Omega_1^+ DBD_{t=j}^+ + \sum_{j=0}^{p} \Gamma_1^- DBD_{t=j}^- + \sum_{j=0}^{p} \Gamma_2^+ DND_{t=j}^+ + \sum_{j=0}^{p} \Gamma_2^- DND_{t=j}^-$$

$$+ \sum_{j=0}^{q} \Gamma_3 PGR_{t=j} + \sum_{j=0}^{q} \Gamma_4 KPW_{t=j} + \sum_{j=0}^{p} \Gamma_5^+ DSC_{t=j}^+ + \sum_{j=0}^{p} \Gamma_5^- DSC_{t=j}^- + \sum_{j=0}^{q} \Gamma_6 SPW_{t=j} \qquad 2$$

$$+ \sum_{j=0}^{q} \Gamma_7 QOG_{t=j} + \sum_{j=0}^{q} \Gamma_8 ECG_{t=j} + \sum_{j=0}^{q} \Gamma_{10} DBD*QOG_{t=j} + \sum_{j=0}^{q} \Gamma_{10} DND*QOG_{t=j} + \varepsilon_{3t}$$

Where DBD = domestic bank-based debts, DND = domestic nonbank-based debts, PGR =Population growth rate, KPW = Capital per worker, SPW = Savings per worker, DSC = debt service cost, ECG = Economic growth.

### 3.2. Computation of Sustainable Human Development (SHD)

Sustainable human development is the dependent variable. It is an indicator that measures the overall well-being and quality of life of individuals within a society. It takes into account factors such as education, healthcare, income, and environmental sustainability. SHD was measured using a composite index that incorporates indicators such as life expectancy, education levels, income, and environmental sustainability. The dimensions are human development dimensions (HDD), environmental sustainability dimension (ESD) and economic equity dimension (EED). The composite index was computed as follows.

Following Vyas and Kumaranayake (2016) and Lind (2019), SHD was expressed as a three-dimensional nine variable function:

$$SHD_t = \alpha_1 HDD_t + \alpha_2 ESD_t + \alpha_3 EED_t$$

where

$$HDD_t = \varphi_1 LEX_t + \varphi_2 EDU_t + \varphi_3 PCI_t$$

$$ESD_t = \phi_1 EFP_t + \phi_2 CO2_t + \phi_3 REU_t$$

$$EED_t = \vartheta_1 CPH_t + \vartheta_2 ACW_t + \vartheta_3 AEL_t$$

And

*LEX = life expectancy, EDU = education, PCI = per capita income, EFP = ecological footprint, CO2 = CO2 emissions, REU = renewable energy use, CPH = consumption per head, ACW = access to clean water, AEL = access to electricity.*

The composite index of SHD was computed using a two-stage principal component analysis.

Computation of Quality of governance (QoG): QoG is an aggregate measure reflecting the efficiency and effectiveness of public institutions, the rule of law, and the extent of corruption control. It encompasses six key indicators: voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, and control of corruption. As a determinant of sustainable human development, it is expected that higher QoG positively influences development outcomes. Effective governance ensures that resources are efficiently allocated, policies are properly implemented, and corruption is minimized. This fosters an environment where human capital can thrive, leading to improved health, education, and economic stability.

To compute the overall QoG index, the six indicators will be standardized and then subjected to PCA using the following function:

$$QOG_t = \theta_1 VA_t + \theta_2 PS_t + \theta_3 GE_t + \theta_4 RQ_t + \theta_5 RL_t + \theta_6 CC_t$$

Where

*VA = voice and accountability, PS = political stability, GE = government effectiveness, RQ = regulatory quality, RL = rule of law, and CC = control of corruption*

## 3.3. Estimation Technique

In this study, the Nonlinear Autoregressive Distributed Lag (NARDL) model was employed as the main estimation technique to capture potential asymmetries in the relationship between domestic debt, governance, and sustainable human development. This methodological approach allows for a more nuanced analysis of nonlinear and directional effects, which conventional linear models may fail to detect. However, before proceeding to the estimation stage, several preliminary techniques were applied to ensure the appropriateness and reliability of the data. First, descriptive statistics were utilized to understand the general behavior and distributional characteristics of the dataset. Second, unit root tests, specifically the Augmented Dickey-Fuller (ADF) and Phillips-Perron tests, were conducted to examine the stationarity properties of the time series variables. Conducting a unit root test is crucial to determine the stationarity of time series data, which affects the validity of regression results (Ekesiobi et al., 2016; Obi et al., 2016; Nwokoye et al. 2019a). Third, the Bounds Test approach to cointegration was applied to determine the existence of a long-run equilibrium relationship among the variables. Cointegration testing is important to determine whether a long-run equilibrium relationship exists among non-stationary variables (Dimnwobi et al. 2017; Okere et al 2024b). Finally, Principal Component Analysis (PCA) was used to reduce dimensionality of sustainable human development and governance indicators into a single composite governance index, which was then used in the regression analysis.

## 3.4. Data Sources and Scope

The data scope covers quarterly series from 1996 to 2022. This amounts to amounts to 108 observations. This period is characterized by pronounced government borrowing predicated on the need to invest in human capital development and environmental sustainability. It is also preferred because it allows for the availability of data and meets the statistical consideration for a sufficient degree of freedom that ensures that statistical estimations are not undermined by the curse of dimensionality. The data to be used are secondary time series data obtained from various sources such as the Central Bank of Nigeria (CBN) statistical bulletin, the World Economic Outlook (WEO), Global Footprint Network (GFN) and the World Development Indicator (WDI).

## 4. Results

### 4.1. Preliminary Findings

#### 4.1.1. Descriptive Statistics

Table 1 summarizes these key statistics, providing valuable insights into the data's characteristics and interconnections. This foundational understanding sets the stage for the more detailed econometric analysis to follow. Table 1 shows that the mean value of SHD is 0.52. Given that the SHD was normalized to range between 1 (highest) and 0 (lowest), this suggests that Nigeria's mean SHD is within the lower range. The maximum and minimum SHD were 0.57 and 0.46. Nigeria's low sustainable human development score stems from inadequate healthcare, limited education access, and economic disparities.

**Table 1** Summary of descriptive statistics

|  | Mean | Median | Min | Max | Std |
|---|---|---|---|---|---|
| Sustainable human development, SHD | 0.52 | 0.53 | 0.46 | 0.57 | 0.03 |
| Population growth, PGR(%) | 2.64 | 2.66 | 2.42 | 2.80 | 0.12 |
| Domestic nonbank debt, DNB (%) | 3.68 | 2.62 | 0.73 | 25.21 | 4.58 |
| Domestic bank debt, DBD(%) | 7.65 | 5.96 | 4.05 | 24.14 | 4.28 |
| Debt service cost, DSC(%) | 1.56 | 1.40 | 0.55 | 5.79 | 1.00 |
| Economic growth, ECG(%) | 5.06 | 4.89 | -1.79 | 14.60 | 3.76 |
| Output per worker, OPW(N'000) | 352.20 | 281.62 | 33.88 | 933.65 | 269.15 |
| Saving per worker, SPW(N'000) | 112.54 | 106.03 | 15.90 | 333.51 | 86.38 |
| Capital per worker, KPW(N'000) | 77.67 | 57.94 | 13.29 | 300.94 | 74.70 |
| Quality of governance, QOG | -0.49 | 0.63 | -4.18 | 2.01 | 2.01 |

Source: Researchers' estimation using EVIEW 13

The mean value of domestic bank debt (DBD) as a percentage of GDP 7.65%; the minimum and maximum values are 4.05% and 24.14%. Domestic nonbank debt (DNB) averaged 3.68% with median and standard deviation of 2.62% and 4.58% respectively. The minimum and maximum DND are 4.05% and 24.14% respectively.

Table 1 also shows that the average population growth rate was 2.64%. The minimum value of 2.42% and maximum value of 2.80% shows that the variance is narrow. This is further corroborated by a minimal standard deviation of 0.12%. Nigeria's persistently high population growth rate is primarily due to sustained high fertility rates (5 births per woman) and a youthful age structure. Despite a marginal decline in fertility, population momentum continues to drive growth, with projections estimating 239 million people by 2025 and 440 million by 2050 (Nwokoye et al., 2020; Dimnwobi et al., 2023c). Cultural preferences for large families, limited access to family planning services, and low contraceptive use further contribute to this trend (Ekesiobi & Dimnwobi, 2020). Additionally, improvements in healthcare have reduced mortality rates, leading to a higher number of births over deaths. Addressing these challenges requires comprehensive policies focusing on education, healthcare, and family planning initiatives.

Nigeria's economic growth (ECG) trajectory has experienced significant fluctuations, notably peaking at 14.6% in 2002 and recording its low of -1.79% in 2020. The average growth was 5.06%. In the early 2000s, under President Olusegun Obasanjo, the government implemented economic reforms, including the deregulation of the telecommunications sector (Dimnwobi et al. 2017; Nwokoye et al. 2022). This liberalization attracted private investments, leading to increased competition, improved services, and substantial economic growth (Nwokoye et al., 2019b). From 2000 to 2010, Nigeria's GDP growth averaged 8.6%. Conversely, the growth trajectory started moderating from 2011, averaging 2.7% between 2011 and 2022. In 2020, Nigeria faced its deepest recession since the 1990s, primarily due to the COVID-19 pandemic and a significant drop in oil prices. The pandemic led to a contraction of 6.1% in the second quarter of 2020, with services and industry sectors being particularly affected. Table 1 also shows that the mean output per worker was ₦352,200 per year with minimum value of ₦33,880 per year and maximum value of ₦933,650 per year. In the same vein, saving per worker (SPW) averaged ₦112,540 per year while capital per worker (KPW) was ₦77,670 per year.

*4.1.2. Stationarity Tests*

In regression analysis, the unit root test is crucial for determining whether a time series variable is stationary or has a unit root (Okafor et al. 2022; Azolibe et al. 2025). A unit root indicates a stochastic trend in the variable, meaning it does not revert to a stable mean over time (Dimnwobi et al. 2023d). Table 2 presents the ADF and PP test results. The null hypothesis of a unit root was tested at a 5% significance level. Findings indicate the variables are not integrated at the same order.

**Table 2** Summary of Unit Root Test Results

| | ADF Test | | Philip-Perron (PP)Test | | Assumptions |
|---|---|---|---|---|---|
| **Variable** | **ADF statistics** | **Order of Integration** | **PP statistics** | **Order of Integration** | |
| Sustainable human development (SHD) | -5.463*** | I(0) | -9.619*** | I(0) | Intercept |
| Debt service cost (DSC) | -4.599 | I(1) | -5.139*** | I(1) | Intercept & trend |
| Domestic bank debt (DBD) | -12.089*** | I(1) | -11.228*** | I(1) | Intercept & trend |
| Domestic nonbank debt (DND) | -6.289*** | I(0) | -6.267** | I(1) | Intercept & trend |
| Savings per worker (SPW) | -26.355*** | I(1) | -25.872*** | I(1) | Intercept & trend |
| | | | | | |
| Capital per worker (KPW) | -4.278*** | I(1) | -16.479*** | I(1) | Intercept & trend |
| Population growth rate (PGR) | -7.428*** | I(1) | -7.403*** | I(1) | Intercept & trend |
| Output per worker (OPW) | -3.976** | I(0) | -3.633** | I(0) | Intercept |
| Quality of governance (QoG) | -4.189*** | I(0) | -4.104*** | I(0) | Intercept |
| Economic growth (ECG) | -6.837*** | I(0) | -3.425** | I(0) | Intercept |
| Critical Values (Both ADF and PP) | Constant | | Constant & Trend | | |
| | I(0) | I(1) | I(0) | I(1) | |
| 1% | -3.788 | -3.809 | -4.468 | -4.498 | |
| 5% | -3.012 | -3.021 | -3.645 | -3.658 | |
| 10% | -2.646 | -2.650 | -3.261 | -3.269 | |

Source: Researchers' estimation using EVIEW 13; Note: *,**,*** imply statistical significance at 10%, 5% and 1% levels.

Table 2 presents the results of ADF and PP tests of the series. The results shows that KPW, DSC, SPW, PGR, and DBD are integrated of order one (I[1]) while other variables are integrated of order zero (I[0]). The results of the unit root test shows that most of the series are realization of difference stationary processes. The problem with non-stationary series is that, except they are cointegrated, a regression of such series could yield spurious regression outcome. Thus, we proceed to test for cointegration.

*4.1.3. Cointegration Test*

The bound test is advantageous because it accommodates variables with different integration orders, making it a versatile method for testing cointegration even when variables are not integrated similarly. Moreover, the bound test is suitable for small sample sizes, which is crucial for time series data analysis. The test was performed using the regression models aligned with the research question, and the results are summarized in Table 3. If the F-statistic from

the bound test exceeds the upper bound critical value at the 5% significance level, the null hypothesis of no cointegration is rejected. Conversely, if the F-statistic falls below the lower bound critical value, we cannot reject the null hypothesis. However, if the F-statistic lies between the upper and lower bound critical values, the outcome is indeterminate. The obtained results indicate that the null hypothesis was rejected for each of the five equations.

**Table 3** Summary of Bound Test Results

| Null Hypothesis: | No level relationship | |
|---|---|---|
| | 13 | |
| | 9.04 | |
| | Cointegrated | |
| | Critical Values | |
| | Upper bound I(1) | Lower bound I(0) |
| 10% | 2.77 | 1.76 |
| 5% | 3.04 | 1.98 |
| 2.5% | 3.28 | 2.18 |
| 1% | 3.61 | 2.41 |

Source: Researchers' estimation

## 4.2. Main Results

In this section, the estimates of the impact of domestic debt, governance quality on sustainable human development (SHD) are presented and interpreted. Domestic debt was disaggregated into domestic bank debt (DBD) and domestic nonbank debt (DND). The null hypothesis of symmetric effect was accepted for DBD but rejected for DND. The F-statistic of DBD is 1.1388 with a probability of 0.3008. In other words, the null hypothesis that the coefficient of DBD exerts symmetric effect on SHD cannot be rejected. This suggests that both negative and positive changes in DBD exert similar effects on SHD. On the other hand, the F-statistic of DND is 26.0897 with a probability of 0.0000. This indicates that the null hypothesis of symmetric effect cannot be accepted at 5% level. Thus, we conclude that DND exerts symmetric effect on SHD.

The result obtained shows that positive shocks to domestic nonbank debts (DND_POS) entered the model with a value of 0.220 and a standard error of 0.050 while a negative shock to domestic nonbank debt (DND_NEG) is 0.192 and a standard error of 0.166 (See Table 4). This implies that both coefficients are statistically significant at 5% level. To be precise, one unit of positive shock to DND will increase SHD by 0.220 unit while one unit of negative shock to DND will reduce SHD by 0.192 unit. This suggests that positive change has a stronger impact on SHD.

**Table 4** Summary Estimates for the Impact of domestic debt on SHD

| | Column 1 Level/differenced xxx/D(xxx) | | Column 2 First lag of the differenced D(xxx(-1)) | | Column 3 Second lag of the differenced D(xxx(-2)) | |
|---|---|---|---|---|---|---|
| Variable | Coef | Std | Coef | Std | Coef | Std |
| SHD (-1) | | | 0.052*** | 0.019 | 0.030 | 0.029 |
| D(PGR) | -0.050*** | 0.012 | | | | |
| D(KPW) | 0.056*** | 0.017 | 0.023 | 0.031 | 0.167** | 0.051 |
| D(SPW) | 0.030** | 0.013 | 0.209* | 0.120 | -0.093 | 0.088 |
| OPW | 0.007*** | 0.003 | 0.083 | 0.082 | | |
| D(QOG) | 0.029*** | 0.011 | 0.033** | 0.015 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| D(ECG) | 0.019*** | 0.002 | 0.424 | 0.566 | | |
| D(DBD*QOG) | 0.329** | 0.134 | 0.223** | 0.090 | | |
| DND*QOG | 0.089*** | 0.029 | | | | |
| D(DSC) | 0.042*** | 0.012 | -0.060*** | 0.008 | | |
| D(DBD) | -0.030** | 0.021 | -0.039*** | 0.011 | | |
| DSC_POS (-1)) | | | -0.021*** | 0.008 | | |
| DSC_NEG (-1)) | | | 0.007** | 0.003 | | |
| DBD_POS (-1)) | | | -0.036*** | 0.009 | | |
| DBD_NEG (-1)) | | | 0.038*** | 0.008 | | |
| DND_POS | 0.220*** | 0.050 | | | | |
| DND_NEG | -0.192*** | 0.166 | | | | |
| R-squared | 0.7927 | | | | | |
| Adjusted R-squared | 0.6916 | | | | | |
| S.E. of regression | 4.0089 | | | | | |
| Log likelihood | -33.2038 | | | | | |
| F-statistic | 12.0383 | | | | | |
| Prob(F-statistic) | 0.0000 | | | | | |

| Coefficient symmetry test - H0: Coefficient is symmetric | | | |
|---|---|---|---|
| | F-statistic | Prob | Remark |
| DSC | 14.2766 | 0.0031 | DSC |
| DBD | 1.1388 | 0.3008 | DBD |
| DND | 26.0897 | 0.0000 | DND |

Source: Researchers' estimation using EVIEW 13; Note: *,**,*** indicates statistical significance at 10%, 5% and 1% respectively; xxx stand for relevant variable.

On the other hand, DBD exerts negative impact on SHD both in the current period and one year after. The coefficients of DBD are -0.030 for D(DBD) and -0.039 for D(DBD (-1)). This implies that one unit increase in DBD will lead to 0.030 unit decrease in SHD in the current period and 0.039 unit decrease in the following year. Note that the symmetric nature of the coefficient means that one unit decrease in DBD will lead to 0.030 unit increase in SHD in the current period and 0.039 unit increase in SHD in the following year.

The results highlight that governance quality positive impacts sustainable human development both independently and when interacted with bank sourced debt and non-bank sourced debt. The result also shows that the coefficients of output per worker (OPW) are 0.007 in the current year and 0.083 in the following year. This suggests that one unit increase in OPW will increase SHD by 0.083 unit in the current year and further increase SHD by 0.083 unit in the following year. Buljac-Samardzic et al. (2020) opine that higher productivity means more goods and services are produced efficiently, leading to economic growth. This growth translates into higher incomes, improved living standards, and greater investments in education, healthcare, and infrastructure - key components of human development. Also, higher coefficient of OPW in period t+1 than in period t suggests a stronger impact of productivity on development in the future compared to the past. This could imply that recent improvements in technology, skills, or work processes are making workers more effective over time (Painter et al., 2021). The coefficients of economic growth (ECG) are 0.019 for period t and 0.424 for period t+1. This suggests that one unit increase in ECG will increase SHD by 0.019 in period t and by 0.424 unit in period t+1. Ranis (2004) also obtained evidence that economic growth plays a crucial role in improving sustainable human development. When an economy grows, it generates more wealth, which can be invested in key areas such as education, healthcare, and infrastructure. These investments enhance the quality

of life, increase life expectancy, and provide better opportunities for people to improve their skills and knowledge. Ranis (2004) and Ulucak and Li (2020) noted that a growing economy also creates jobs, reducing poverty and increasing income levels, which in turn, fosters overall human development.

Now, let us talk about the implication of having a higher coefficient of economic growth in period t+1 than in period t. This indicates that the impact of economic growth on human development is becoming more significant over time. It suggests that the economy's recent growth has had a stronger positive effect on sustainable human development compared to previous periods. This could be due to more effective policies, better governance, or advancements in technology and innovation that enhance productivity and resource allocation (Stewart et al., 2018; Ulucak and Li, 2020).

## 4.3. Robustness Check

We employed the bootstrapping technique as a robustness check to validate the reliability of our estimated coefficients. Bootstrapping involves repeatedly resampling the data to create numerous simulated samples, allowing us to assess the stability of our results. This method enhances confidence in the consistency of our findings by reducing the influence of outliers and sample-specific biases.

**Table 5** Bootstrap estimates

| Model 3 | Average of the resampled coefficient | Bias | Bootstrapped Std. Error | bias (p-value) | Remarks |
|---|---|---|---|---|---|
| Null Hypothesis (H0):  Bootstrap bias is not statistically significant | | | | | |
| SHD (-1) | 0.0539 | -0.0023 | 0.0203 | 0.3051 | Do not reject H0 |
| SHD (-2) | 0.0296 | 0.0003 | 0.0288 | 0.4321 | Do not reject H0 |
| D(PGR) | -0.0518 | 0.0013 | 0.0122 | 0.1823 | Do not reject H0 |
| D(KPW) | 0.0563 | 0.0002 | 0.0174 | 0.2604 | Do not reject H0 |
| KPW(-1) | 0.0261 | -0.0035 | 0.0364 | 0.5453 | Do not reject H0 |
| KPW(-2) | 0.1668 | 0.0006 | 0.0508 | 0.7624 | Do not reject H0 |
| D(SPW) | 0.0299 | 0.0001 | 0.0127 | 0.1905 | Do not reject H0 |
| D(SPW(-1) | 0.2076 | 0.0013 | 0.1191 | 0.7869 | Do not reject H0 |
| D(SPW(-2) | -0.0937 | 0.0010 | 0.0887 | 0.3306 | Do not reject H0 |
| OPW | 0.0071 | 0.0000 | 0.0028 | 0.0418 | Do not reject H0 |
| OPW(-1) | 0.0920 | -0.0093 | 0.0917 | 0.3756 | Do not reject H0 |
| D(QOG) | 0.0288 | 0.0001 | 0.0108 | 0.1627 | Do not reject H0 |
| D(QOG(-1)) | 0.0324 | 0.0002 | 0.0144 | 0.2164 | Do not reject H0 |

| | | | | | |
|---|---|---|---|---|---|
| D(ECG) | 0.0186 | 0.0000 | 0.0019 | 0.0279 | Do not reject H0 |
| D(ECG(-1) | 0.4172 | 0.0064 | 0.5579 | 0.3691 | Do not reject H0 |
| D(DBD*QOG) | 0.3276 | 0.0015 | 0.1334 | 0.0004 | Do not reject H0 |
| D(DBD*QOG(-1)) | 0.2224 | 0.0010 | 0.0900 | 0.3503 | Do not reject H0 |
| DND*QOG | 0.0886 | 0.0003 | 0.0290 | 0.4346 | Do not reject H0 |
| D(DSC) | -0.0422 | -0.0001 | -0.0116 | 0.1735 | Do not reject H0 |
| D(DSC(-1) | 0.0589 | 0.0009 | 0.0082 | 0.1230 | Do not reject H0 |
| D(DBD) | 0.0286 | 0.0013 | 0.0111 | 0.1670 | Do not reject H0 |
| D(DBD(-1)) | 0.0375 | 0.0016 | 0.0108 | 0.1617 | Do not reject H0 |
| CUMDP(DSC(-1)) | 0.0120 | 0.0092 | 0.0046 | 0.0696 | Do not reject H0 |
| CUMDN(DSC(-1)) | 0.0069 | -0.0003 | 0.0029 | 0.0429 | Do not reject H0 |
| CUMDP(DBD(-1)) | 0.0358 | 0.0001 | 0.0094 | 0.1416 | Do not reject H0 |
| CUMDN(DBD(-1)) | 0.0382 | 0.0001 | 0.0078 | 0.1172 | Do not reject H0 |
| CUMDP(DND) | 0.2190 | 0.0006 | 0.0503 | 0.7547 | Do not reject H0 |
| CUMDN(DND) | 0.1993 | -0.0074 | 0.0685 | 0.0277 | Do not reject H0 |

Source: Researchers' estimation

The bootstrap result (See Table 5) shows the bias of the average of the resampled coefficients compared with the observed coefficients are not statistically significant. This indicates that the model which estimated the impact of domestic debt on SHD is robust.

## 5. Discussion of Findings

Domestic debt sourced from banks tends to have a negative impact on sustainable human development. Domestic bank loans usually come with higher interest rates and shorter repayment periods compared to external loans. According to Hilton (2021), this places a significant burden on the government's finances, as a substantial portion of the budget must be allocated to servicing the debt rather than investing in development projects. Additionally, domestic banks may prioritize short-term profitability over long-term development, leading to a misallocation of resources. The higher cost of domestic borrowing can crowd out essential public investments, exacerbating socio-economic inequalities and hindering human development.

However, Fseifes and Warrad (2020) emphasized that domestic debt sourced from local banks could lead to crowding out effect. When the government borrows heavily from local banks, it can lead to a crowding-out effect. This occurs because local banks have a limited amount of funds available for lending. When the government absorbs a significant portion of these funds through borrowing, less capital is available for private sector loans. As a result, businesses and individuals may find it more challenging to secure financing for investments and consumption. The increased demand

for funds can also drive-up interest rates, making borrowing more expensive for the private sector. Higher interest rates can deter businesses from investing in new projects or expanding operations, which slows down economic growth and development. Furthermore, with reduced access to capital, private enterprises may struggle to innovate, create jobs, and contribute to overall economic productivity. This diversion of funds from the private sector to government borrowing thus hampers private investment, leading to a slowdown in economic activities and potentially stifling sustainable human development (Fseifes & Warrad, 2020; Hilton, 2021).

On the other hand, the positive impact of domestic debt from nonbank sources on sustainable human development can be linked to the flexibility and diversity of these funding sources. Nonbank sources of domestic debt include government bonds, loans from private investors, and funding from non-governmental organizations. These sources often provide more favorable terms and conditions compared to traditional bank loans (Tung & Nguyen, 2024). For instance, government bonds can be structured to have longer maturities and lower interest rates, reducing the immediate financial burden on the government. This allows for a more strategic allocation of resources towards development projects that yield long-term benefits. Moreover, borrowing from nonbank sources can encourage greater participation and investment from the private sector and civil society in development initiatives. This can lead to innovative solutions and increased accountability, as stakeholders have a vested interest in the success of these projects. The involvement of diverse funding sources also reduces the reliance on a single type of debt, spreading the financial risk and creating a more resilient economic environment (Hausmann & Panizza, 2011).

Hausmann and Panizza (2011) added that government bonds, a form of nonbank debt, offer a stable investment avenue for households. When households purchase these bonds, they receive regular interest payments, boosting their income. This additional income can be invested in education, healthcare, and other essential services, directly contributing to human development. Moreover, government bonds are low-risk investments, ensuring financial security for households. This security allows them to plan and allocate resources more effectively towards long-term development goals, ultimately enhancing the overall quality of life and promoting sustainable growth within the community.

## 6. Conclusion

This study investigated the impact of public debt and governance quality on sustainable human development in Nigeria, using quarterly data from 1996 to 2022 and applying the Nonlinear Autoregressive Distributed Lag (NARDL) model. The empirical findings reveal that the effects of public debt on sustainable human development are asymmetric and depend on the type and direction of the debt change. Specifically, positive changes in domestic bank-based debt were found to reduce sustainable human development, suggesting that increased reliance on bank-based debt may crowd out private investment or be channeled into unproductive expenditures. In contrast, negative shocks to bank-based debt indicating a reduction in this type of borrowing were associated with improvements in sustainable development outcomes. On the other hand, domestic nonbank-based debt showed the opposite trend. Positive changes in nonbank-based debt improved sustainable human development, likely due to its potential to finance long-term investments through more stable and development-oriented mechanisms. However, reductions in this form of debt had a detrimental effect, underscoring the importance of maintaining and strengthening nonbank financing channels. Furthermore, governance quality emerged as a crucial driver of sustainable human development. A stronger governance framework characterized by accountability, transparency, and institutional effectiveness was found to positively influence development outcomes. More importantly, the interaction between governance quality and domestic bank sourced and nonbank-based debt further amplified the positive impact, suggesting that good governance enhances the effectiveness of public debt in promoting human development.

Based on these findings, there is a clear need for policymakers to carefully manage the structure of public debt. Emphasis should be placed on promoting nonbank-based domestic borrowing, particularly in an environment where governance structures are strong and capable of ensuring efficient resource allocation. At the same time, efforts should be made to reduce reliance on bank-based debt, especially in contexts where such borrowing may displace private sector credit or lack transparency. Strengthening governance institutions is essential not only for their direct effect on human development but also for enhancing the productive use of public debt. Good governance acts as a catalyst, transforming public borrowing into effective development outcomes.

Looking ahead, future research could delve deeper into the specific dimensions of governance such as regulatory quality, rule of law, and control of corruption to identify which aspects are most critical in shaping the debt-sustainable development nexus. Comparative studies across countries or regions would also enrich the understanding of how public debt and governance jointly influence sustainable human development in different institutional and macroeconomic contexts. Moreover, extending the analysis to include external debt dynamics and fiscal sustainability measures would

provide a more comprehensive view of how various sources of public finance can be aligned with the goals of sustainable human development.

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## Compliance with ethical standards

*Disclosure of conflict of interest*

No conflict of interest to be disclosed.

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