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Research Article

Public Debt and Capital Development: An Empirical Analysis of Agricultural and Livestock Capital Development in Nigeria

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Abstract

Despite Nigeria's vast expanse of fertile land, the potential of agricultural and livestock capital development to drive sustainable economic growth remains largely underutilized. Although public debt has been extensively examined in relation to overall economic growth, there is limited empirical evidence on how such borrowing specifically supports agricultural and livestock capital development in Nigeria. This study addresses this gap by investigating the effect of public debt on agricultural and livestock capital development as a critical sector of the Nigerian economy from 1994 to 2024. Time-series data were sourced from the National Bureau of Statistics, the Central Bank of Nigeria, the Debt Management Office, the Budget Office of the Federation, and the Ministry of Budget and Economic Planning. The findings reveal a significant relationship between public borrowing, debt servicing costs, and agricultural capital formation. In the short run, debt servicing costs exert a significant positive influence on agricultural and livestock capital development; however, when debt servicing costs are lagged by two to three periods, the relationship becomes negative and remains statistically significant. The study contributes to the literature by emphasizing the need for government and policymakers to ensure the optimal utilization of public debt to strengthen agricultural and livestock capital development, thereby fostering economic growth and improving citizens' standard of living.

Keywords

Agricultural and Livestock, Capital Development, Debts Service Cost, Domestic Debts, Foreign Debts

1. Introduction

Agricultural and livestock capital development play a pivotal role in the Nigerian economy by serving as a primary source of food security, employment, industrial raw materials and foreign exchange earnings. The sector contributes significantly to gross domestic product and remains the dominant livelihood for a large proportion of the rural population, providing jobs for millions and helping to reduce poverty and income inequality. Livestock production in particular supplies essential proteins, supports nutritional security and underpins the growth of agro-allied industries such as dairy, leather and meat processing. Beyond its direct output, agriculture stimulates backward and forward linkages with manufacturing, transportation and trade, creating multiplier effects that drive inclusive economic growth [1, 2]. By enhancing rural incomes, generating export commodities and reducing the country's dependence on oil revenues, sustained agricultural and live-

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stock capital development is critical for diversifying Nigeria's economic base, ensuring macroeconomic stability and achieving long-term sustainable development [18, 19]. Incidentally, despite the role of and importance of agricultural and livestock capital development in Nigeria, successive and present government in Nigeria have failed to make impactful investment in this sector over the years [4, 11, 37].

Generally, a sustained capital development is a prerequisite for long-term economic growth and structural transformation, yet in Nigeria it remains elusive despite decades of public investment and substantial public borrowing [5, 40]. One of the most persistent constraints is the chronic inadequacy of infrastructure, particularly in the energy and agricultural sectors. The country's livestock is grossly neglected and power supply remain erratic and grossly insufficient for the needs of households, industry, and commercial agriculture. According to Oshodi and Onyenebo [51], only about 45 per cent of Nigerians are connected to the national grid, and in some regions power outages are so frequent that as much as 85 per cent of the population effectively lacks reliable electricity. Average daily power supply rarely exceeds four hours, with some localities experiencing days without any electricity at all. Although the country has an installed generation capacity of over 13,000 megawatts, actual transmission seldom reaches 5,000 megawatts [3, 47, 10]. This gap reflects structural weaknesses in gas supply, given that roughly 80 per cent of Nigeria's electricity is generated from gas-fired plants and the remaining 20 per cent from hydro sources.

In Nigeria, agricultural and livestock capital development, historically the backbone of Nigeria's economy and endowed with vast natural resources, has also suffered from these infrastructure deficits [40, 60]. Poor road networks, inadequate irrigation facilities and unreliable power supply have made it difficult for farmers to transport produce to markets and to sustain year-round cultivation, leading to substantial post-harvest losses and suppressed productivity [61]. These structural impediments, coupled with underinvestment in rural infrastructure, have constrained the capacity of agricultural and livestock capital development production to drive broad-based capital development. The agricultural and livestock capital development sector is further undermined by regulatory uncertainty, inconsistent policy implementation, transmission network limitations and long-standing planning deficiencies [58, 61, 63, 64].

Faced with these persistent gaps, successive Nigerian governments have relied heavily on public debt to finance capital projects, including those intended to improve infrastructure and stimulate agricultural transformation. The rationale is that judiciously managed borrowing can bridge fiscal shortfalls, finance strategic investments and ultimately foster economic development [40, 52, 37]. Yet the record of public debt management has been mixed. After independence, successive military and civilian administrations accumulated substantial external debt, often without commensurate improvements in infrastructure or productive capacity. Although the Nigerian government secured significant external debt relief in the early 2000s, subsequent administrations have again increased the debt stock, prompting concerns over debt sustainability, fiscal discipline and the efficiency with which borrowed funds are deployed according to Adole et al. [4].

1.1. Statement of the Problem

Studies have shown that despite decades of public borrowing intended to infrastructure finance (roads, energy projects and agricultural and livestock infrastructure), Nigeria continues to face a severe infrastructure deficit [43, 48, 59]. Epileptic power supply, poorly maintained road networks and limited irrigation facilities continue to undermine both industrial activity and agricultural productivity. According to Petrovic et al. [16, 53], in principle, growing public debt should translate into visible and sustained capital development, yet in practice the relationship between borrowing and capital formation remains ambiguous. Evidently, reported and unprecedented unethical practices, growing corruption, regulatory inefficiencies and poor project implementation raises doubts about whether public debt has been effectively channeled toward agricultural and livestock productive investment [41, 49].

Incidentally, public perceptions of debt have become increasingly skeptical, as successive administrations have accumulated liabilities without generating the structural improvements necessary for economic diversification and poverty reduction and this disconnect between rising debt levels and the slow pace of capital development particularly in agricultural and livestock capital development represents a pressing policy and research challenge [23, 30, 37, 50]. Consequently, understanding whether, and under what conditions, public debt contributes to capital development especially in key sectors such as agricultural and livestock capital development has become critical for designing fiscal and development strategies that can simultaneously promote growth and maintain debt sustainability.

1.2. Gaps in the Literature

Although an extensive body of research has examined public debt and economic performance in Nigeria, empirical studies that focus specifically on the effect of public debt on sectoral capital development remain sparse [19, 22]. Existing scholarship often addresses debt sustainability, macroeconomic growth or broad measures of development, but rarely isolates how public borrowing influences capital formation in agricultural and livestock capital development production sectors that are particularly vulnerable to infrastructural deficits and critical to food security [25, 29, 33]. Moreover, where studies have been conducted, they frequently employ aggregate national indicators without disaggregating capital expenditure or exploring the mechanisms through which debt service obligations may crowd out productive investment [21,

50, 56]. There is also limited empirical evidence on the long-term dynamics between public debt, debt servicing costs and capital development, particularly using robust time-series econometric frameworks. This paucity of sector-specific, evidence-based analysis leaves policymakers without clear guidance on how to balance borrowing with investment priorities. By investigating the effect of public debt on capital development in Nigeria's agricultural and livestock sector, this study addresses a critical gap in the literature and provides insights that can inform fiscal policy, guide debt management strategies and promote sustainable economic transformation.

Consequently, in contributing to knowledge and filling the identified gaps in literature, this study provided the following hypothesis as thus:

Research Hypothesis: Public debt has no significant effect on capital development in agricultural and livestock capital development in Nigeria.

The rest of the study was fashioned in this manner: In section 2, the study considered literature review and theoretical framework. In section 3, the methodology was presented. In section 4, the study considered data analysis, results, interpretation and discussion of findings. The conclusion, recommendations, limitations, and suggestions for further studies.

2. Literature Review and Theoretical Framework

2.1. Agricultural and Livestock Capital Development

Iheme [25] observes that the persistent shortage of affordable housing in many developing countries, including Nigeria, stems largely from weak and poorly implemented low-income housing policies. Although successive governments have pledged to meet basic housing needs at reasonable cost, these commitments remain largely unfulfilled, allowing the housing deficit to deepen. In Nigeria, this challenge is particularly acute, with mounting pressure on government to provide low-cost public housing amid rapid urbanization and rising poverty [44, 46, 36]. The problem is pronounced in the South-South and increasingly in the South-West, where low-income households endure poor living conditions despite various government housing initiatives. Existing programmes have failed not only to meet the growing demand but also to ensure acceptable standards of quality, adequacy and livability [51, 43].

2.1.1. Public Debt

Public debt represents the total financial obligations of a government to domestic and external creditors, incurred to finance development and other public expenditures [36, 47]. In Nigeria, the process of contracting public debt involves collaboration between the Federal Ministry of Finance, Budget and National Planning, relevant Ministries, Departments and Agencies (MDAs), and the Debt Management Office (DMO). Following technical review and legal vetting by the Ministry of Justice, borrowing proposals require approval of both the Federal Executive Council and the National Assembly in line with Section 41 of the Fiscal Responsibility Act 2007 [14, 50]. For analytical purposes, public debt in this study is captured through three key indicators: external (foreign) debt, domestic debt, and debt service cost.

2.1.2. Foreign Debt

Generally, the concept of foreign debt comprises loans obtained from external sources such as bilateral and multilateral creditors including the IMF, World Bank and African Development Bank repayable in foreign currency and usually linked to international benchmarks like the London Interbank Offered Rate [16, 17, 55]. Historically, Nigeria's external debt burden has been shaped by cycles of accumulation and relief; for instance, the government secured a substantial Paris Club debt buyback in the mid-2000s, reducing the external debt stock by about two-thirds and easing fiscal pressure [6, 18]. Nevertheless, external borrowing remains a critical source of development finance while exposing the economy to exchange rate and interest rate risks.

2.1.3. Domestic Debt

Domestic debt refers to financial obligations raised and serviced within a country through instruments such as treasury bills, federal government bonds, and other securities held by the Central Bank, pension funds, deposit money banks, local contractors, and private investors [9, 15]. These liabilities are typically contracted to finance budget deficits, refinance maturing obligations, and support critical government expenditure when revenue falls short. While domestic borrowing offers the advantage of avoiding exchange-rate risk and fostering the development of local financial markets, it is often dominated by short-term instruments, making it susceptible to rollover and liquidity risks [1, 6]. Heavy reliance on such short-term debt can exert upward pressure on domestic interest rates, crowd out private sector investment, and complicate the conduct of monetary policy. Moreover, persistent accumulation of domestic debt may strain fiscal resources through rising interest obligations, with potential implications for inflation and overall financial market stability [8, 10, 22].

2.1.4. Debt Service Cost

Debt service cost encompasses the total principal and interest payments due on both domestic and foreign loans (Kose et al. [28]. Persistent debt servicing requirements have significant macroeconomic implications, including heightened fiscal pressure, potential crowding-out of capital expenditure, and risks of inflation and unemployment [26, 44]. Although external and domestic borrowing remain vital for sustaining

government operations and long-term investment, the challenge lies in ensuring that borrowed funds are efficiently managed and generate sufficient economic returns to offset the rising cost of debt servicing [31, 35, 42].

2.2. Theoretical Framework

2.2.1. Lerner Theory of Public Debt

The Lerner theory of public debt, advanced Lerner through the functional finance framework in 1943 (Aspromourgos [13], provides a critical foundation for understanding how public borrowing can stimulate economic development when effectively managed. Lerner contends that the soundness of fiscal policy should be judged not by the size of the deficit or debt but by its impact on macroeconomic outcomes such as employment, investment, and price stability. Government borrowing, in his view, is an instrument for regulating liquidity and maintaining an optimal interest rate that encourages productive private investment without triggering inflation. For the present study, this theory underscores the idea that public debt if strategically deployed can serve as a tool for financing capital projects such as agricultural and livestock capital development. Rather than perceiving public debt solely as a fiscal burden, the Lerner perspective highlights its potential to mobilize resources for long-term capital formation and to stimulate economic activity, provided debt management ensures that borrowing costs remain sustainable and inflationary pressures are contained.

2.2.2. Infrastructural Development Theory

The infrastructural development theory by Frischmann in the year 1956 [35], reinforces the relevance of public debt by emphasizing the centrality of infrastructure to economic transformation and social progress. The theory posits that physical and social infrastructure ranging from transportation networks and energy systems to healthcare, education, and agricultural facilities forms the backbone of productivity, human well-being, and economic growth [26, 32]. Without adequate infrastructure, economies risk stagnation and are unable to unlock their full productive potential [32, 34]. This perspective is particularly pertinent to Nigeria, where inadequate power supply, poor rural road networks, and limited irrigation systems continue to constrain agricultural and livestock productivity. By linking public debt to infrastructural expansion, the theory supports the study's central argument that judicious borrowing can be instrumental in bridging critical infrastructure gaps, fostering rural development, and promoting sustainable capital formation [34, 33]. Together, these theories provide a robust conceptual lens: Lerner highlights the macroeconomic rationale for well-managed public borrowing, while infrastructural development theory explains why channeling such borrowing toward critical infrastructure is essential for long-term agricultural and economic growth.

2.3. Empirical Review

Fijoh and Iheaturu [22] examined the effect of public debt proxied by internal and external borrowings and interest rates on Nigeria's economic growth, using ex-post facto design and multiple regression. They found that external debt exerts a significant negative influence on GDP, whereas internal debt shows a significant positive effect, stressing the need for prudent borrowing and prioritization of domestic sources. Furthermore, Olajide et al.[47], applying a two-regime threshold ARDL model on annual data from 1981–2021, reported that debt ratios below identified thresholds positively affect growth, but ratios above those levels have a significant negative impact; only domestic debt proved sustainable both in the short and long run. Similarly, Okere et al. [45], using an ARDL approach, observed that past values of GDP, gross fixed capital formation, external debt and debt service repayments positively influenced economic growth, while the exchange rate and domestic debt had negative but mostly insignificant effects.

At the continental level, Ndoricimpa [38] established a public debt threshold of about 62–66% of GDP for Africa, beyond which debt begins to harm growth. Ajayi and Edewusi [7] analyzing 35 years of Nigerian data, found domestic debt detrimental to economic progress and recommended stricter internal debt management and repayment strategies. In contrast, Okon et al. [46] reported that both domestic and foreign debt significantly and positively influence gross fixed capital formation, while Omodero [49] observed that foreign debt depresses per-capita income but domestic debt has a positive effect. George-Anokwuru and Inimino [23] further showed that external debt and its servicing reduce economic growth, despite a positive role of exchange rate movements.

Similarly, Sylvester [58] highlighted debt overhang and crowding-out effects as key channels through which external debt hampers investment and growth. Yet, Nzeh [43], employing ARDL bounds testing, demonstrated that public debt can promote growth in both the short and long term, provided it remains within an optimal threshold. Broader evidence from Ehikioya et al. [30], using panel GMM for 43 African countries, confirmed a long-run equilibrium relationship between external debt and growth but warned that exceeding critical thresholds reverses the benefits.

Taken together, these studies reveal no uniform conclusion: while a number document the growth-retarding effects of excessive external debt [22, 23, 38, 58], others highlight the potential growth-enhancing role of domestic debt or of external debt kept within sustainable limits [43, 46]. This mixed evidence underscores the central policy implication that the impact of public debt on economic performance is strongly conditional on debt composition, prudent management, and adherence to sustainable thresholds.

3. Methodology

This study investigates the effect of public debts on capital development from the perspective of agricultural and livestock capital development deficits in Nigeria. The study presents the research design, population and sample techniques, model specification and measurement of variable in this manner:

3.1. Research Design

This study employs an *ex-post facto* research design to investigate the effect of public debt on capital development in Nigeria using thirty one years of time-series data covering the period 1994–2024. The *ex-post facto* approach is appropriate because it examines historical relationships between the dependent and independent variables without any manipulation of data or experimental control. By focusing on observed trends over time, this design enables the researcher to assess how variations in public debt captured through domestic debt, foreign debt and debt service costs have influenced key indicators of capital development such as federal expenditure on power, education, healthcare, transportation, and agricultural and livestock capital development.

3.2. Population of the Study

The population comprises all federal government capital expenditure subheads during the thirty-year study period. Specifically, nine major capital expenditure categories and thirty-nine indicative expenditure ceilings constitute the data frame. The chosen timeframe captures a critical span in Nigeria's economic history marked by both growth cycles and fiscal constraints, providing a robust context for assessing the long-term relationship between public debt and capital development.

3.3. Sample Size and Sampling Technique

Purposive sampling is adopted to identify and extract the most relevant data from the population. This non-probability sampling method is suitable because it allows the researcher to focus on those capital expenditure subheads that accurately represent federal investment in key development sectors. The data, drawn from authoritative secondary sources such as the National Bureau of Statistics, the Budget Office of the Federation, the Ministry of Budget and Economic Planning, and the Central Bank of Nigeria Statistical Bulletin, provide a reliable and comprehensive basis for empirical analysis.

3.4. Model Specification

The dependent variable of the study is agricultural and livestock capital development (ALCD). The independent variable of the study is public debts and its measuring proxies are domestic debts (DDT), foreign debts (FDT) and debts service cost (DSC).

These variables translated to the following:

$$Yt = \beta 0 + \beta 1Xt + \beta 2X2t + \mu t \quad (1)$$

$$ALCDt = \beta 0 + \beta 1DDTt + \beta 2FDTt + \beta 3DSCt + \mu t \quad (2)$$

Where:

ALCD = Agricultural and livestock capital development, DDT = Domestic debts

FDT = Foreign debts, DSC = Debts service cost

The study presents measurement of variables in Table 1.

Table 1. *Measurement of Variables.*

Variables	Type	Measurement	Sources
Agricultural and livestock capital development (ALCD)	Dependent Variable	Total amount capital expenditure incurred on agriculture and livestock by government for the period under consideration (1994-2024).	Ekpo [20]
Domestic Debt (DDT)	Independent Variable	Total Amount borrowed locally for a given period of time.	Asogwa [12]
Foreign Debt (FDT)	Independent Variable	Total Amount borrowed Total Amount borrowed for a given period of time.	Hurley et al. [24]
Debt Service Cost (DSC)	Independent Variable	Total cost of finance on domestic and foreign debts for a given period of time.	Kose et al. [28]

4. Data Analysis, Results and Discussions

Table 2 presents the results of the Autoregressive Distributed Lag (ARDL) model for examining the relationship between public debt, debt service costs, and agricultural and livestock capital development (LACD) in Nigeria over the

period from 1994 to 2024. The model assesses both the short-run dynamics and long-run equilibrium between these variables. In this section, the study provided a detailed interpretation of the results, focusing on the significance of the coefficients, the statistical values, and the overall diagnostic tests, while considering the economic implications of the findings.

The combined equation can be structured as:

The ARDL model for the effect can be expressed as follows:

$$LALCD_t = C + \beta_1 LPBD_t + \beta_2 LDSC_t + \sum_{i=1}^{1} \phi iD(LPBD_t + \sum_{j=1}^{3} \psi jD(LDSC_{t-j}) + \epsilon_t$$

Substituting the Coefficients:

Substituting the specific coefficients derived from the ECM and Levels Equation into the equation yields: 0.432; 0.349.

$$LALCD_t = -0.596LPBD_t - 0.2681.449_t + \epsilon_t$$

Long-Run Equation:

Short-Run Equation:

$$LALCD_t = 2.139 + 0.351D(LALCD_{t-1}) + 0.971D(LDSC_t) - 0.622D(LDSC_{t-1}) - 1.049D(LDSC_{t-2}) - 0.937D(LDSC_{t-3}) - 0.758CointEq_{t-1} + \epsilon_t$$

Table 2. *Auto regression Distributed Lag Model (ARDL).*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Error Correction Regression				
Constant	2.139	0.443	4.830	0.000
D(LALCD(-1))	0.351	0.191	1.842	0.083
D(LDSC)	0.971	0.471	2.062	0.055
D(LDSC(-1))	-0.622	0.435	-1.432	0.170
D(LDSC(-2))	-1.049	0.416	-2.518	0.022
D(LDSC(-3))	-0.937	0.417	-2.249	0.038
CointEq(-1)*	-0.758	0.165	-4.588	0.000
Long Run Equation				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LPBD	-0.596	0.580	-1.028	0.318
LDSC	1.449	0.418	3.468	0.003
Diagnosis tests:				
ARDL Bound Test @ 5%: F – stat = 6.278 (I (0) = 3.79, I (1) = 4.85				
R2 = 0.567 Adj. R2 = 0.431; F- stat = 4.153 (0.008)				
$X^2_{JB} = 3.157$ (0.206); $X^2_{LM} = 1.146$ (0.344); $X^2_{BPG} =$ 0.497 (0.842) $X^2_{RR} = 2.261$ (0.139) STABILITY: CUSUM & CUSUMSQ				

Source: Researcher's Computation (2025) from E-Views 12. Notes: SE: standard error; $X^2_{JB}; X^2_{LM}; X^2_{BPG}$; X^2_{RR} represent Jarque-Bera normality test, LM test for serial correlation, Breusch-Pagan Godfrey test for heteroscedasticity, and Ramsey Reset test for linearity respectively. I(0) and I(1) represent lower and upper bound, respectively. While the respective probability values are in bracket; ECT: Error correction term. The dependent variable is Natural Logarithm of Agricultural and livestock capital development (LALCD). The independent variables are Natural Logarithm of public debt (LPBD) and Natural Logarithm of debts service costs (LDSC) for 31 years period from 1994 to 2024 in Nigeria. The estimation process was facilitated using E-views 12.0.

4.1. ARDL Bounds Test Result

The ARDL bounds testing procedure yielded an F-statistic of 6.278, which exceeds the 5 per cent upper-bound critical value of 4.85. This outcome provides clear evidence of a long-run cointegrating relationship among public debt, debt service costs and agricultural and livestock capital develop-

ment in Nigeria. In practical terms, the result implies that these variables are not drifting apart over time but are jointly determined, moving together in a way that reflects a stable equilibrium relationship in the long run. This long-run association is essential for understanding how fiscal policies and borrowing strategies translate into sustained capital development within the agricultural sector, as it shows that shocks to any of the variables eventually dissipate and the system returns to a long-term equilibrium path.

4.2. Error Correction Model (ECM) Result

The error-correction model (ECM) further supports the existence of a stable long-run relationship and provides insight into the speed of adjustment when short-term shocks occur. The error-correction term, CointEq(–1), has a coefficient of –0.758 with a standard error of 0.165, a t-statistic of –4.588 and a p-value of 0.000. The negative and highly significant coefficient is consistent with theory and indicates that approximately 75.8 per cent of any short-run disequilibrium is corrected within a single period. This relatively fast adjustment confirms that deviations from the long-run equilibrium are not persistent and that the model rapidly reverts to its steady-state relationship. The constant term in the short-run equation is 2.139 (t = 4.830, p = 0.000), showing a positive baseline influence on agricultural and livestock capital development, although this constant is best interpreted in the context of the overall dynamic model rather than in isolation.

4.3. Short-run Dynamics

Short-run dynamics reveal important transitional effects. The one-period lag of agricultural and livestock capital development, D(LALCD(–1)), carries a coefficient of 0.351 with a p-value of 0.083, which is marginally significant at the 10 per cent level. This suggests that past investment continues to exert a positive, though relatively weak, influence on current agricultural capital development. The contemporaneous change in debt service costs, D(LDSC), has a coefficient of 0.971 and a p-value of 0.055, indicating a positive short-term impact that is also significant at the 10 per cent level. This finding may reflect the government's tendency to increase capital spending in agriculture when faced with higher debt-servicing obligations, perhaps to stimulate economic activity or to offset fiscal pressures. However, the effect of lagged debt service costs is not uniformly positive. The first lag, D(LDSC(–1)), is negative but statistically insignificant (p = 0.170), whereas the second and third lags, D(LDSC(–2)) and D(LDSC(–3)), have coefficients of –1.049 (p = 0.022) and –0.937 (p = 0.038), respectively, both significant at the 5 per cent level. These results imply that while rising debt service costs may initially encourage investment in agricultural and livestock capital development, the cumulative fiscal strain manifests as a drag on capital development after two to three periods.

4.4. Long Run Equation

The long-run equation offers a more stable perspective on the relationship between public debt and agricultural capital development. The coefficient for public debt (LPBD) is –0.596, with a t-statistic of –1.028 and a p-value of 0.318, indicating a negative but statistically insignificant long-run effect. This suggests that, over time, increases in overall public debt do not exert a decisive influence on capital development in the agricultural and livestock capital development sector. By contrast, debt service costs (LDSC) exhibit a strong positive and statistically significant long-run impact, with a coefficient of 1.449, a t-statistic of 3.468 and a p-value of 0.003. This finding highlights the critical role of debt service dynamics in shaping long-term agricultural investment: sustained increases in debt service costs may compel the government to channel resources into agricultural and livestock capital development as part of a broader strategy to stimulate growth and reduce fiscal vulnerability. The long-run results therefore indicate that it is not the sheer size of public debt but rather the management of debt servicing that carries significant implications for agricultural capital development.

4.5. Diagnostic Test

Comprehensive diagnostic tests confirm the robustness of the estimated model. The Jarque–Bera statistic of 3.157 with a p-value of 0.206 indicates that the residuals are normally distributed, satisfying a key assumption for valid inference. The LM test for serial correlation yields a statistic of 1.146 with a p-value of 0.344, showing no evidence of autocorrelation in the residuals. The Breusch–Pagan–Godfrey test for heteroscedasticity reports a statistic of 0.497 with a p-value of 0.842, suggesting that the variance of the residuals is constant across observations. Furthermore, the Ramsey RESET test statistic of 2.261 with a p-value of 0.139 provides no indication of model misspecification or omitted variables. The coefficient of determination (R^2) is 0.567, and the adjusted R^2 is 0.431, indicating that the model explains about 56.7 per cent of the variation in agricultural and livestock capital development, or 43.1 per cent after adjusting for the number of explanatory variables. Although the explanatory power is moderate, the overall F-statistic of 4.153 with a p-value of 0.008 confirms that the joint influence of public debt and debt service costs on agricultural capital development is statistically significant at the 5 per cent level. Consequently, the null hypothesis that public debt has no significant effect on agricultural and livestock capital development in Nigeria is rejected.

4.6. Discussion of Findings

The findings from this study provide several noteworthy insights into the relationship between fiscal variables and agricultural development. In the short run, the positive effect of current debt service costs on agricultural capital develop-

ment suggests that rising debt obligations may initially stimulate government investment in agriculture, perhaps as a countercyclical measure to sustain growth and stabilize the economy. However, the significant negative coefficients on the second and third lags of debt service costs indicate that these positive effects dissipate and eventually reverse as the burden of servicing debt accumulates. The highly significant error-correction term underscores the capacity of the system to restore equilibrium after short-term shocks, reinforcing the stability of the long-run relationship. Over the long run, public debt as a whole does not significantly influence agricultural and livestock capital development, whereas debt service costs have a strong and positive effect. This suggests that the fiscal discipline and policy responses triggered by higher debt service obligations may play a more decisive role in shaping long-term investment patterns than the absolute level of debt.

The results align with the conclusions of previous studies who collectively argue that debt service dynamics can stimulate capital development when managed effectively [6, 7, 9, 39, 40, 48, 57, 60, 61]. For example, Ushie [60] found that while external and domestic debt exerted a negative long-term effect on infrastructure development in Nigeria, exchange and interest rates contributed positively, underscoring the complexity of fiscal and macroeconomic interactions. Conversely, other studies have documented insignificant relationships between public debt and capital expenditure [18, 23, 27, 30, 54, 62]. Audu and Zaccheaus [14], for instance, observed that both domestic and external debt had insignificant effects on Nigeria's capital expenditure, despite employing robust econometric techniques including the Vector Error Correction Model.

Taken together, these results suggest that in the Nigerian context it is the pattern and burden of debt service, rather than the mere accumulation of public debt that exerts the most meaningful influence on agricultural and livestock capital development. The government's ability to manage debt servicing obligations appears to shape its incentives and capacity to invest in agricultural infrastructure and human capital. This underscores the policy relevance of maintaining a prudent debt service profile, ensuring that rising debt obligations translate into long-term productive investments rather than constraining fiscal space for critical capital development.

5. Conclusion, Recommendations, and Suggestions for Further Studies

5.1. Conclusion

This study investigated the effect of public debt on capital development in Nigeria's agricultural and livestock sector using the Autoregressive Distributed Lag (ARDL) framework. The empirical results yield important insights into the dynamic relationship between public borrowing, debt service costs and agricultural capital formation. In the short run, debt service costs exert a significant positive effect on agricultural and livestock capital development. However, when debt service costs are lagged by two and three periods, the relationship turns negative and remains statistically significant, implying that while debt servicing may initially stimulate agricultural investment, the persistence of such obligations eventually constrains capital formation. In the long run, the overall stock of public debt does not exert a statistically significant influence on agricultural and livestock capital development, whereas debt service costs retain a strong positive and significant effect. These findings suggest that the manner in which debt is serviced, rather than the absolute size of public debt, is more critical to sustaining agricultural investment. Short-term gains from debt servicing may therefore mask the longer-term risk of crowding out public resources needed for continued capital development.

5.2. Policy Implications

The findings have important implications for the Ministry of Agriculture and Rural Development, the livestock sub-sector and national economic policymakers. Achieving sustainable food security and improving the standard of living will remain a challenge so long as a substantial share of the national budget is absorbed by debt servicing. Although the results indicate that debt service costs can positively influence agricultural investment in the short term, the absence of a significant long-run impact of public debt itself highlights the urgent need to re-examine Nigeria's fiscal and debt-management strategies. Policy frameworks must be redesigned to ensure that public borrowing translates into measurable and sustained capital development in agricultural and livestock capital development production. This will require stronger institutional mechanisms for curbing corruption and enhancing the efficiency of public resource utilization. Rather than relying on ever-increasing borrowing and allocating a growing share of resources to debt servicing, government must create an enabling environment in which public debt supports targeted agricultural investments that strengthen food production, boost productivity and secure the sector's long-term growth. These insights are particularly valuable for policymakers seeking to balance the need for external and domestic borrowing with the imperative of protecting capital budget allocations for the agricultural economy.

5.3. Recommendations

In light of these results, it is recommended that the Debt Management Office undertake a comprehensive review of existing debt service policies and advise the government on strategies to reduce the long-term burden of debt servicing on capital expenditure. Budgetary priorities should be recalibrated to favour capital investments in agricultural and livestock capital development over recurrent spending so that

public borrowing yields tangible improvements in productive capacity. Fiscal discipline must be reinforced through stricter oversight and anti-corruption mechanisms to ensure that borrowed funds and debt-servicing arrangements generate developmental outcomes rather than merely financing recurrent obligations. Moreover, Nigeria should diversify the sources of agricultural financing beyond conventional public borrowing by encouraging public–private partnerships, issuing sector-specific agricultural bonds and exploring concessional financing windows. These complementary funding options would reduce excessive dependence on public debt and enhance the sustainability of agricultural capital development.

5.4. Limitations and Directions for Future Research

This study offers new empirical insights into the relationship between public debt and capital development, yet several limitations should be noted. The analysis covered only thirty years because more detailed historical data were unavailable, and in some cases records of capital expenditure across key ministries were incomplete or inconsistently reported. At times, budget items were merged under broad headings, making it difficult to separate agricultural or livestock-specific spending, while periodic mergers and reorganizations of ministries further complicated consistent tracking of expenditures. Despite these challenges, the researcher overcame many of the data gaps with the cooperation of academic colleagues, civil service contacts and the Debt Management Office, which provided critical information. These limitations highlight the need for further inquiry. Future studies could draw on longer and more finely disaggregated datasets as they become available, undertake sectoral or state-level analyses to capture regional differences, and examine how public debt interacts with foreign direct investment and agricultural productivity. Such work would strengthen the evidence base for designing debt and fiscal policies that both preserve macroeconomic stability and foster sustainable agricultural transformation.

Abbreviations

ALCD	Agricultural and Livestock Capital Development
ARDL	Autoregressive Distributed Lag
DDT	Domestic Debts
DMO	Debt Management Office
DSC	Debts Service Cost
ECD	Error Correction Model
FDT	Foreign Debts
GDP	Gross Domestic Product
IMF	International Monetary Fund
MDAS	Ministries, Departments and Agencies

Author Contributions

Aguguom Theophilus Anaekenwa is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The author declares no conflicts of interest.

References

[1] Abille, A. B., & Kiliç E. (2023). Asymmetric modeling of the public debt–economic growth nexus in Ghana. Review of Economics and Political Science, 8(2), 108-122. https://doi.org/10.1108/REPS-03-2022-0022

[2] Adegbie, F. F., Ajayi, A., Aguguom, T. A., & Otitolaiye, E. D. (2023). Diversification of the economy, tax revenue and sustainable growth in Nigeria. International Journal of Innovative Research and Scientific Studies, 6(1), 115-127. https://doi.org/10.53894/ijirss.v6i1.1114

[3] Adegbie, F. F., Otitolaiye, E. D., Aguguom, T. A., & Ajayi, A. (2022). Public debt. management and economic growth in Nigeria. Wseas Transactions on Business and Economics. 9(92), 1046-1060. https://doi.org/10.37394/23207.2022.19.92

[4] Adole, S. O., Abraham, O. I., & Sunday, E. A. (2021). Government expenditure and economic growth in Nigeria. Journal of Economics and Finance, 12(1), 28–38. https://doi.org/10.9790/5933-1201022835

[5] Aguguom, T. A. (2019). Strategic financial intervention of donor agencies to poverty eradication postulates in Africa. European Journal of Accounting, Finance, and Investment, 5(6), 36-47.

[6] Ajah, B. A & Jacob, Z. (2021). Effect of public debt on capital expenditure in Nigeria. International Journal of Economics, Commerce and Management, 9(11). https://ijecm.co.uk/wp-content/uploads/2021/11/9112.pdf

[7] Ajayi, I., & Edewusi, D. (2020. Effect of public debt on economic growth of Nigeria: An empirical investigation. International Journal of Business and Management Review, 8(1), 18-38. https://doi.org/10.37745/ijbmr.vol8.no1p18-38.2020

[8] Akanbi, A., Uwaleke, U., & Ibrahim, U. (2022) Effect of external debt service on economic growth in Nigeria. Journal of Service Science and Management, 15(4), 437-451. https://doi.org/10.4236/jssm.2022.154026

[9] Alade, M. E. (2022). Government revenue, public expenditure, and debts in Nigeria. Fuoye Journal of Accounting and Management, 5(1), 253-271. www.fjam.fuoye.edu.ng

[10] Ale, S. A., Islam, M. S., & Nessa, H. T. (2023). Does external debt affect economic growth: Evidence from South Asian countries? International Journal of Economics and Financial Issues, 13(1), 65-83. https://doi.org/10.32479/ijefi.13527

[11] Ariyibi, M. E., Akingunola, R., & Asogba, I. O. (2023). Foreign debt and infrastructural development in Nigeria. Journal of Business, 12(2), 23-36 https://doi.org/10.31578/job.v12i2.239

[12] Asogwa, R. C. (2005). Domestic government debt structure, risk characteristics and monetary policy conduct: Evidence from Nigeria [Working Paper No. 2005/01]. Department of Economics and Financial Studies, Fountain University.

[13] Aspromourgos, T. (2018). Keynes, public debt, and the complex of interest rates. Journal of Historical Economic Thought, 40(5), 493–512. https://doi.org/10.1017/S1053837217000578

[14] Audu, A. B., & Zaccheaus, Z. (2021). Effect of public debt on capital expenditure in Nigeria. International Journal of Economics, Commerce and Management, 9(11), 19-29. http://ijecm.co.uk/

[15] Babu, J. O., Kiprop, S., Kalio, A. M., & Gisore, M. (2015). Effect of domestic debt on economic growth in the East African Community. American Journal of Research Communication, 3(9), 73-95. www.usa-journals.com

[16] Ballestar, M. T., Camiña, E., & Díaz-Chao, A. (2021). Torrent-Sellens, J. Productivity and employment effects of digital complementarities. Journal of Innovative Knowledge, 6(2), 177–190. https://doi.org/10.1016/j.jik.2020.10.006

[17] Dey, S. R., & Tareque, M. (2020). External debt and growth: Role of stable macroeconomic policies. Journal of Economic Finance and Administrative Science, 25(5), 185–204. https://doi.org/10.1108/JEFAS-05-2019-0069

[18] Dibia, D., & Ayokunle, P. (2020). External debt, domestic debt and economic growth in Nigeria. Advances in Economics and Business, 8(2), 85–94. https://doi.org/10.13189/aeb.2020.080202

[19] Efanga, U. O., Etim, R. S., & Mfon, J. S. (2020). Public debt and economic development in Nigeria. IIARD International Journal of Banking and Finance Research, 6(1), 1-16

[20] Ekpo, A. (2019). Housing deficit in Nigeria: Issues, challenges and prospects. CBN Economic and Financial Review, 57(4), 177-188. https://dc.cbn.gov.ng/efr

[21] Fagge, M., & Ibrahim, T. (2018). Public debt management in Nigeria: The impacts of institutional changes after exiting from the Paris Club in 2006. Islamic University Multidisciplinary Journal (IUMJ), 5(2), 52-62. Online at https://mpra.ub.uni-muenchen.de/100364/

[22] Fijoh, K. O. & Iheaturu, B. I. (2023). Empirical analysis of the effect of public debt on the economic growth of Nigeria. Economics and Business Quarterly Reviews, 6(1), 1-18. Available at SSRN: https://ssrn.com/abstract=4320307

[23] George-Anokwuru, C. C. & Inimino, E. E. (2022). External debt and economic growth in Nigeria. International Journal of Research and Innovation in Social Science, 4(4), 254-265.

[24] Hurley, M., Morris, S., & Portelance, G. (2018). Examining the debt implications of the Belt and Road Initiative from a policy perspective. Center for Global Development, 1-40. RePEc: cgd: ppaper: 121.

[25] Iheme, C. (2020). Factors for the implementation of affordable federal public housing policies in south-south region of Nigeria (Doctoral dissertation, University of Port Harcourt).

[26] Ijirshar, V. U., Joseph, F., & Godoo, M. (2016). The relationship between external debt and economic growth in Nigeria. International Journal of Economics & Management Sciences, 6(1), 1–5. https://doi.org/10.4172/2162-6359.1000390

[27] Juergen, A. (2019). Public debt and economic growth nexus: A dynamic panel ARDL approach. MPRA Working Paper No. 96023. https://mpra.ub.uni-muenchen.de/96023/1/MPRA_paper_96023.pdf

[28] Kose, M. A., Ohnsorge, F., & Sugawara, N. (2020). Benefits and costs of debt: The dose makes the poison. World Bank Group.

[29] Kallal, R., Haddaji, A., & Ftiti, Z. (2021). ICT diffusion and economic growth: Evidence from the sectorial analysis of a periphery country. Technol. Forecast. Soc. Change, 162(4), 120-113. https://doi.org/10.1016/j.techfore.2020.120403

[30] Ehikioya, B. G., & Omankhanlen, A. E. (2020). Dynamic relations between public external debt and economic growth in African countries: A curse or blessing? Journal of Open Innovation: Technology, Market, and Complexity, 6(3), 1-16. https://doi.org/10.3390/joitmc6030088

[31] Kranke, M. (2022). Tomorrow's debt, today's duty: debt sustainability as anticipatory global governance. Global Society, 36(5), 223–239. https://doi.org/10.1080/13600826.2021.2021152

[32] Kwawu, W., & Laryea, S. (2013). Incentive contracting in construction, in Smith, S. D., & AhiagaDagbui, D. D. (Eds), Procs 29th Annual ARCOM Conference, 2-4 September. Association of Researchers in Construction Management, Reading, UK, 729-738.

[33] Lee, M. T., Suh, I. (2022). Understanding the effects of environment, social, and governance conduct on financial performance: arguments for a process and integrated modelling approach. Sustainable Technology and Entrepreneurship, 1(1), 1-12. http://dx.doi.org/10.1016/j.stae.2022.100004

[34] Li, X., Gao-Zeller, X., Rizzuto, T. E., & Yang, F. (2019). Institutional pressures on corporate social responsibility strategy in construction corporations: the role of internal motivations. Corporate Social Responsibility and Environmental Management, 26(4), 721-740. https://doi.org/10.1002/csr.1713

[35] Lin, B., & Zhou, Y. (2022). Does energy efficiency make sense in China? Based on the perspective of economic growth quality. Sciences of Total Environment, 804(4), 149-168. https://doi.org/10.1016/j.scitotenv.2021.149895 Epub 2021 Aug 25.

[36] Liu, Y., Poulova, P., Prazak, P., Ullah, F., & Nathaniel, S. P. (2023), Infrastructure development, human development index, and CO_2 emissions in China: A quantile regression approach. Frontiers of Environ Science, 7(3), 1-21. https://doi.org/10.3389/fenvs.2023.1114977

[37] Musa, K., Sohag, K., Said, J., Ghapar, F., & Ali, N. (2023). Public debt, governance, and growth in developing countries: An application of quantile via moments. Mathematics, 11(4), 650-675. https://doi.org/10.3390/math11030650

[38] Ndoricimpa, A. (2020). Threshold effects of public debt on economic growth in Africa: A new evidence. Journal of Economic Development, 22(4), 187–207. https://doi.org/10.1108/JED-01-2020-0001

[39] Nur, H. A, Shafinar, I & Abdul, R. R (2019). How does Public debt affect economic growth? A Systematic review. Cogent Business and Management 6(1), 13-23. https://doi.org/10.1080/23311975.2019.1701339

[40] Nurudeen, A., Joseph, D., Mohammed, G. A., & Obi, B. (2022) Non-linear effect of government debt on public expenditure in Nigeria: Insight from Bootstrap ARDL Procedure. Organizations and Markets in Emerging Economies, 13(1), 163-182. https://doi.org/10.15388/omee.2022.13.75

[41] Nuru, N. Y., & Gereziher, H. Y. (2021). The effect of fiscal policy on economic growth in South Africa: A non-linear ARDL model analysis. Journal of Economics and Administrative Science, 38(5), 229–245. https://doi.org/10.1108/JEAS-06-2020-0088

[42] Nwonyuku, K. N. (2016). Corporate governance and profitability of listed food and beverages firms in Nigeria. SSRN Electronic Journal, 6(3), 47–105.

[43] Nzeh, I. C. (2020), Public debt and economic growth in Nigeria: Investigating the optimal threshold level. Asian Development Policy Review, 8(2), 112-127. https://doi.org/10.18488/journal.107.2020.82.112.127

[44] Ogbonna, O., Ihemeje, I., Obioma, O., Hanson, H., & Amadi, A. (2021). Impact of external debt management on economic growth of Nigeria. Journal La Bisecoman, 2, 25-41. https://doi.org/10.37899/journallabisecoman.v2i2.359

[45] Okere, P. A., Uzowuru, L. N., & Amako. J. C. (2019). Government expenditure and economic growth in Nigeria. International Journal of Economics and Financial Management, 4(2), 29–41.

[46] Okon, E. U., Etim, R. S., & Mfon, J. S. (2020). Public debt and economic development in Nigeria. International Journal of Business and Finance Research, 6(1), 8-31. Available at www.iiardjournals.org

[47] Olajide, O., Oyadeyi,, Olayode W., Agboola S. O. Okunade, T., & Osinubi, (2023) The debt-growth nexus and debt sustainability in Nigeria: Are there reasons to be concerned?, Journal of Policy Modeling, 5(3), 1-12. https://doi.org/10.1016/j.jpolmod.2023.11.004

[48] Oluwayemisi, A.-M. B., Shawai Akinsanmi, F. J., Rotimi, O., & Adekunle, A. R. (2022). An Assessment of the Impact of Public Debts on Development in Nigeria (2003-2020). Acta Universitatis Danubius. Œconomica, 18(3) Retrieved from https://dj.univ-danubius.ro/index.php/AUDOE/article/view/1740

[49] Omodero, C. O. (2020). Public debt and the living condition of people in Nigeria. EuroEconomica 39(1), 35 – 46. Retrieved from https://dj.univ-danubius.ro/index.php/EE/article/view/244

[50] Opara, I. V., Mbadike, N. S., & Kanu, S. I. (2021). Nigeria's domestic public debts and economic development. International Journal of Management Science and Business Administration, 7(5), 7-22. https://doi.org/10.18775/ijmsba.1849-5664-5419.2014.75.1001

[51] Oshodi, R. O., & Onyenebo, I. N. (2022). The effect of public Debt on Economic Growth of Nigeria. The International Journal of Business & Management, 12(1), 37–49.

[52] Orji, K. E., Worika, I. L., & Nsikan, U. (2017). The impact of human development on Nigeria's industrial sector. African Research Review 11(3): 23. https://doi.org/10.4314/afrrev.v11i3.3

[53] Petrovic, P.; Arsić, M.; Nojković, A. (2021). Increasing public investment can be an effective policy in bad times: Evidence from emerging EU economies. Economic Model, 94(4), 580–597. https://doi.org/10.1016/j.econmod.2020.02.004

[54] Saungweme, T.; Odhiambo, N. M. 2019). Government debt, government debt service and economic growth nexus in Zambia: A multivariate analysis. Cogent Economics & Finance, 7(1). https://doi.org/10.1080/23322039.2019.1622998

[55] Sharaf, M. F. (2021). The asymmetric and threshold impact of external debt on economic growth: New evidence from Egypt. Journal of Business and Socio-Economic and Development, 2(2), 1–18. https://doi.org/10.1108/JBSED-06-2021-0084

[56] Sharkdam, W., & Agbalajobi, D. T. (2012). The Obasanjo administration and the campaign for external debt relief for Nigeria. Journal of Social Science and Policy Review, 4(1), 1-18.

[57] Syder, I. D., and Isagua, N. M. (2021). Public debt management and Nigerian economic performance: an autoregressive distributed lag approach. African Journal of Business and Economic Development 1(9), 89-101. https://www.ijaar.org/articles/ajbed/v1n9/ajbed-v1n9-Sep21-p1936.pdf

[58] Sylvester, O. (2021). External debt and economic growth nexus: Empirical evidence from Nigeria. The American Economist, 65(1), 1-23. https://doi.org/10.1177/0569434520914862

[59] Useni, Y., Allahoki, N, V., Usman, S. Y., Rhaba, A. D., Uten, A. N., & Sale, A. J. (2022). Impact of government expenditure on economic growth In Nigeria. Sapientia Foundation Journal of Education, Sciences and Gender Studies, 4(3), 151-163. https://www.sfjesgs.com/index.php/SFJESGS/article/view/315

[60] Ushie, O. S. (2023). The effect of foreign debt on the Nigerian economy. African Journal of Accounting and Financial Research, 6(3), 115-128. https://doi.org/10.52589/AJAFRWTWUJGJX

[61] Yusuf, A. & Mohd, S. (2023). Nonlinear effects of public debt on economic growth in Nigeria, SN Business and Economics, 3(4), 72-88. https://doi.org/10.1007/s43546-023-00468-7

[62] Zaheer, S., Khaliq, F., & Rafiq, M. (2019). Does government borrowing crowd-out private sector credit in Pakistan. Journal of Finance & Economics Research, 4(2), 30–41. https://doi.org/10.20547/jfer1904203

[63] Zungu, L. T., & Greyling, L. (2022). Government size and economic growth in African emerging economies: does the BARS curve exist?. International Journal of Social Economics, 49(5), 356-371. 1-16. https://doi.org/10.1108/IJSE-01-2021-0016

[64] Zungu, L. T., Makhoba, B. P. and Greyling, L. (2022), "A scrutiny into fiscal policy in the South African economy: a Bayesian approach with hierarchical priors", Cogent Economics and Finance, 10(1), 1-20. https://doi.org/10.1080/23322039.2022.2028975