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Oil Tax Revenue And Educational Infrastructure In Nigeria

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Abstract
Nigeria's infrastructural profile is unremarkable, housing conditions are deplorable on both theoretical and practical levels. Majority of facilities are now in deplorable conditions, further elaborating that there is desperate need for repairs and renovations. Numerous problems including funding, technological development, maintenance, and design. This is associated with the fact that Nigeria's revenue mobilization ranks among the lowest globally, with a tax-to-GDP ratio of approximately 6 percent. In addition to persistent fiscal deficits, Nigeria's high levels of corruption and limited administrative capacities have resulted in diminished levels of productive public investments in both physical and human capital. Therefore, the study investigated the effect of oil tax revenue on public infrastructure development in Nigeria between 1986 to 2023. The study employs Autoregressive Distributed Lag (ARDL) Modelling. The result reveal that Petroleum Profits Tax has a positive and significant effect on educational infrastructure. However, Crude Oil Sales is not statistically significant. Other Oil Revenue has a significant negative effect with on educational infrastructure. Crude Oil & Gas Exports also shows a significant negative effect on educational infrastructure. In conclusion, the findings depicts that oil tax revenue, particularly from petroleum profits tax and crude oil sales, plays a crucial role in educational infrastructure development in Nigeria. However, the negative impact of crude oil and gas exports, alongside inefficiencies in the allocation of other oil revenues, hampers the effectiveness of these revenues in supporting long-term infrastructure growth. Based on the findings of this study, the result recommended that the Nigerian government increase its allocation of petroleum profits tax revenues towards the education sector. This could involve creating dedicated funds for educational infrastructure projects, such as the construction of new schools, modernization of existing ones, and investment in digital learning resources.

Keywords: *Oil Tax Revenue, Educational Infrastructure, Crude oil Tax, ARDL*

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I. Introduction

Infrastructure development is an undertaking that hinges on financial resources. It entails a substantial demand for funds, making it imperative to generate ample revenue for the planning, execution, and upkeep of infrastructure projects within a state. This necessity extends to revenue generation for various facets of infrastructure development, including the construction of educational facilities, the enhancement of telecommunications, the creation of a conducive business environment, the generation of electricity, the establishment of accessible road networks, and the improvement of healthcare, among other critical areas (Tanko & Shishi, 2020). Taxation, as articulated by Ayeni and Afolabi (2020), exerts a pivotal influence on the types of physical investments that serve as catalysts for business activities. Olaniyi and Akinola (2020) add that through taxation, governments can strategically allocate resources towards critical infrastructure projects, stimulating growth and driving economic prosperity. In essence, taxation serves as a crucial mechanism by which governments mobilise resources to support essential infrastructure development.

Nigeria's infrastructural profile, like that of any developing nation, is unremarkable, housing conditions are deplorable on both theoretical and practical levels. Umar et al., (2019) argue that majority of facilities are now in deplorable conditions, further elaborating that there is desperate need for repairs and renovations. Numerous problems exist, including those related to funding, technological development, maintenance, and design. This in spite of the fact that development of infrastructure in Nigeria holds paramount importance in promoting economic growth and enhancing the quality of life for its citizens. Even before the outbreak of the COVID-19 pandemic, Nigeria had been grappling with significant economic and societal challenges. For instance, macroeconomic

stability and fiscal consolidation had been deteriorating, primarily attributable not only to infrastructure deficits but also to issues such as tax evasion, a sizable informal economy, and a relatively limited tax base. Dorbanda et al. (2022) recounted that as of 2022, Nigeria's revenue mobilization ranks among the lowest globally, with a tax-to-GDP ratio of approximately 6 percent. In addition to persistent fiscal deficits, Nigeria's high levels of corruption and limited administrative capacities have resulted in diminished levels of productive public investments in both physical and human capital. Therefore, Nigeria's economic growth has not translated into economic development, primarily because of a lack of infrastructure, high poverty and unemployment rates (Olufemi et al. 2013).

More so, Nigeria is a country with a vast population, and the educational system serves as a critical avenue for empowering its citizens with the skills and knowledge necessary to contribute to the nation's growth and development. However, despite being one of the largest economies in Africa, Nigeria faces numerous challenges in its infrastructural development (Onwioduokit, 2020). These challenges include lack of vision, political instability, maintaining projects, insufficient funding, insecurity and corruption. The dominant role of oil tax revenue in Nigeria's national income generation raises questions about how effectively these resources are being channeled towards improving the infrastructure. While oil revenue is a substantial source of income, its allocation and utilization have often been a subject of debate. Consequently, it becomes imperative to scrutinize whether the considerable funds generated from oil taxes are being translated into tangible improvements in educational infrastructure.

II. Literature Review

Educational attainment is defined as the highest level of education that an individual completes (U.S. Census Bureau, 2010) and is viewed as a common indicator of life outcomes with significant implications for individuals, communities, and the nation (Sarah et al., 2018). Funding Education in Nigeria is the shared responsibility of the federal, state and local governments. The Federal Ministry of Education plays a leading role in regulating the education sector, formulating policy and ensuring quality control. However, the federal government is more directly involved with tertiary education than it is with basic and secondary education, which is largely the responsibility of state (secondary) and local (Basic) governments. Education in Nigeria is mainly provided by the governments, though there are some community efforts especially on basic education through community schools. Private institutions also complement the process (Habibu et al., 2013).

Oil revenue refers to the income earned from the sale of crude oil. Gideon, Johnson and Samson (2021) asserted that oil is the dominant source of government revenue, accounting for about 90 percent of total exports, thus, approximately 80 percent of total government revenues. Since the discoveries of oil in the early 1970s, it has become the dominant factor in Nigeria's economy. The problem of low economic performance of Nigeria cannot be attributed solely to instability of earnings from the oil sector, but as a result of failure by government to utilize productively the financial windfall from the export of crude oil from the mid 1970's to develop other sectors of the economy. Oil revenue has ever been one of the most influential factors in economies of oil exporting countries, Nigeria included. Due to its remarkable importance in world industrialization, crude oil can be one of the most important constituents of demand of developed countries (Anfofum & Olure-Bank, 2018). Oil revenue has made up an insignificant amount of the overall income generated over time when equated to the majority of proceeds generated by the Federal Government (Yahaya & Bakare, 2018).

Theoretical Review: Bowen's model of Taxation

Bowen's model of taxation, proposed by economist Harold Bowen, provides a framework for understanding the relationship between tax structure, economic development, and public goods provision. The model suggests that the optimal tax structure balances the need for revenue generation with the desire to minimize distortions in economic decision-making. Bowen's model makes several key assumptions. Firstly, it assumes that governments seek to maximize social welfare rather than individual welfare. Secondly, it assumes that tax revenue is the only source of government revenue. Thirdly, it assumes that individuals and firms respond rationally to changes in tax policy, adjusting their behavior to minimize their tax burden. Finally, it assumes that there are no administrative costs associated with tax collection.

Bowen's model has more operational significance, since it demonstrates that when social goods are produced under conditions of increasing costs, the opportunity cost of private goods is foregone. For example, if there is one social good and two taxpayers (A and B), their demand for social goods is represented by a and b; therefore, a+b is the total demand for social goods. The supply curve is shown by a'+b', indicating that goods are produced under conditions of increasing cost. The production cost of social goods is the value of foregone private goods; this means that a'+b' is also the demand curve of private goods. The intersection of the cost and demand curves at B determines how a given national income should (according to taxpayers' desires) be divided between social and private goods; hence, there should be OE social goods and EX private goods. Simultaneously, the tax

shares of A and B are determined by their individual demand schedules. The total tax requirement is the area (ABEO) out of which A is willing to pay GCEO and B is willing to pay FDEO.

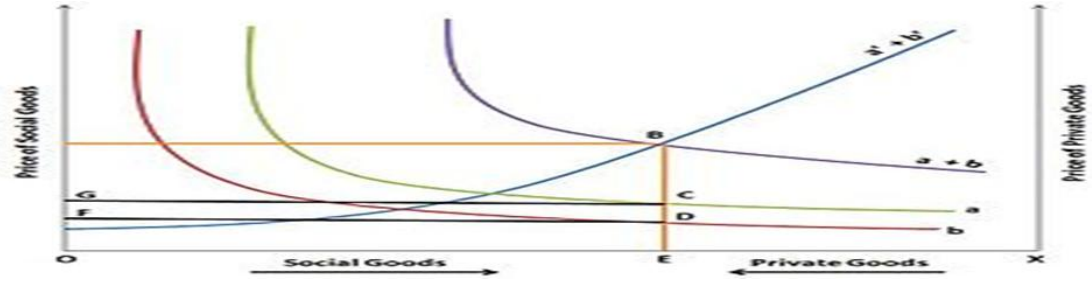

Figure 1:

One criticism of Bowen's model is that it oversimplifies the relationship between tax structure and economic development. Critics argue that the model fails to account for the complexity of real-world tax systems and the diverse objectives of different tax policies. Additionally, some critics argue that the model's assumption of rational behavior is unrealistic, as individuals and firms may not always respond predictably to changes in tax policy.

Despite these criticisms, Bowen's model remains a useful tool for policymakers seeking to design tax systems that promote economic development and social welfare. The model highlights the importance of considering the impact of tax policy on economic incentives and behavior, and provides a framework for evaluating the trade-offs involved in tax policy decisions.

The advantage of this theory is that it pinpoints the direct correlation between revenue and expenditure in a budget. It approximates market behaviour in the allocation procedures of the public sector. Although simple in its application, the theory has difficulties. In the context of studying non-oil tax revenue and infrastructure financing, Bowen's model provide valuable insights into the design of tax systems that can effectively finance infrastructure projects. By considering the impact of tax policy on economic behavior, Additionally, Bowen's model help to identify opportunities to improve tax compliance and enhance revenue generation, thereby increasing the resources available for infrastructure financing.

Empirical Review

Lyndon and Paymaster (2016) examined the relationship between petroleum profit tax (PPT) and economic growth, measured by real gross domestic product (GDP), in Nigeria. Using the Ordinary Least Squares (OLS) technique in SPSS 20, their findings showed that petroleum profit tax had a significantly positive relationship with economic growth. The study recommended strengthening the tax administration system to broaden tax income and promote tax education for voluntary compliance. This aligns with the findings of Alhassan et al. (2020), who also investigated the impact of petroleum profit tax on Nigerian economic growth. Their study employed cointegration and fully modified OLS techniques, confirming a long-run positive relationship between petroleum profit tax and economic growth. These studies suggest that revenue from petroleum profit tax can be leveraged for economic development, including investments in educational infrastructure.

More so, Musa, Sunusi, Sabiu, and Abdullahi (2016) critically analyzed the impact of oil revenue on the Nigerian economy using multivariate regression analysis. Their findings indicated a weak linkage between oil revenue inflows and key economic sectors. This finding aligns with Omodero and Ehikioya (2020), who established that oil revenue had a significant negative impact on infrastructural development. However, their study also found that non-oil revenue had a significant positive effect, suggesting that diversified revenue sources, including tax revenue, may be more effective for infrastructure investment, including educational infrastructure. Ordu and Nkwoji (2019) specifically examined the impact of education tax revenue on Nigeria's economic development from 2006 to 2017. Their study, using regression and thematic analysis, found that education tax revenue had a significant positive effect on economic development. This aligns with Nkang et al. (2022), who explored the relationship between fiscal autonomy and educational attainment across Nigerian states. Their findings suggest that while fiscal autonomy does not necessarily guarantee high educational attainment, efficient tax revenue utilization is crucial for funding education infrastructure. Together, these studies highlight the role of education tax revenue in improving educational facilities, which contributes to broader economic development.

Kareem et al. (2020) investigated the relationship between Value Added Tax (VAT) and economic performance in Nigeria. Using unit root tests, bound test cointegration, and causality tests, their results indicated that VAT positively and significantly impacted economic performance in both the long and short run. This corroborates the findings of Ayeni and Cordelia (2022), who utilized the Vector Error Correction Model to assess

the impact of PPT, CIT, and VAT on GDP. Their study revealed that while PPT and VAT had positive and significant effects on GDP, CIT had a negative effect. These studies reinforce the argument that tax revenue, including VAT and PPT, contributes to national economic performance, which in turn affects government capacity to invest in educational infrastructure. Lateef et al. (2022) examined the effect of tax revenue collections on healthcare infrastructure development in Nigeria from 2013 to 2020. Using multiple linear regression, they found that PPT and VAT strongly influenced healthcare infrastructural development. Similarly, Daniel-Adebayo et al. (2022) found that tax revenue had a significant effect on the infrastructural expectation gap in Sub-Saharan Africa. Their findings highlight the importance of efficient tax revenue utilization in addressing infrastructure gaps. These studies suggest that tax revenue could also be channeled into educational infrastructure to bridge existing gaps in Nigeria's education sector.

Lastly, Damianus et al. (2021) investigated the effect of educational attainment and work experience on self-efficacy, using multilinear regression analysis and ANOVA. Their study found a strong correlation between educational attainment and self-efficacy. This underscores the importance of investing in educational infrastructure, as highlighted by the studies on tax revenue contributions to economic and infrastructural development. Without adequate funding from tax revenue, improvements in educational attainment may remain limited, subsequently affecting workforce productivity and self-efficacy.

In summary, the empirical findings reviewed suggest that tax revenue from petroleum profit tax, VAT, and education tax plays a critical role in Nigeria's economic and infrastructural development, particularly in education. While oil revenue has shown mixed results regarding its direct impact on infrastructure, non-oil tax revenue sources consistently demonstrate positive contributions to economic growth and public sector investments. To ensure sustainable educational infrastructure development, Nigeria must focus on enhancing tax revenue collection, reducing leakages, and implementing prudent expenditure policies.

III. Methodology

This study employs an *ex-post facto* research design, also known as a retrospective or causal-comparative research design. This design is appropriate for investigating the relationship between past oil tax revenue and public infrastructure financing in Nigeria over a specific period, as it allows us to analyze existing data and draw causal inferences from it. To address the methodology aspects, the theoretical framework for this study was Bowen theoretical model; the model demonstrates that when social goods are produced under condition of increasing cost, the opportunity cost of private goods is foregone. The model is as stated below:

$y = f(k)$…… (3.1)

Where y is output per worker and k is capital per worker. Each person works a given amount of time; that is, there is no labor-leisure choice. As is well known, the maximization of the representative household's income

$y = \emptyset(k, g) = k \,.\, \emptyset(\frac{g}{k})$ …….. (3.2)

The theory assume that government expenditure is financed contemporaneously by a flat-rate income tax

$g = T = \tau y = \tau \cdot k \cdot \emptyset\ \frac{g}{k}$ ---------- (3.3)

Where T is government revenue and τ is the tax rate. The model normalized the number of households to unity so that g corresponds to aggregate expenditures and T to aggregate revenues. Note that equation (1) constrains the government to run a balanced budget. That is, the government can neither finance deficits by issuing debt nor run surpluses by accumulating assets. The production function in equation 4 implies that the marginal product of capital is

$\frac{\partial y}{\partial k} = \emptyset\left(\frac{g}{k}\right) \cdot \left(1 - \emptyset \cdot \frac{g}{y}\right) = \emptyset\frac{g}{y} \cdot (1 - \pi)$ …… (3.4)

Where π is the elasticity of y with respect to g (for a given value of k), so that 0 < -q < 1. Note that the marginal product $\frac{\partial y}{\partial k}$, is calculated by varying k in equation (3.4)

Model Specification

In order to investigate the effect of oil tax revenue on public infrastructure financing, both the Bowen model of taxation and financing and Esfahania and Ramı´rez (2003) works on Institutions, infrastructure, and economic growth will be adapted and carefully modified to suit each of the objectives.

Goyal function relationship was specified below:

$GDP_t = (TOT_t, OET_t, PGC_t, POD_t, SIG_t, CEM_t)$ …… (3.5)

Where:

GDP is Gross Domestic Product, AVT is Aviation, OET is Output elasticity with respect to Telephones, PGC is Power generation capacity, POD is population density, SIG is Share of industry in GDP

CEM is Contract enforcement, INV is f investment –GDP ratio, EDIF is Education Attainment. Sequel to the study, the oil tax revenue was proxy with petroleum profit tax, Crude Oil Sales, Other Oil Revenue, Crude Oil & Gas Exports. The functional relationship is specified below

$EDIT_t = (PPT_t, COS_t, OOR_t, CGE_t)$ .....(3.6)

To complete the specification of the econometric model, we consider the form of algebraic or linear relationship among the economic variables. The corresponding econometric model is specified in linear form:

$EDIF_t = \alpha_0 + \alpha_1 PPT_t + \alpha_2 COS_t + \alpha_3 OOR_t + \alpha_4 CGE_t + \mu_t$.....(3.7)

In other to avoid the problem of heteroskedasticity, the variables were re-scale into ratio by logging them, thus the model was re-specified in a log linear form

$lnEDIF_t = \alpha_0 + \alpha_1 PPT_t + \alpha_2 lnCOS_t + \alpha_3 lnOOR_t + \alpha_4 lnCGE_t + \mu_t$..... (3.8)

Where:

EDIF = Educational Infrastructure, PPT = Petroleum Profits Tax, COS = Crude Oil Sales

OOR = Other Oil Revenue, CGE= Crude Oil & Gas Exports, *l*n = Natural logarithm

β_0 = Intercept, $\beta_{1,2,3,4}$ = Parameters of the independent variables, μ= Stochastic or error term

t = time variant

Table 3.1: Variables, Description, Measurement and Sources

Variables	Measurement	A'Priori Expectation	Source (s)
Educational Infrastructure	This variable is measured as the average number of years of secondary education completed by the population		World Development Indicators, (2021)
Petroleum Profits Tax	This variable is measured as the revenue generated from taxes on petroleum profits	_	National Bureau of Statistics, CBN Publications
Crude Oil Sales	This variable is measured as the percentage of GDP represented by revenue from crude oil sales.	_	World Development Indicators, (2021)
Other Oil Revenue	This variable is measured as revenue from sources other than taxes on petroleum profits.	_	National Bureau of Statistics, CBN Publications
Crude Oil & Gas Exports	This variable is measured as the percentage of GDP represented by revenue from exports of crude oil and natural gas.	_	World Development Indicators, (2021)

Source: Researcher's Compilation, 2023

Descriptive Statistics

This section presents the descriptive statistics of the variables used in this study, providing a summary of the key characteristics of the data. This section reports measures such as the mean, standard deviation, minimum, and maximum values, allowing for an understanding of the data's general trends and patterns before conducting more advanced statistical analyses. By examining these statistics, the study provides a foundational overview of the dataset.

Table 2: Descriptive Statistics

	Mean	Median	Maximum	Minimum	Std. Dev.	Observ
EDIF	33.34161	31.5663	54.88297	21.90142	9.728738	35
LCOIS	6.878762	7.898745	9.091441	2.092765	2.028591	35
CGE	93.55317	94.14639	99.6565	84.03897	4.00623	35
LOOR	9.258864	9.588018	11.43176	0.530628	1.758304	35
LPPT	4.936531	5.756375	8.311307	0	2.950499	35

Source: Author's Computation (2025); Where: Educational Infrastructure (EDIF), Log of Petroleum Profits Tax (LPPT), Log of Crude Oil Sales (COIS), Other Oil Revenue (OOR), Crude Oil & Gas Exports (CGE)

Table 2 presents the summary of the descriptive statistics of the variables analyzed in this study, highlighting their central tendencies, variability, and ranges. The educational infrastructure (EDIF) displayed greater variability compared to other variables as EDIF, with the mean of 33.34 and a standard deviation of 9.73,

shows the most substantial variability, reflecting the diverse scale of investments in educational infrastructure across the study period. These wide ranges highlight that the focus on educational and industrial development has been uneven and heavily influenced by external factors such as revenue fluctuations or policy changes.

Power generation infrastructure (PGI) also exhibited significant variability, with a mean of 113.47 and the highest standard deviation of 27.51 among the variables. This wide range, from a minimum of 74.15 to a maximum of 154.17, reveals inconsistent investment patterns in power generation. On the other hand, crude oil and gas exports (CGE) demonstrated relative stability, with a mean of 93.55 and a narrow standard deviation of 4.01, indicating consistent export activities throughout the period.

Finally, variables associated with oil revenue, including the log of crude oil sales (LCOIS), other oil revenue (LOOR), and petroleum profits tax (LPPT), revealed differing levels of variability. LCOIS has a mean of 6.88 and moderate variability (standard deviation of 2.03), while LOOR has a mean of 9.26 with a standard deviation of 1.76, indicating greater consistency in other oil revenue. LPPT, however, showed significant variability with a mean of 4.94 and a standard deviation of 2.95, reflecting fluctuations in petroleum profit tax contributions over time. Together, these patterns underscore the impact of oil tax revenue on public infrastructure financing, with considerable differences in investment stability across sectors.

Multicollinearity

This section examined the issue of multicollinearity among the independent variables in the study, which can affect the reliability of regression results. To assess this, the correlation matrix of pairwise correlation coefficients between the variables was used.

Table 3: Correlation Matrix

	EDIF	LCOIS	CGE	LOOR	LPPT
EDIF	1				
LCOIS	0.739866	1			
CGE	-0.6826	-0.3260183	1		
LOOR	0.122755	0.4782453	-0.04355	1	
LPPT	0.803296	0.7482274	-0.39914	0.410422	1

Source: Author's Computation (2025); Where: Educational Infrastructure (EDIF), Log of Petroleum Profits Tax (LPPT), Log of Crude Oil Sales (COIS), Other Oil Revenue (OOR), Crude Oil & Gas Exports (CGE)

Table 3 present the correlation matrix with which present both the relationships between the variables under study and multicollinearity test among the independent variables. As regards the independents variables of log of petroleum profits tax (LPPT), log of crude oil sales (LCOIS), log of other oil revenue (LOOR), and crude oil & gas exports (CGE), the matrix shows moderate to high positive correlations between LPPT and LCOIS (0.7482) and between LPPT and LOOR (0.4104), revealing that petroleum profit tax revenue is influenced by both crude oil sales and other oil-related revenue streams. Similarly, LCOIS exhibits a moderate positive correlation with LOOR (0.4782), highlighting a complementary relationship between crude oil sales and other oil revenue sources. Conversely, CGE demonstrates weak correlations with the other variables. For example, CGE and LPPT have a negative correlation (-0.3991), and CGE and LCOIS are negatively correlated (-0.3260). This reveals that the revenue from crude oil and gas exports does not align directly with other oil-related tax revenue streams, potentially reflecting differences in allocation or timing. LOOR and CGE have an extremely weak negative correlation (-0.0436), indicating minimal direct interaction between these two revenue categories.

The presence of multicollinearity among independent variables is a concern when correlation coefficients exceed 0.90 (Hair et al., 2010). In summary, none of the correlations among LPPT, LCOIS, LOOR, and CGE exceed the 0.90 threshold for multicollinearity, ensuring that the variables can be reliably included in the regression model without concerns of significant distortion. This finding confirms the robustness of the selected variables for further econometric analysis.

Table 4: Unit root Test

	Augmented Dickey-Fuller test			ADF
	Level	First Diff.	Critical	
EDIF	-0.7464	-6.6295	-2.9511	I(1)
LCOIS	-3.2690	-	-2.9511	I(0)
CGE	-1.9752	-7.2926	-2.9511	I(1)
LOOR	-4.21728	-	-2.9511	I(0)
LPPT	-1.2750	-5.7973	-2.9511	I(1)

Source: Author's Computation (2025); Where: Educational Infrastructure (EDIF), Log of Petroleum Profits Tax (LPPT), Log of Crude Oil Sales (COIS), Other Oil Revenue (OOR), Crude Oil & Gas Exports (CGE)

The results of the Augmented Dickey-Fuller (ADF) test presented in Table 4 reveal the stationarity properties of the variables under study. At the level form, variables such as log of telephone infrastructure (LTLIF), log of aviation infrastructure (LAVIF), industry infrastructure (INIF), educational infrastructure (EDIF), power generation infrastructure (PGI), and log of petroleum profits tax (LPPT), exhibits non-stationarity properties as their ADF test statistics are greater than the critical value of -2.9511. This implies that these variables exhibit unit roots and are not mean-reverting at their original levels. After taking the first difference, all variables become stationary, as evidenced by their test statistics. This confirms that variables such as LTLIF, LAVIF, INIF, EDIF, CGE, PGI, and LPPT are integrated of order one, I(1).

However, variables such as log of crude oil sales (LCOIS) and other oil revenue (LOOR) are stationary at level, as their ADF test statistics are less than the critical value, indicating they are integrated at order zero, I(0). The mix of variables integrated at different orders (I(0) and I(1)) accentuates the suitability of an econometric framework capable of accommodating such heterogeneity. Importantly, no variable is integrated of order two, I(2), as this would invalidate the use of autoregressive distributed lag (ARDL) modelling (Pesaran et al., 2001).

Test of Hypothesis

H_0: there is no significant contribution of oil tax revenue on educational infrastructure in Nigeria

Table 5: Bound Test Cointegration of Oil Tax Revenue and Educational Infrastructure in Nigeria

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	10.11293	10%	2.2	3.09
K	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

Source: Author's Computation (2025); Where: Educational Infrastructure (EDIF), Log of Petroleum Profits Tax (LPPT), Log of Crude Oil Sales (COIS), Other Oil Revenue (OOR), Crude Oil & Gas Exports (CGE)

The results of the Bounds Test for cointegration presented in Table 5 indicate a significant long-run relationship between oil tax revenue and educational infrastructure in Nigeria at the 5% significance level. The calculated F-statistic of 10.11293 exceeds the upper critical bound value of 3.49, which corresponds to the 5% level of significance. This implies that the null hypothesis of no levels relationship is rejected, confirming the existence of cointegration among the variables. The findings suggest that oil tax revenue variables, such as petroleum profits tax, crude oil sales, and other oil revenue, have a stable long-term association with the financing of educational infrastructure in Nigeria. This evidence aligns with Pesaran et al.'s (2001) cointegration framework, validating the suitability of the ARDL approach for modelling these relationships.

Table 6: Autoregressive Distributed Lag Modelling for Oil Tax Revenue and Educational Infrastructure in Nigeria

Panel A: Long Run Estimates				
Dependent Variable: EDIF				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob**
LPPT	2.743375	0.522502	5.250461	0.0019
LCOIS	1.295738	0.787596	1.645181	0.1510
LOOR	-3.551499	0.813430	-4.366079	0.0047
CGE	-1.444333	0.122734	-11.76795	0.0000
C	176.0717	11.20103	15.71924	0.0000
Panel B: Short Run Estimates				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob**
D(LPPT)	4.510783	0.562865	8.013970	0.0002
D(LCOIS)	3.582334	0.771644	4.642471	0.0035
D(LOOR)	-1.297214	0.305839	-4.241488	0.0054
D(CGE)	-0.714397	0.146064	-4.890998	0.0027
ECT(-1)*	-1.959415	0.185777	-10.54714	0.0000
Panel C: Evaluation Tests		Statistics	Prob.	
R-squared		0.949010	-	
Adjusted R-squared		0.874843	-	
F-statistic			0.0000	

Source: Author's Computation (2025); Where: Educational Infrastructure (EDIF), Log of Petroleum Profits Tax (LPPT), Log of Crude Oil Sales (COIS), Other Oil Revenue (OOR), Crude Oil & Gas Exports (CGE)

The long-run estimates of the effect of oil tax revenue and educational infrastructure in Nigeria was presented in table 6. Specifically, the coefficient of LPPT (Log of Petroleum Profits Tax) is 2.743375, with a t-statistic of 5.250461 and a p-value of 0.0019. This indicates a positive and statistically significant relationship at

the 5% significance level, revealing that an increase in petroleum profits tax positively impacts educational infrastructure in the long run. On the other hand, the variable LCOIS (Log of Crude Oil Sales) has a coefficient of 1.295738, but its t-statistic of 1.645181 and a p-value of 0.1510 indicate that it is not statistically significant at the 5% level, meaning it does not have a significant impact on educational infrastructure in the long term. Furthermore, LOOR (Other Oil Revenue) has a negative coefficient of -3.551499, with a t-statistic of -4.366079 and a p-value of 0.0047, indicating a significant negative effect on educational infrastructure. This reveals that higher other oil revenue negatively impacts the development of educational infrastructure in the long run.

Additionally, CGE (Crude Oil & Gas Exports) shows a strongly negative coefficient of -1.444333, with a t-statistic of -11.76795 and a p-value of 0.0000, which is highly statistically significant at the 5% level. This reveals that an increase in crude oil and gas exports reduces the financing available for educational infrastructure. The constant (C) has a coefficient of 176.0717, indicating that in the absence of the explanatory variables, educational infrastructure would be at this level, with a t-statistic of 15.71924 and a p-value of 0.0000, confirming the strong significance of the model overall.

The error correction term (ECT(-1)) is -1.959415, with a t-statistic of -10.54714 and a p-value of 0.0000, which is highly significant. The negative coefficient and significance is in line with the theoretical assumption. The negativity indicated that the model adjusts back to long-run equilibrium at a rate of approximately 1.96% per period, confirming the long-term dynamics of the relationship between oil tax revenue and educational infrastructure. The short-run estimates reveal that the coefficient of D(LPPT) is 4.510783, with a t-statistic of 8.013970 and a p-value of 0.0002, indicating a positive and statistically significant relationship at the 5% significance level. Similarly, D(LCOIS) has a positive coefficient of 3.582334, with a t-statistic of 4.642471 and a p-value of 0.0035, indicating a significant positive effect on educational infrastructure in the short run. Conversely, D(LOOR) shows a negative coefficient of -1.297214, with a t-statistic of -4.241488 and a p-value of 0.0054, indicating a significant negative effect on educational infrastructure in the short run. The D(CGE) has a negative coefficient of -0.714397, with a t-statistic of -4.890998 and a p-value of 0.0027, indicating a significant negative effect on educational infrastructure. This means that higher crude oil and gas exports reduce the development of educational infrastructure in the short run.

The coefficient of determination, as indicated by the Adjusted R-squared value of 0.874843, reveals that approximately 87.48% of the variation in educational infrastructure (EDIF) in Nigeria is explained by the independent variables jointly. This high value indicates a strong fit of the model. The F-statistic value of 0.0000, which is statistically significant, indicating that the overall model is highly significant and that at least one of the independent variables has a meaningful impact on educational infrastructure in Nigeria. Hence, we can reject the null hypothesis that stated that there is no significant contribution of oil tax revenue to educational infrastructure. This confirms that oil tax revenue does have a significant effect on educational infrastructure in Nigeria.

Table 4.6: Diagnostics Test for Oil Tax Revenue and Educational Infrastructure in Nigeria

	Chi-Square	Prob
Serial Correlation LM Test	0.7196	0.4981
Heteroskedasticity Test:	0.5697	0.8425
Normality Test	0.9786	0.6131
	CUSUM	CUSUMSQ
Stability Test	Stable	Stable

Source: Author's Computation (2025); Where: Educational Infrastructure (EDIF), Log of Petroleum Profits Tax (LPPT), Log of Crude Oil Sales (COIS), Other Oil Revenue (OOR), Crude Oil & Gas Exports (CGE)

The diagnostic tests for oil tax revenue and educational infrastructure in Nigeria show that the model passes key diagnostic checks. The Serial Correlation LM Test yields a chi-square value of 0.7196 with a probability of 0.4981, indicating that there is no significant serial correlation in the residuals. The Heteroskedasticity Test results in a value of 0.5697 with a probability of 0.8425, revealing no evidence of heteroskedasticity in the model. The Normality Test shows a value of 0.9786 with a probability of 0.6131, implying that the residuals are normally distributed. Finally, the CUSUM and CUSUMSQ tests confirm the stability of the model, indicating that the estimates are robust and the model is well-specified for the analysis.

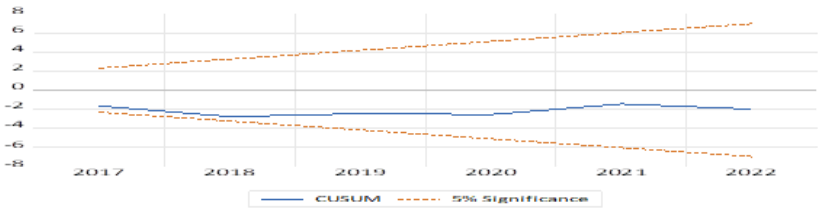

Figure 1: CUSUM Squares for Oil Tax Revenue and Educational Infrastructure in Nigeria

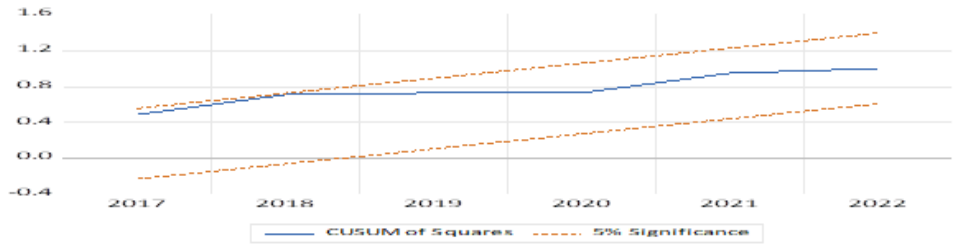

Figure 2: CUSUM Test for Oil Tax Revenue and Educational Infrastructure in Nigeria

IV. Summary, Conclusion And Recommendations

The study investigated the effect of oil tax revenue on public infrastructure development in Nigeria between 1986 to 2023. The study employs Autoregressive Distributed Lag (ARDL) Modelling, utilizing time-series data sourced from the Central Bank of Nigeria and the World Development Index, covering a period of 36 years. The result reveal that Petroleum Profits Tax has a positive and significant effect on educational infrastructure. However, Crude Oil Sales is not statistically significant. Other Oil Revenue has a significant negative effect with on educational infrastructure. Crude Oil & Gas Exports also shows a significant negative effect on educational infrastructure. The findings of this study align with some empirical studies but also diverge from others. The positive and significant relationship between Petroleum Profits Tax (and educational infrastructure in the long run is in agreement with Nkang et al. (2022), who highlighted the importance of fiscal autonomy in educational development. However, Nkang et al. (2022) argued that fiscal autonomy alone does not guarantee high educational attainment, which contrasts with the finding that an increase in LPPT, representing a key oil tax revenue, positively impacts educational infrastructure. On the other hand, the significant negative relationship between Other Oil Revenue (LOOR) and educational infrastructure aligns with the concerns raised by Ayeni and Cordelia (2022), who found that petroleum-related tax revenues such as Petroleum Profit Tax (PPT) can positively affect economic growth but may not always translate to significant improvements in other sectors like education. This negative impact of LOOR in the current study reveals that while oil revenue is crucial for economic growth, its allocation to education may not be effective in fostering long-term development in this sector, as noted in other studies.

The findings in this study also diverge from Daniel-Adebayo et al. (2022), who found that tax revenue influenced infrastructural gaps in Sub-Saharan Africa, including educational infrastructure. The significant negative relationship between Crude Oil and Gas Exports (CGE) and educational infrastructure may point to the diversion of resources from educational development due to the prioritization of oil exports, aligning with the conclusions of Lateef et al. (2022) on how petroleum-related tax revenue, such as PPT, can strengthen other sectors like health but may not yield similar results for education. Thus, while oil revenues, including PPT, have the potential to positively influence infrastructure, their allocation and impact on educational infrastructure might not be as straightforward as suggested by some studies.

In conclusion, the findings depicts that oil tax revenue, particularly from petroleum profits tax and crude oil sales, plays a crucial role in educational infrastructure development in Nigeria. However, the negative impact of crude oil and gas exports, alongside inefficiencies in the allocation of other oil revenues, hampers the effectiveness of these revenues in supporting long-term infrastructure growth.

Based on the findings of this study, the result recommended that the Nigerian government increase its allocation of petroleum profits tax revenues towards the education sector. This could involve creating dedicated funds for educational infrastructure projects, such as the construction of new schools, modernization of existing ones, and investment in digital learning resources.

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