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Tax Revenue Composition and External Debt Sustainability in Nigeria: Evidence from Threshold Regression Analysis

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Abstract **Original Research Article**

The paper examined the effect of tax revenue composition on external debt sustainability in Nigeria against the background of persistent external debt pressures despite series of economic reforms and structural policies. The main objective was to determine the threshold effect of tax revenue composition on external debt sustainability in Nigeria. The paper adopted an ex-post facto research design and threshold regression based on the Bai–Perron sequential threshold procedures. The findings showed that Value-Added Tax (VAT) exhibited a statistically significant threshold effect on external debt sustainability, with an estimated threshold value of ₦312.60 billion. Below the identified threshold, VAT had exerted a negative and significant effect on external debt sustainability. Above the threshold, its effect had remained negative but had become statistically insignificant, indicating that its debt-reducing influence had weakened. Customs and Excise Duties (CED) also demonstrated a statistically significant threshold effect, with an estimated threshold value of ₦344.99 billion. In the lower regime, CED exerted a negative and significant effect on external debt sustainability. In the upper regime, the effect becomes positive but statistically insignificant, indicating that the earlier debt-reducing relationship had not persisted. Company Income Tax (CIT) equally exhibited a statistically significant threshold effect on external debt sustainability, with an estimated threshold value of ₦170.20 billion. Below the threshold, CIT exerted a negative and significant influence on external debt sustainability. Above the threshold, its effect had become positive but statistically insignificant, suggesting that its contribution to reducing the external debt burden had weakened. The paper thus recommended that the Nigeria Revenue Service strengthened VAT and CIT compliance, widened the effective tax base, and improved digital tax administration. The paper further recommended that the Nigeria Customs Service intensified customs valuation, anti-leakage measures, and trade-related revenue monitoring, while the Federal Ministry of Finance and Debt Management Office linked additional tax revenues more directly to deficit reduction, external debt servicing, and prudent borrowing decisions.

Keywords: Tax Revenue Composition, External Debt Sustainability, Value-Added Tax, Customs and Excise Duties, Company Income Tax.

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I. Introduction

External debt sustainability has emerged as a critical macroeconomic concern for nations worldwide, because of the rapid accumulation of sovereign and external liabilities, rising borrowing costs, exchange-rate vulnerabilities and the increasing proportion of public revenues devoted to debt servicing, particularly in the context of increasing globalization and the growing need for development financing. The

sustainability of external debt is typically assessed through various indicators, including the ratio of external debt stocks to Gross National Income (GNI), debt service-to-export ratios, and the capacity of a nation to generate sufficient foreign exchange earnings to service its external obligations (Obafemi, 2025).

In Sub-Saharan Africa, the issue of external debt sustainability has taken on particular urgency as countries in the region have experienced a significant deterioration in their debt positions over the past decade. The region's external debt sustainability has risen substantially, driven by increased borrowing to finance infrastructure development, respond to economic shocks, and address persistent fiscal deficits (African Development Bank, 2025). Many Sub-Saharan African countries have transitioned from concessional borrowing to more expensive commercial debt, including Eurobonds and loans from non-traditional creditors, which has increased debt service burdens and vulnerability to external shocks. Ajeigbe *et al.* (2024) highlighted the historical debt challenges in Sub-Saharan Africa, noting that excessive external borrowing, combined with poor debt management practices, weak governance structures, and unfavourable terms of trade, contributed to debt distress in several countries during the 1980s and 1990s.

Nigeria's experience with external debt sustainability reflects the broader challenges faced by Sub-Saharan Africa while also exhibiting unique characteristics shaped by its status as Africa's largest economy and a major oil exporter. Nigeria's external debt trajectory has been characterized by significant fluctuations, with periods of rapid accumulation followed by debt relief interventions. The data presented reveals that Nigeria's external debt sustainability stood at an alarmingly high 120.84% in 1993, reflecting the debt crisis that characterised the structural adjustment period of the late 1980s and early 1990s (Tote & Suleiman, 2026). Following economic reforms and improved macroeconomic management, Nigeria's external debt-to-GNI ratio declined steadily, reaching a historic low of 5.60% in 2006 after the country secured debt relief from the Paris Club, which wrote off approximately $18 billion of Nigeria's external debt (Debt Management Office Nigeria, 2024). This debt relief created substantial fiscal space and improved Nigeria's debt sustainability indicators significantly. However, the trend reversed from 2015 onwards, with external debt stocks rising progressively from 9.37% of GNI in 2015 to 40.8% in 2025, representing a more than fourfold increase over the decade (World Bank, 2024). This recent surge in external debt has been driven by increased borrowing to finance infrastructure projects, budget deficits worsened by oil price volatility, the economic impact of the pandemic, security challenges, and the need to diversify revenue sources beyond oil. The African Development Bank (2025) reports that Nigeria's debt service costs have risen to approximately 4.1% of GDP, raising concerns about debt sustainability and the potential crowding out of critical development expenditures. According to Sunday et al. (2025), the total public debt, which includes both domestic and external components, has grown substantially, placing increasing pressure on government finances and highlighting the urgent need to strengthen revenue mobilization to ensure debt sustainability.

The composition of tax revenue represents a fundamental determinant of fiscal capacity and economic stability globally, as it reflects the structure of a country's tax system and its effectiveness in mobilizing domestic resources to finance public expenditures and service debt obligations. Tax revenue composition refers to the relative contributions of different tax categories, including direct taxes such as personal and corporate income taxes, and indirect taxes such as value-added tax, customs duties, and excise duties, to total government revenue. The optimal composition of tax revenue has been a subject of extensive debate in public finance literature, with different tax instruments offering varying degrees of revenue productivity, equity implications, economic efficiency, and administrative feasibility.

Nigeria’s tax revenue composition has changed substantially over time as the country seeks to reduce its dependence on oil revenue and strengthen non-oil revenue mobilisation. Historically, heavy reliance on oil exposed government finances to fluctuations in global oil

prices, increasing the importance of tax diversification (Central Bank of Nigeria, 2025). Value-Added Tax (VAT), introduced in 1993 at 5%, increased from ₦7.26 billion to ₦8,610.36 billion in 2025, reflecting an expanded tax base, improved administration, and the 2020 rate increase to 7.5% (Federal Inland Revenue Service, 2024). Customs and excise duties also rose significantly from ₦9.26 billion in 1990 to ₦7,281.25 billion in 2025, although collections remained volatile due to changes in imports, exchange rates, trade policies, and border administration (Owolabi et al., 2023). Similarly, Company Income Tax increased from ₦2.99 billion in 1990 to ₦9,210.25 billion in 2025, despite fluctuations associated with corporate profitability, sectoral performance, tax compliance, and policy changes (Nkanor & Chukwu, 2024). Despite these improvements, Nigeria's tax-to-GDP ratio remains relatively low, indicating considerable scope for stronger revenue mobilisation through broader tax bases, improved compliance, administrative reforms, and greater diversification of government revenue sources (Central Bank of Nigeria, 2025).

The relationship between tax revenue composition and external debt sustainability represents a critical area of inquiry in public finance and development economics, as the structure and productivity of a country's tax system fundamentally influence its capacity to service external debt obligations without compromising macroeconomic stability or development objectives. Theoretically, a well-diversified and productive tax revenue system enhances debt sustainability by providing stable and predictable revenue flows that can be allocated to debt service while maintaining essential public expenditures. Countries with robust tax systems are better positioned to manage external shocks, reduce reliance on additional borrowing, and maintain investor confidence, all of which contribute to sustainable debt dynamics. Conversely, countries with weak revenue mobilization face higher risks of debt distress as they struggle to generate sufficient resources to meet debt service obligations, potentially leading to accumulation of arrears, need for debt restructuring, or adoption of procyclical fiscal policies that can undermine economic growth.

Therefore, given that a sound and diversified tax revenue structure is essential for strengthening fiscal capacity, reducing excessive dependence on borrowing, and enhancing the ability of government to meet its external financial obligations, it is imperative to examine how the thresholds of tax revenue influenced external debt sustainability in Nigeria over the period 1990 to 2025.

The paper raised and addressed the following research questions:

i. To what extent does the threshold effect of Value-Added Tax influence external debt sustainability in Nigeria?

ii. What is the effect of the Customs and Excise Duties threshold on external debt sustainability in Nigeria?

iii. How does the Company Income Tax threshold influence external debt sustainability in Nigeria?

II. Literature Review

Conceptual Clarifications

Composition of tax revenue

Tax revenue composition represented a multidimensional fiscal construct that encompassed the structural distribution and relative contributions of various tax instruments to a government's total revenue mobilization framework. Luo (2023 conceptualized tax revenue composition as the systematic categorization and proportional allocation of revenue sources derived from different taxation mechanisms, including direct and indirect taxes, which collectively determined a nation's fiscal capacity and revenue sustainability. Similarly, Obafemi (2025) defined tax revenue composition as the disaggregated taxonomy of governmental revenue streams originating from distinct tax bases, emphasizing that the compositional mix reflected both policy choices and structural economic characteristics of the taxing jurisdiction.

Value-Added Tax constituted a consumption-based indirect tax levied on the incremental

value added at each stage of production and distribution within the supply chain. Simon and Dadda'u (2024) defined Value-Added Tax as a multi-stage tax imposed on the difference between a firm's sales and its purchases of intermediate inputs, with the tax burden ultimately borne by final consumers while businesses served as collection agents for tax authorities. Correspondingly, Oziegbe and Itua (2024) viewed VAT as a comprehensive consumption tax that operated through a credit-invoice mechanism, whereby registered businesses collected tax on their sales while claiming credits for taxes paid on their inputs, thereby ensuring taxation occurred only on the value addition.

Customs and excise duties represented border and consumption taxes imposed on imported goods and specific domestically produced or consumed commodities respectively. Bakare et al. (2024) defined customs duties as tariffs levied on goods crossing international borders, serving dual purposes of revenue generation and protection of domestic industries from foreign competition. Similarly, Agwor and Agwor (2024) characterized these duties as indirect taxes distinguished by their narrow base compared to VAT, targeting specific goods identified either by their origin (imported items for customs) or their nature (luxury or demerit goods for excise).

Company income tax constituted a direct tax imposed on the profits and earnings of incorporated business entities operating within a tax jurisdiction. Adaramola et al. (2026) defined company income tax as a fiscal levy on the net income or taxable profits of corporations, calculated by applying statutory tax rates to revenues after deducting allowable business expenses and capital allowances. Furthermore, Omotoso et al. (2026) characterized corporate taxation as a fundamental component of direct tax systems that contributed to revenue mobilization while raising efficiency and equity considerations related to economic incidence, international tax competition, and potential double taxation of corporate earnings.

For this paper, tax revenue composition was defined as the structural distribution of government tax revenues across three primary sources, Value-Added Tax representing broad-based consumption taxation, customs and excise duties capturing trade-related and selective consumption taxes, and company income tax reflecting direct taxation of corporate profits, measured in absolute nominal values to assess their individual and collective contributions to fiscal capacity for external debt sustainability in Nigeria.

External Debt Sustainability

External debt sustainability constituted a critical macroeconomic concept that encompassed a nation's capacity to meet current and future external debt obligations without compromising economic growth or requiring debt restructuring interventions. Güneş and Akin (2023) conceptualized external debt sustainability as the condition whereby a country maintained the ability to service its foreign currency-denominated debt obligations through internally generated resources without accumulating arrears, necessitating exceptional financing, or experiencing fiscal distress that undermined developmental objectives. Similarly, Thakkar and Morshed (2026)) defined external debt sustainability as a multidimensional state characterized by stable or declining debt-to-income ratios over the medium term, with debt service payments remaining within manageable thresholds relative to export earnings and fiscal revenues.

From institutional perspectives, external debt sustainability represented a forward-looking assessment of debt trajectory viability under realistic macroeconomic assumptions and potential stress scenarios. Haroon and Bhatti (2024) articulated external debt sustainability as the probabilistic evaluation of whether current debt levels and projected accumulation patterns remained consistent with maintaining market access, preserving debt servicing capacity, and avoiding liquidity or solvency crises under baseline and adverse scenarios. Correspondingly, Oyadeyi *et al. (*2024) conceptualized debt sustainability as encompassing both stock and flow dimensions, where stock sustainability referred to the debt-to-GDP or debt-to-revenue ratios remaining below

critical thresholds, while flow sustainability concerned debt service obligations not exceeding a country's payment capacity as measured by fiscal revenues or export earnings.

External debt sustainability was operationally defined in this paper as Nigeria's capacity to maintain its external debt burden at a level supportable by national income and repayment capacity, measured by external debt stocks as a percentage of gross national income.

Theoretical foundation

The theoretical underpinning for this paper was the Debt Overhang Theory, which was principally associated with Krugman (1988) and further developed within the external debt literature by Sachs and other scholars. The theory suggested that when a country accumulated external debt beyond a level considered manageable relative to its repayment capacity, expectations of large future debt-service obligations could weaken investment incentives, constrain economic activity and reduce the resources available for productive development. Krugman (1988) argued that a substantial debt overhang could distort economic incentives because part of the benefits arising from improved economic performance would effectively accrue to external creditors through higher expected debt repayments rather than remaining entirely within the debtor economy. Within this framework, the ability of a government to generate adequate and sustainable domestic revenue became relevant because stronger fiscal resources could improve its capacity to meet debt obligations without excessive dependence on additional borrowing. The relevance of the theory to this paper therefore rested on the argument that the composition of tax revenue, represented by Value-Added Tax, Customs and Excise Duties, and Company Income Tax, could influence the fiscal resources available for managing Nigeria's external debt obligations. VAT represented revenue derived largely from taxable consumption, Customs and Excise Duties reflected revenue associated with international trade and selected commodities, while Company Income Tax represented revenue generated from corporate profits. Changes in these revenue components could consequently influence government financing conditions and the capacity to support external debt servicing.

Empirical Review

Empirical studies that examined taxation, debt, fiscal sustainability, and related macroeconomic outcomes provided useful evidence for understanding how the composition of tax revenue could have been associated with external debt sustainability.

Tote and Suleiman (2026) investigated non-oil tax revenue and external debt distress in Nigeria over 2000–2025 while incorporating institutional quality as a moderating variable. Their ex-post facto study employed annual time-series data and a moderated Autoregressive Distributed Lag framework after examining the integration properties of the variables. External debt distress was measured by the external debt service-to-revenue ratio, while Company Income Tax, Value-Added Tax, and Personal Income Tax represented non-oil tax revenue. In the long run, CIT, VAT, and PIT produced negative and statistically significant effects on external debt risk. In the short run, CIT and VAT remained negative and significant at the 5% level, whereas PIT was negative but failed to attain significance at that level. The ARDL specification strengthened the analysis by distinguishing short-run from long-run relationships. However, Personal Income Tax replaced Customs and Excise Duties, so the tax structure did not correspond fully with the present study. Moreover, debt-service-to-revenue measured debt pressure differently from external debt stocks sustainability.

Adegbie *et al.* (2026) investigated non-oil tax revenue and economic sustainability in Nigeria using an ex-post facto time-series design and the ARDL technique. The article's abstract reported a 1984–2024 study period, although its methodology section subsequently described the coverage as 1994–2024, thereby revealing an internal inconsistency in the reported timeframe. VAT, Company Income Tax, and Customs and Excise Duties represented the tax variables, making its revenue specification particularly

comparable with the present study. The long-run estimates showed that VAT exerted a positive and statistically significant effect on the sustainability measure, whereas CIT and CED produced negative and statistically significant effects. In the short run, VAT remained positive and significant, CIT was negative but insignificant contemporaneously, and CED displayed mixed effects across current and lagged terms. Although ARDL allowed both short-run and long-run dynamics to be examined, economic sustainability was proxied by mineral-resource depletion rather than external debt sustainability. Consequently, its tax-variable structure aligned closely with the present study, but its dependent-variable conceptualisation addressed a substantially different sustainability dimension.

A different perspective was presented by Obafemi (2025), who assessed tax revenue components and federal government revenue generation in Nigeria between 2015 and 2024. The paper adopted an ex-post facto research design, relied on secondary annual data from the Central Bank of Nigeria Statistical Bulletin, and applied multiple regression analysis. Company Income Tax, Petroleum Profit Tax, Value-Added Tax, and Customs and Excise Duties represented the explanatory variables. The estimates showed that CIT and VAT exerted positive and statistically significant effects on federal revenue generation, while Petroleum Profit Tax and Customs and Excise Duties produced positive but statistically insignificant effects. The disaggregation of taxation enabled the paper to reveal variations in the contributions of individual revenue sources. However, federal revenue generation rather than external debt sustainability constituted the outcome variable, thereby limiting direct comparison with the present study. In addition, the 2015–2024 period supplied only ten annual observations for a multiple-regression specification containing several explanatory variables, which restricted the available degrees of freedom and the extent to which longer-term fiscal dynamics could have been captured.

Sunday *et al.* (2025) examined the impact of taxation on federal revenue generation in Nigeria from 1981 to 2023. The paper adopted an ex-post facto research design and employed annual secondary data sourced from the Central Bank of Nigeria and Federal Inland Revenue Service. Descriptive and inferential techniques were applied to establish the short- and long-run relationships between the variables. Value-Added Tax, Company Income Tax, and Customs and Excise Duty represented the tax components. The findings indicated that VAT exerted a positive and statistically significant effect on government revenue generation, while CIT similarly produced a positive and significant effect. In contrast, Customs and Excise Duty generated a negative but statistically insignificant effect on revenue generation. The lengthy sample period strengthened the paper's ability to capture long-term fiscal movements. Nevertheless, government revenue generation represented the dependent variable rather than external debt sustainability. Consequently, the paper established the revenue-generating behaviour of the three tax components but did not determine whether such revenues translated into reduced external indebtedness or improved debt-carrying capacity.

Narayan *et al.* (2025) investigated debt sustainability and the effectiveness of fiscal-policy instruments in the Maldives by comparing taxation adjustments with government expenditure reductions. The paper employed a Structural Vector Autoregressive model to distinguish short-run and long-run responses of public debt and economic growth to fiscal-policy shocks. Tax revenue management and expenditure reductions constituted the principal fiscal adjustment instruments considered. The results indicated that tax-based adjustments reduced debt and contributed to debt sustainability, while expenditure reductions produced comparable debt-reducing effects in the short run and stronger effects over the longer horizon. Economic growth was found to stabilise debt initially but to increase debt over time under the estimated dynamics. The SVAR framework constituted an important methodological advantage because it captured feedback relationships and dynamic responses among fiscal variables. Nevertheless, taxation was treated largely as an aggregate fiscal instrument rather than decomposed into VAT, corporate

income tax, customs duties, or other tax categories. Furthermore, the peculiar characteristics of a small island economy restricted straightforward generalisation of the findings to Nigeria's substantially larger and more diversified economy.

Baum *et al.* (2025) analysed the effects of tax reforms across the six Gulf Cooperation Council countries following the fiscal adjustment process triggered by the 2014 oil-price collapse. Their firm-level analysis covered 2007–2022 and employed an unbalanced panel containing financial information on GCC firms alongside macroeconomic data. The reforms examined included the introduction of Value-Added Tax and excise taxes and the broadening of Corporate Income Tax, while panel estimation techniques were employed to evaluate macroeconomic and firm-level effects. VAT reforms produced no significant adverse effect on firm financial outcomes, whereas changes in CIT affected some firms, particularly smaller companies. Excise-tax effects varied across the subgroups examined, while the overall macroeconomic effects of the tax reforms remained relatively modest. The multi-country panel design allowed tax reforms to be evaluated across heterogeneous resource-dependent economies. However, the dependent outcomes centred on GDP, inflation, and corporate financial performance rather than sovereign external debt sustainability, while customs duties were not incorporated. Accordingly, its relevance to the present study rested principally on demonstrating that individual tax components generated heterogeneous economic effects that could have differed from those of aggregate taxation.

Nkanor and Chukwu (2024) examined the impact of tax revenue on external public debt using annual secondary data that covered 1998–2021. Data were obtained from the Central Bank of Nigeria and Federal Inland Revenue Service, while descriptive statistics and Ordinary Least Squares multiple regression were employed for estimation. Tax revenue was decomposed into Petroleum Profit Tax, Company Income Tax, Customs and Excise Duty, and Value-Added Tax. The findings showed that Petroleum Profit Tax, Company Income Tax, and Customs and Excise Duty exerted negative and statistically significant effects on external public debt, whereas VAT produced a negative but statistically insignificant effect. This paper closely corresponded with the present investigation because three of its tax variables matched the present tax-revenue-composition measures. Nevertheless, the dependent variable was external public debt in level form rather than external debt stocks relative to national income. Furthermore, its reliance on OLS provided less explicit consideration of long-run dynamic adjustments and cointegration than a time-series framework designed specifically for potentially non-stationary macroeconomic variables would have provided.

Obi and Igbodo (2024) assessed the effect of tax revenue on external public debt over the 2000–2023 period. The researchers relied on annual secondary data obtained from the Federal Inland Revenue Service and Central Bank of Nigeria and applied descriptive statistics and Ordinary Least Squares multiple regression. Their stated tax measures comprised Value-Added Tax, Company Income Tax, Customs and Excise Duty, and Petroleum Profit Tax. The reported regression estimates indicated that Company Income Tax and Petroleum Profit Tax exerted negative and statistically significant effects on external public debt, while VAT produced no significant effect. Although Customs and Excise Duty formed part of the stated objectives, the reported final regression model contained only Petroleum Profit Tax and Company Income Tax, thereby leaving the inferential effect of CED inadequately established. This inconsistency between the stated variables and estimated model reduced the comprehensiveness of the analysis. Moreover, external public debt was examined in absolute terms rather than relative to national income, unlike the external-debt-to-GNI measure adopted in the present study.

Broader cross-country evidence was supplied by Ajeigbe *et al.* (2024), who investigated sustainable tax revenue, government expenditure, and sustainable development outcomes using annual observations from 45

selected African and developed countries between 2010 and 2020. Secondary data were obtained from the World Development Indicators, while the Generalised Method of Moments technique was used for estimation. Taxation was represented by total tax revenue, taxes on exports, taxes on goods and services, taxes on income, profits and capital gains, and other taxes. Their estimates showed that the various tax revenue components generally exerted positive effects on economic growth and negative effects on poverty and unemployment, suggesting that stronger mobilisation across different tax bases supported macroeconomic and social sustainability. The application of GMM strengthened the treatment of possible endogeneity and country heterogeneity. However, the paper aggregated VAT within taxes on goods and services and CIT within taxes on income and profits, thereby preventing the separate effects of VAT, CIT, and customs-related revenue from being isolated. External debt sustainability was also not modelled directly, which limited the applicability of its findings to Nigeria's external debt dynamics.

Owolabi *et al.* (2023) investigated the effect of tax revenue on external short-term debt stock across 23 Sub-Saharan African countries over the period 1990–2020. The researchers adopted an ex-post facto design and employed dynamic panel estimation through the system Generalised Method of Moments (GMM). Tax revenue was represented by Customs, Import and Export Duties, taxes on products, and VAT, while external short-term debt stock represented the dependent variable. Their results indicated that VAT exerted a positive but statistically insignificant effect on external short-term debt stock, whereas Customs, Import and Export Duties and taxes on products produced negative but statistically insignificant effects. Collectively, the tax variables were reported to have influenced external short-term debt financing. Although the use of system GMM accommodated dynamics and possible endogeneity, the paper concentrated on short-term external debt rather than overall external debt sustainability. It also excluded Company Income Tax and combined customs with import and export duties, thereby differing from the tax composition adopted in the present study.

III. Methodological Framework

The paper adopted an *ex-post facto* research design to examine the relationship between tax revenue composition and external debt sustainability in Nigeria. This design was considered appropriate because the paper relied on historical data that had already occurred and could not be manipulated by the researcher. Specifically, the paper examined Value-Added Tax, Customs and Excise Duties, and Company Income Tax as measures of tax revenue composition, while external debt stocks as a percentage of Gross National Income represented external debt sustainability. The ex-post facto design enabled the researcher to analyse variations in these variables over the paper period using secondary time-series data. It also provided a basis for assessing the relationships among the variables without experimental controls or manipulation.

The paper utilised annual secondary time-series data covering the period 1990 to 2025. The data were quantitative in nature and consisted of observations on Value-Added Tax, Customs and Excise Duties, Company Income Tax, and external debt stocks as a percentage of Gross National Income. Data on Value-Added Tax and Company Income Tax were obtained mainly from the Federal Inland Revenue Service, while data on Customs and Excise Duties were sourced from the Central Bank of Nigeria and relevant government revenue reports. External debt data were obtained principally from the World Bank's World Development Indicators and International Debt Statistics, with supporting information from the Debt Management Office Nigeria.

Guided by the Debt Overhang Theory, this paper developed its empirical model by adapting the analytical framework employed by Owolabi, Akintoye, and Dada (2023), who examined the relationship between tax revenue components and external short-term debt in Sub-Saharan Africa. Accordingly, the functional and econometric specification for the paper was expressed as follows:

$$EDS_t = \beta_0 + \beta_1 VAT_t + \beta_2 CED_t + \beta_3 CIT_t + \zeta_t \quad (1)$$

Where;

EDS is external debt sustainability (that is, external debt stocks (% of GNI))

VAT is Value added tax

CED is Customs and excise duties

CIT is Company Income Tax

β_0 the intercept

$\beta_1, \beta_2, \beta_3$ are the coefficients of value added tax, Customs and excise duties and company income tax

ζ_t is the residual

The empirical analysis commenced with a unit root test to determine the stationarity properties of the time-series variables used in the paper. Following Dickey and Fuller (1979), the test was employed to ascertain whether the variables contained unit roots or stochastic trends and whether differencing was necessary to make them stationary. Establishing the stationarity status of the variables was important because estimating relationships among non-stationary series could produce spurious regression results and unreliable statistical inferences. The unit root test therefore served as an important preliminary procedure for determining the appropriate estimation technique for assessing the relationship between tax revenue composition and external debt sustainability in Nigeria. The Augmented Dickey-Fuller (ADF) test was specified as:

$$\Delta Y_t = \alpha + \beta t + \gamma Y_{t-1} + \sum_{i=1}^{p} \delta_i \Delta Y_{t-i} + \varepsilon_t \quad (2)$$

where ΔY_t is the first difference of the series, α is the intercept, βt is the time trend, Y_{t-1} is the lagged level of the variable, δ_i represents the coefficients of the lagged differences, $p$is the number of lag lengths, and ε_t is the white-noise error term.

The decision rule was based on the coefficient of the lagged level term, γ. The null hypothesis stated that the series had a unit root ($\gamma = 0$), while the alternative hypothesis stated that the series was stationary ($\gamma < 0$).

After establishing the order of integration of the variables, the analysis proceeded to investigate whether a stable long-run relationship existed among tax revenue composition and external debt sustainability using the Hansen (1992) parameter-instability cointegration test. Unlike conventional residual-based procedures that primarily test for the presence of a unit root in the estimated residuals, Hansen's approach assessed whether the parameters of an estimated cointegrating relationship remained stable over the sample period. The procedure was particularly useful for time-series relationships in which the variables were integrated of order one, I(1), because parameter instability could indicate that the proposed long-run equilibrium relationship was not maintained throughout the period under investigation. Accordingly, the Hansen test provided an additional basis for determining whether Value-Added Tax, Customs and Excise Duties, Company Income Tax, and external debt sustainability maintained a stable long-run association in Nigeria.

Hansen (1992) demonstrated that where the long-run relationship was unstable, the disturbance term could be represented as consisting of a random-walk component and a stationary component:

$$u_t = w_t + v_t \quad (3)$$

Accordingly, the long-run relationship could be rewritten as:

$$Y_t = \alpha_t + \boldsymbol{\beta}' X_t + v_t \quad (4)$$

where:

$$\alpha_t = \alpha + w_t \quad (5)$$

In this formulation, w_t represented the random-walk component that captured possible instability in the long-run parameters, while v_t represented the stationary component of the disturbance term. If w_t was absent or statistically unimportant, the parameters were regarded as stable and the variables could be considered cointegrated.

The Hansen L_c statistic used for testing parameter stability was generally represented

as:

$$L_c = \frac{1}{T\hat{\omega}_{u\cdot v}^2}\sum_{t=1}^{T}\hat{S}_t{}'\left(\sum_{i=1}^{T}Z_i\,Z_i{}'\right)^{-1}\hat{S}_t \quad (6)$$

where $\hat{S}_t$ represented the cumulative score associated with the estimated long-run parameters, Z_t represented the vector of deterministic terms and integrated regressors, $\hat{\omega}_{u\cdot v}^2$ represented the estimated conditional long-run variance, and T represented the number of observations.

The hypotheses for the Hansen cointegration test were stated as:

H_0:The variables were cointegrated and the long -run parameters were stable

H_1:The variables were not cointegrated or the long-run parameters were unstable

The decision rule was based on the probability value of the L_c statistic at the 5% significance level. Where the probability value exceeded 0.05, the null hypothesis was not rejected, indicating evidence of a stable long-run cointegrating relationship among External Debt Sustainability, Value-Added Tax, Customs and Excise Duties, and Company Income Tax. Conversely, a probability value below 0.05 suggested parameter instability and provided evidence against stable cointegration.

Following the confirmation of a stable long-run relationship among the variables, the paper proceeded to model possible nonlinearities using a threshold regression framework. The threshold regression approach, associated with Hansen (2000), allowed the effect of a tax revenue component on external debt sustainability to differ according to whether the relevant tax variable was below or above an unknown threshold value. This procedure was considered appropriate because a conventional linear model imposed a constant marginal effect over the entire sample period, whereas the relationship between tax revenue composition and external debt sustainability could vary once a tax source attained a particular level. Rather than imposing the threshold ex ante, the threshold value was estimated from the observed data by searching over admissible values of the threshold variable and selecting the value that minimised the sum of squared residuals.

The general two-regime single-threshold model was represented as:

$$Y_t = \alpha_1 + \beta_1{}'X_t + \varepsilon_t, \quad \text{if } q_t \le \gamma \quad (7)$$

$$Y_t = \alpha_2 + \beta_2{}'X_t + \varepsilon_t, \quad \text{if } q_t > \gamma \quad (8)$$

where Y_t represented the dependent variable, X_t represented the vector of explanatory variables, q_t represented the threshold variable, γ denoted the unknown threshold parameter, α_1 and α_2 represented regime-specific intercepts, β_1 and β_2 represented regime-specific slope coefficients, and ε_t represented the stochastic disturbance term. The observations were consequently separated into a lower regime when q_t was less than or equal to γ and an upper regime when q_t exceeded γ.

In the context of this paper, External Debt Sustainability (EDS) constituted the dependent variable, while Value-Added Tax (VAT), Customs and Excise Duties (CED), and Company Income Tax (CIT) represented the tax revenue composition variables. To determine whether the relationship associated with each tax component changed after a particular level, each proxy was considered in turn as the threshold variable, while the remaining tax variables entered as non-threshold-varying controls.

For Value-Added Tax, the threshold specification was expressed as:

$$EDS_t = \alpha_1 + \beta_{VAT,1}VAT_t + \theta_1 CED_t + \theta_2 CIT_t + \varepsilon_t, \ \ VAT_t \le \gamma_{VAT} \quad (9)$$

$$EDS_t = \alpha_2 + \beta_{VAT,2}VAT_t + \theta_1 CED_t + \theta_2 CIT_t + \varepsilon_t, \ \ VAT_t > \gamma_{VAT} \quad (10)$$

For Customs and Excise Duties, the corresponding model was specified as:

$$EDS_t = \alpha_1 + \beta_{CED,1}CED_t + \theta_1 VAT_t + \theta_2 CIT_t + \varepsilon_t, \ \ CED_t \le \gamma_{CED} \quad (11)$$

$$EDS_t = \alpha_2 + \beta_{CED,2}CED_t + \theta_1 VAT_t + \theta_2 CIT_t + \varepsilon_t, \ \ CED_t > \gamma_{CED} \quad (12)$$

For Company Income Tax, the threshold model took the form:

$$EDS_t = \alpha_1 + \beta_{CIT,1} CIT_t + \theta_1 VAT_t + \theta_2 CED_t + \varepsilon_t, \quad CIT_t \leq \gamma_{CIT} \tag{13}$$

$$EDS_t = \alpha_2 + \beta_{CIT,2} CIT_t + \theta_1 VAT_t + \theta_2 CED_t + \varepsilon_t, \quad CIT_t > \gamma_{CIT} \tag{14}$$

The unknown threshold value was estimated through a grid search over an admissible interior range of the selected threshold variable. Candidate values close to the extreme ends of the distribution were excluded so that each regime contained an adequate number of observations. For every admissible threshold value, the model was estimated by least squares and the corresponding residual sum of squares was computed. The estimated threshold was the candidate value that produced the minimum residual sum of squares.

$$\mathrm{SSR}(\gamma) = \sum_{t=1}^{T} [\hat{\varepsilon}_t(\gamma)]^2 \tag{15}$$

$$\hat{\gamma} = \arg\min \mathrm{SSR}(\gamma), \quad \gamma \in \Gamma$$

where Γ represented the set of admissible threshold values and $\hat{\gamma}$ represented the estimated threshold. The coefficients below and above the threshold were then interpreted separately. Thus, βVAT,1 and βVAT,2 captured the VAT effects in the lower and upper regimes; βCED,1 and βCED,2 represented the corresponding Customs and Excise Duties effects; while βCIT,1 and βCIT,2 represented the Company Income Tax effects across the two regimes.

The presence of a threshold effect was assessed by testing whether the regime-specific coefficients were statistically different. The hypotheses were stated as:

$H_0: \beta_1 = \beta_2$ (no threshold effect)

$H_1: \beta_1 \neq \beta_2$ (threshold effect existed)

A threshold test statistic compared the residual sum of squares obtained from the restricted linear model with the residual sum of squares from the threshold model. In general, it was represented as:

$$\mathrm{F}(\gamma) = \frac{SSR_0 - SSR_1(\gamma)}{\hat{\sigma}^2} \tag{16}$$

The null hypothesis implied that a single linear relationship adequately described the effect of the relevant tax variable on external debt sustainability, while the alternative hypothesis indicated that the relationship changed significantly across identified regimes.

The existence of a threshold effect was assessed using the Bai–Perron sequential threshold testing procedure. Under this approach, the scaled F-statistic was compared with the corresponding *Bai–Perron* critical value at the 5% significance level. Where the scaled F-statistic exceeded the critical value, the null hypothesis of no threshold effect was rejected in favour of the threshold specification. The estimated threshold value was then used to divide the observations into lower and upper regimes, while the regime-specific coefficients were interpreted to determine how the relationship between the relevant component of tax revenue composition and external debt sustainability differed below and above the identified threshold. This procedure therefore enabled the study to establish whether the effects of Value-Added Tax, Customs and Excise Duties, and Company Income Tax remained constant or changed significantly across different revenue regimes.

IV. Results and Discussions

Descriptive Statistics Results

Descriptive statistics were used to summarise the basic distributional characteristics of the variables employed in the paper before proceeding to the inferential and threshold regression analyses. These measures were useful in revealing the extent of variation in Nigeria's external debt burden and tax revenue components over the paper period and in identifying possible distributional characteristics that could justify further examination of nonlinear and threshold relationships among the variables.

Table 1: Summary Statistics

	EDS	VAT	CED	CIT
Mean	35.8186	981.3544	801.7008	991.0464
Maximum	120.8400	8610.3600	7281.2500	9210.2500
Minimum	5.6000	7.2600	9.2600	2.9900
Std. Dev.	29.2862	1602.1530	1303.7480	1742.4000
Skewness	1.0634	3.5395	3.7046	3.3535
Kurtosis	3.6433	16.8946	18.3068	15.3997
Jarque-Bera	7.4053	334.3615	433.7906	298.1044
Probability	0.0247	0.0000	0.0000	0.0000
Observations	36	33	36	36

Source: Researcher's Computation Using EViews-14 (2026)

External Debt Sustainability (EDS), measured by external debt stocks as a percentage of Gross National Income, recorded a mean value of 35.8186%, indicating that Nigeria's external debt stock averaged approximately 35.82% of GNI over the period examined. The maximum value of 120.8400% contrasted sharply with the minimum of 5.6000%, demonstrating substantial historical variation in the external debt burden. The relatively large standard deviation of 29.2862 further confirmed considerable fluctuations around the mean. EDS exhibited positive skewness of 1.0634, implying that the distribution had a longer right tail and that relatively high external debt ratios occurred less frequently but exerted noticeable influence on the distribution. Its kurtosis value of 3.6433 exceeded the normal-distribution benchmark of 3, indicating a moderately leptokurtic distribution with somewhat heavier tails. The Jarque-Bera statistic of 7.4053, with a probability value of 0.0247, led to rejection of the null hypothesis of normality at the 5% significance level. Thus, EDS was not normally distributed over the period.

Value-Added Tax (VAT) recorded an average annual collection of ₦981.3544 billion, although its maximum value of ₦8,610.3600 billion was considerably above the mean, while the minimum collection stood at only ₦7.2600 billion. The wide difference between the minimum and maximum reflected the substantial expansion of VAT revenue over time. Its standard deviation of ₦1,602.1530 billion, which exceeded the mean, indicated considerable dispersion and volatility in VAT collections across the sample period. The skewness coefficient of 3.5395 showed that VAT was strongly positively skewed, suggesting that a small number of very large VAT observations, particularly in the later years, were concentrated in the upper tail of the distribution. Its kurtosis value of 16.8946 was considerably above 3, revealing an extremely leptokurtic distribution characterised by a sharp peak and heavy tails. Consistent with these distributional properties, the Jarque-Bera statistic was 334.3615, with a probability of 0.0000, indicating a clear rejection of normality.

Customs and Excise Duties (CED) recorded a mean value of ₦801.7008 billion, suggesting that average annual customs and excise revenue remained below the corresponding averages for VAT and CIT. Nevertheless, the maximum CED collection of ₦7,281.2500 billion was substantially higher than its minimum value of ₦9.2600 billion, demonstrating considerable growth and variation throughout the period. The standard deviation of ₦1,303.7480 billion exceeded the mean, confirming substantial

dispersion in CED receipts and indicating that annual collections frequently departed widely from their average level. CED recorded the highest skewness coefficient among the tax variables at 3.7046, showing a strongly right-skewed distribution dominated by a relatively small number of exceptionally high observations. Its kurtosis value of 18.3068 was also the highest among all the variables, indicating an extremely leptokurtic distribution with pronounced tails and a high concentration of observations around particular lower values alongside a few very large outcomes. The Jarque-Bera statistic of 433.7906, with a probability value of 0.0000, strongly rejected the null hypothesis of normality.

Company Income Tax (CIT) recorded a mean annual value of ₦991.0464 billion, making it the tax component with the highest average collection among the three revenue variables considered. Its maximum value reached ₦9,210.2500 billion, whereas the minimum was only ₦2.9900 billion, indicating a very wide range and reflecting the considerable expansion of corporate tax receipts over the paper period. The standard deviation of ₦1,742.4000 billion was substantially greater than the mean and represented the highest dispersion among the tax revenue variables, suggesting considerable annual fluctuations in CIT collections. The skewness value of 3.3535 indicated a strongly positively skewed distribution, implying that exceptionally high CIT receipts occurred in a relatively small number of years and pulled the distribution towards the right. Its kurtosis coefficient of 15.3997 was far above 3, demonstrating substantial leptokurtosis and the presence of heavy tails. The Jarque-Bera statistic of 298.1044, accompanied by a probability value of 0.0000, confirmed that CIT was not normally distributed.

Unit Root Test

The Augmented Dickey-Fuller unit root test was conducted to determine the stationarity properties of External Debt Sustainability (EDS), Company Income Tax (CIT), Value-Added Tax (VAT), and Customs and Excise Duties (CED). hypothesis of a unit root was rejected and the variable was considered stationary.

Table 2: Summary of Unit Root Test Results

Variable	Levels: ADF Test Statistics (Critical Values)	1st Difference: ADF Test Statistics (Critical Values)	Order of Integration
EDS	-1.209988 (-3.544284)	-4.122065 (-3.552973)**	I(1)
CIT	-2.207349 (-3.562882)	-7.815938 (-4.252879)*	I(1)
VAT	-1.098102 (-3.612199)	-5.847285 (-4.416345)*	I(1)
CED	-2.123549 (-4.252879)	-3.693680 (-3.548490)**	I(1)

Note: The tests include intercept with trend; ** and ** significant at 1 and 5 percent.*

Source: Researcher's Computation Using EViews-14 (2026)

For External Debt Sustainability, the ADF test statistic at first difference was -4.122065, which was more negative than the critical value of -3.552973. The result was significant at the 5 percent level, leading to rejection of the null hypothesis of a unit root. This indicated that EDS became stationary after first differencing and was therefore classified as I(1).

Company Income Tax also became stationary at first difference. Its ADF test statistic was -7.815938, which was more negative than the

critical value of -4.252879. The result was significant at the 1 percent level. Consequently, the null hypothesis of non-stationarity was rejected, confirming that CIT was integrated of order one, I(1).

Value-Added Tax exhibited a similar pattern. At first difference, the ADF test statistic was -5.847285, compared with a critical value of -4.416345. Since the test statistic was more negative than the critical value, the null hypothesis of a unit root was rejected at the 1 percent significance level. VAT was therefore stationary at first difference and classified as I(1).

Customs and Excise Duties also achieved stationarity after first differencing. The ADF test statistic of -3.693680 was more negative than the critical value of -3.548490, and the result was significant at the 5 percent level. This led to rejection of the null hypothesis of a unit root and confirmed that CED was integrated of order one, I(1).

Co-integration Test

The Hansen (1992) cointegration test was employed to determine whether a stable long-run relationship existed among External Debt Sustainability (EDS), Value-Added Tax (VAT), Customs and Excise Duties (CED), and Company Income Tax (CIT). The Hansen test evaluated the null hypothesis that the series were cointegrated against the alternative that no stable cointegrating relationship existed.

Table 3: Hansen Cointegration Test

	Stochastic	Deterministic	Excluded	
Lc statistic	Trends (m)	Trends (k)	Trends (p2)	Prob.*
0.021241	3	0	0	> 0.2

Note: *Hansen (1992b) Lc(m2=3, k=0) p-values, where m2=m-p2 is the number of stochastic trends in the asymptotic distribution; *Null hypothesis: Series are cointegrated.

Source: Researcher's Computation Using EViews-14 (2026)

The result produced an Lc-statistic of 0.021241 with a probability value greater than 0.20. Since the probability value exceeded the conventional significance level of 5%, the null hypothesis of cointegration could not be rejected. This indicated that the variables maintained a stable long-run equilibrium relationship over the period examined.

Threshold Regression Analysis

The threshold regression results in Tables 4–6 examined whether the effects of the individual components of tax revenue composition on external debt sustainability differed when tax collections were below and above endogenously determined threshold levels. The threshold models made it possible to determine whether the effects of VAT, Customs and Excise Duties, and Company Income Tax remained constant across the entire sample or changed after particular revenue levels were attained.

Value-Added Tax Threshold Regression

The Value-Added Tax, Table 4 showed an estimated threshold of approximately ₦312.60 billion, which corresponded to the 2006 observation. Below this threshold, VAT recorded a coefficient of −0.3287, a t-statistic of −6.7362, and a probability value of 0.0000. The coefficient was therefore negative and statistically significant at the 5% level. This indicated that increases in VAT within the lower

regime were associated with reductions in external debt sustainability, suggesting an improvement in external debt sustainability.

Table 4: Value-Added Tax Threshold Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
VAT < 312.59999 -- 13 obs				
VAT	-0.3287	0.0488	-6.7362	0.0000
C	88.0477	5.4057	16.2880	0.0000
312.59999 <= VAT -- 20 obs				
VAT	-0.0011	0.0042	-0.2564	0.7995
C	8.1870	3.5693	2.2938	0.0298
Non-Threshold Variables				
CED	0.0040	0.0077	0.5232	0.6051
CIT	0.0023	0.0045	0.4964	0.6236
Reliability Estimates				
R-squared	0.8567			
Adjusted R-squared	0.8302			
F-statistic	32.2859			
Prob(F-statistic)	0.0000			
Durbin-Watson stat	1.7429			

Threshold Test: The Bai–Perron sequential threshold test produced a scaled F-statistic of 155.5160, which exceeded the 5% critical value of 11.47, thereby confirming a statistically significant threshold effect. The estimated VAT threshold was ₦312.60 billion, corresponding to the 2006 observation. Below the threshold, VAT had a negative and statistically significant effect on external debt sustainability. At and above the threshold, the effect remained negative but became substantially weaker and statistically insignificant.

Source: Researcher's Computation Using EViews-14 (2026)

However, when VAT reached or exceeded ₦312.60 billion, its coefficient declined substantially in magnitude to −0.0011, with a probability value of 0.7995. Although the direction remained negative, the effect became statistically insignificant. This suggested that the debt-reducing association of VAT was noticeable when VAT collections were relatively low but became substantially weaker after the identified threshold was crossed. The result therefore provided evidence of a nonlinear relationship between VAT and external debt sustainability rather than a uniform effect across all levels of VAT collection.

Customs and Excise Duties Threshold Regression

Table 5 presented the results for Customs and Excise Duties and identified an estimated threshold of approximately ₦344.99 billion, corresponding to the 2006 observation. Below this threshold, CED had a coefficient of −0.1971,

a t-statistic of −6.3682, and a probability value of 0.0000. The negative and statistically significant coefficient indicated that increases in Customs and Excise Duties within the lower regime were associated with reductions in external debt sustainability. This implied that additional customs and excise revenue at relatively lower levels of collection was associated with an improvement in external debt sustainability. Above the ₦344.99 billion threshold, however, the coefficient changed direction to 0.0053, with a probability value of 0.4638. Although the positive coefficient suggested that higher CED beyond the threshold was associated with an increase in the external debt ratio, the relationship was statistically insignificant. The change from a significant negative coefficient below the threshold to an insignificant positive coefficient above it demonstrated that the relationship between CED and external debt sustainability differed across the two revenue regimes.

Table 5: Customs and Excise Duties Threshold Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CED < 344.98999 -- 12 obs				
CED	-0.1971	0.0309	-6.3682	0.0000
C	91.3855	5.4962	16.6271	0.0000
344.98999 <= CED -- 21 obs				
CED	0.0053	0.0071	0.7432	0.4638
C	8.7788	3.2127	2.7325	0.0109
Non-Threshold Variables				
VAT	-0.0015	0.0039	-0.3920	0.6981
CIT	0.0016	0.0042	0.3679	0.7159
Reliability Estimates				
R-squared	0.8750			
Adjusted R-squared	0.8519			
F-statistic	37.8130			
Prob(F-statistic)	0.0000			
Durbin-Watson stat	1.5385			

Threshold Test: *The Bai–Perron sequential threshold test produced a scaled F-statistic of 182.2839, which exceeded the 5% critical value of 11.47, thereby confirming a statistically significant threshold effect. The estimated CED threshold was ₦344.99 billion, corresponding to the 2006 observation. Below the threshold, CED had a negative and statistically significant effect on external debt sustainability. At and above the threshold, the effect became positive but remained statistically insignificant.*

Source: Researcher's Computation Using EViews-14 (2026)

Company Income Tax Threshold Regression

For Company Income Tax, Table 6 identified a

threshold of approximately ₦170.20 billion, corresponding to the 2005 observation. Below the threshold, CIT recorded a coefficient of −0.5101, a t-statistic of −5.5471, and a probability value of 0.0000. This showed that CIT had a negative and statistically significant relationship with external debt sustainability in the lower regime. Thus, increases in Company Income Tax when collections were below ₦170.20 billion were associated with a reduction in Nigeria's external debt burden.

Table 6: Company Income Tax Threshold Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CIT < 170.19999 -- 12 obs				
CIT	-0.5101	0.0920	-5.5471	0.0000
C	89.1259	5.8992	15.1081	0.0000
170.19999 <= CIT -- 21 obs				
CIT	0.0019	0.0046	0.4122	0.6835
C	8.8128	3.4930	2.5230	0.0178
Non-Threshold Variables				
VAT	-0.0013	0.0043	-0.3106	0.7585
CED	0.0046	0.0077	0.5923	0.5585
Reliability Estimates				
R-squared	0.8523			
Adjusted R-squared	0.8249			
F-statistic	31.1554			
Prob(F-statistic)	0.0000			
Durbin-Watson stat	1.5118			

Threshold Test: *The Bai–Perron sequential threshold test produced a scaled F-statistic of 150.0407, which exceeded the 5% critical value of 11.47, thereby confirming a statistically significant threshold effect. The estimated CIT threshold was ₦170.20 billion, corresponding to the 2005 observation. Below the threshold, CIT had a negative and statistically significant effect on external debt sustainability. At and above the threshold, the effect became positive but remained statistically insignificant.*

Source: Researcher's Computation Using EViews-14 (2026)

Among the three tax variables, CIT recorded the largest negative lower-regime coefficient in absolute terms. Above the threshold, the CIT coefficient changed to 0.0019, while its probability value increased to 0.6835. The effect was therefore positive but statistically insignificant. The result indicated that the relationship between CIT and external debt sustainability weakened substantially once CIT collections exceeded the threshold level.

Summary of Estimated Thresholds

A particularly important feature of the results was the timing of the threshold years. The VAT and CED thresholds were both associated with

2006, while the CIT threshold corresponded to 2005. These dates coincided with the period of Nigeria's major Paris Club debt relief, during which the country experienced a substantial reduction in its external debt burden.

The clustering of the identified threshold years around 2005–2006 suggested that the structural relationship between tax revenue and external debt sustainability changed during a major turning point in Nigeria's debt history. This coincidence did not, by itself, establish that the Paris Club debt relief caused the threshold effects, but it provided an important historical context for understanding the nonlinear behaviour observed in the results.

Table 7: Summary of Estimated Thresholds

Threshold Variable	Estimated Threshold	Threshold Year	Lower-Regime Coefficient	Prob.	Upper-Regime Coefficient	Prob.	Bai–Perron Threshold Test	Threshold Effect
VAT	₦312.60bn	2006	-0.3287	0.0000	-0.0011	0.7995	155.5160 > 11.47	Significant
CED	₦344.99bn	2006	-0.1971	0.0000	0.0053	0.4638	182.2839 > 11.47	Significant
CIT	₦170.20bn	2005	-0.5101	0.0000	0.0019	0.6835	150.0407 > 11.47	Significant

Note: *The threshold effect was considered significant where the threshold estimation indicated a statistically meaningful change in the relationship between the tax variable and external debt sustainability across the identified regimes. The estimated thresholds were ₦312.60 billion for VAT, ₦344.99 billion for CED, and ₦170.20 billion for CIT, corresponding to 2006, 2006, and 2005, respectively. The dates it coincided with the period of Nigeria's major Paris Club debt relief and the substantial decline in the country's external debt burden.*

Source: Researcher's Computation Using EViews-14 (2026)

Discussion of findings

Findings from the paper showed that Value-Added Tax exhibited a significant threshold effect on external debt sustainability in Nigeria. In the lower regime, VAT had a negative and statistically significant influence on external debt sustainability, implying that increases in VAT revenue at relatively lower levels were associated with a reduction in Nigeria's external debt burden relative to national income. This suggested that, before the identified threshold was reached, VAT collections have strengthened government revenue capacity and reduced the pressure to depend excessively on external borrowing for fiscal financing. However, once VAT crossed the identified threshold, its effect remained negative but became statistically insignificant. The implication was that further increases in VAT revenue beyond the threshold did not produce a proportionate improvement in external debt sustainability. This reflected the fact that tax revenue alone could not offset the influence of rising expenditure obligations, exchange-rate depreciation, new external borrowing, and debt-service commitments. The outcome was consistent with Tote and Suleiman (2026), who found that VAT had a negative and significant effect on external debt risk in Nigeria, particularly over the long run, indicating that stronger non-oil tax mobilisation could reduce debt-related vulnerability. The finding also related to Sunday *et al.* (2025), who reported that VAT contributed positively and significantly to

government revenue generation in Nigeria, suggesting that VAT strengthened domestic fiscal resources that could potentially support debt management. However, the present study extended these earlier findings by showing that the influence of VAT was not uniform across all revenue levels, but changed once a particular threshold was attained.

The findings further revealed that Customs and Excise Duties had a significant threshold effect on external debt sustainability in Nigeria. Below the identified threshold, CED exerted a negative and statistically significant effect on external debt sustainability, indicating that higher customs and excise revenue within the lower regime was associated with a reduction in external debt sustainability. This implied that improved mobilisation of revenue from international trade and selected excisable goods may have enhanced the government's domestic financing capacity and reduced external borrowing pressures. Beyond the threshold, however, the effect of CED became positive but statistically insignificant. This suggested that increases in customs and excise revenue above the threshold did not exert a meaningful influence on external debt sustainability. One possible explanation was that customs revenue remained sensitive to import volumes, tariff policy, exchange-rate movements and trade conditions, making its contribution to debt sustainability less predictable at higher revenue levels. The finding agreed with Nkanor and Chukwu (2024), who found that Customs and Excise Duties had a negative and significant effect on external public debt in Nigeria, suggesting that stronger collections from this source could reduce external financing dependence. In contrast, Adegbie *et al.* (2026) found that Customs and Excise Duties had a negative and significant effect on their measure of economic sustainability, although their dependent variable differed substantially from the external debt sustainability indicator used in the present study. The present finding therefore added to the literature by demonstrating that the effect of CED on external debt sustainability changed across revenue regimes rather than remaining constant over time.

With respect to Company Income Tax, the paper established that CIT had a significant threshold effect on external debt sustainability in Nigeria. In the lower regime, CIT exerted a negative and statistically significant effect, implying that increases in corporate tax revenue were associated with reductions in the external debt burden when CIT remained below the identified threshold. This suggested that improved taxation of corporate profits have provided government with additional domestic resources for meeting expenditure and debt-service obligations, thereby limiting the need for further external borrowing. Above the threshold, however, CIT became positive but statistically insignificant, indicating that further increases in corporate income tax revenue did not translate into a statistically meaningful improvement in external debt sustainability. This may have reflected broader fiscal conditions in which growing government expenditure, debt servicing, exchange-rate pressures and fresh external borrowing outweighed the contribution of higher corporate tax collections. The finding was in line with Obi and Igbodo (2024), who reported that Company Income Tax exerted a negative and significant effect on Nigeria's external public debt, thereby suggesting that stronger corporate tax mobilisation could reduce debt dependence. It also related to Obafemi (2025), who found that CIT contributed positively and significantly to government revenue generation in Nigeria, highlighting its importance as a source of domestic fiscal capacity. The present study, however, went beyond these earlier linear relationships by showing that the influence of CIT on external debt sustainability changed after the tax variable crossed a particular threshold, thereby confirming the existence of a nonlinear relationship.

V. Conclusion and Recommendations

The paper showed that tax revenue composition had a nonlinear relationship with external debt sustainability in Nigeria. Value-Added Tax, Customs and Excise Duties, and Company Income Tax each exhibited significant threshold effects, indicating that their influence on external debt sustainability changed after specific revenue levels were attained. In the lower regimes, increases in the three tax components

were associated with reductions in external debt stocks relative to gross national income, suggesting that stronger tax mobilisation initially supported improved debt sustainability. However, beyond the identified thresholds, the effects weakened considerably and became statistically insignificant, implying that further increases in tax revenue alone were insufficient to guarantee continued improvements in the external debt position. The findings therefore showed that the effectiveness of tax revenue in supporting debt sustainability depended on the prevailing revenue regime. In conclusion, sustainable external debt management required stronger tax mobilisation alongside prudent borrowing, effective expenditure control, and macroeconomic stability.

The following recommendations were suggested based on the findings:

i. Given that the findings showed that Value-Added Tax improved external debt sustainability only within the lower regime but became statistically insignificant after the identified threshold, the policy emphasis should not simply be on raising the VAT rate or pursuing ever-higher nominal VAT collections. The Nigeria Revenue Service (NRS) should instead concentrate on broadening the effective VAT base, reducing leakages, improving electronic invoicing, strengthening taxpayer registration, and using transaction-level data to identify under-declaration and non-compliance. The NRS should also work with the Federal Ministry of Finance and the Joint Revenue Board to review exemptions and zero-rated items periodically so that legitimate social protections are retained while unnecessary revenue losses are reduced.

ii. The finding that Customs and Excise Duties reduced the external debt burden below the threshold but became positive and insignificant above it suggested that simply increasing tariffs or excise rates would not necessarily improve external debt sustainability. The Nigeria Customs Service (NCS) should therefore prioritise revenue efficiency rather than tariff escalation. Specifically, the NCS should strengthen customs valuation, post-clearance audits, risk-based cargo inspection, anti-smuggling enforcement, and automated reconciliation of import declarations with banking and tax records.

iii. For Company Income Tax, the significant debt-reducing effect in the lower regime and insignificant effect above the threshold implied that greater CIT mobilisation alone would not automatically translate into improved external debt sustainability once collections became relatively large. The Nigeria Revenue Service (NRS) should therefore focus less on increasing statutory corporate tax burdens and more on expanding the number of effectively taxed profitable companies, strengthening transfer-pricing audits, improving detection of profit shifting, integrating electronic invoicing with company tax returns, and undertaking risk-based audits of large taxpayers. The NRS should collaborate with the Corporate Affairs Commission (CAC) to reconcile company-registration records with tax-registration and filing records so that incorporated businesses operating outside the effective tax net are identified.

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Table A: Data Presentation

Year	Value-Added Tax ((Billion naira))	Custom and Excise Duties (Billion naira)	company Income tax ((Billion naira))	External debt stocks (% of GNI)
1990	na	9.26	2.99	65.41
1991	na	12.23	3.83	71.85
1992	na	17.06	5.42	64.71
1993	7.26	16.42	9.55	120.84
1994	20.76	19	12.27	105.12
1995	32.5	53.69	21.88	81.48
1996	35.3	81.26	23.1	64.32
1997	37.6	93.16	27.8	54.51
1998	47.8	85.2	33.3	58.55
1999	58	116.75	46.2	50.25
2000	91.7	144.53	53.3	52.94
2001	108.6	244.56	69.4	48.26
2002	136.4	265.49	89.1	40.30
2003	163.3	288.15	114.8	42.28
2004	192.7	327.71	130.8	35.22
2005	232.7	349.06	170.2	17.88
2006	312.6	344.99	246.7	5.60

2007	401.7	413.41	332.4	5.87
2008	481.41	470.83	420.6	6.30
2009	564.89	513.97	595.18	8.11
2010	659.15	546.64	658.5	8.39
2011	710.56	741.84	654.45	8.72
2012	802.68	850.88	820.57	8.89
2013	802.96	833.25	963.45	8.62
2014	767.33	977.1	1,173.49	8.41
2015	828.2	904.07	1,268.98	9.37
2016	972.35	548.8	933.54	10.98
2017	1,108.04	628	1,215.06	17.73
2018	1,189.98	705.5	1,340.33	16.92
2019	1,531.09	837.3	1,604.70	17.49
2020	2,072.85	1297.96	1,275.45	20.51
2021	2511.52	1687.65	1,747.99	22.28
2022	3639.32	1858.57	2649.19	22.19
2023	1,287.65	2206.05	4896.47	29.04
2024	1,965.44	3089.64	2,856.43	39.33
2025	8,610.36	7,281.25	9,210.25	40.8

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