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Non-oil tax revenue and infrastructural development in Nigeria

Central European Economic Journal (CEEJ)

Provided in Cooperation with:
Faculty of Economic Sciences, University of Warsaw

Suggested Citation: Oziegbe, David Jerry; Itua, Perpetual Omoyemi (2024) : Non-oil tax revenue and infrastructural development in Nigeria, Central European Economic Journal (CEEJ), ISSN 2543-6821, Sciendo, Warsaw, Vol. 11, Iss. 58, pp. 200-213, https://doi.org/10.2478/ceej-2024-0014

This Version is available at:
https://hdl.handle.net/10419/324609

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Mitglied der Leibniz-Gemeinschaft

Central European Economic Journal

sciendo

ISSN: 2543-6821 (online)

Journal homepage: http://ceej.wne.uw.edu.pl

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To cite this article

Oziegbe, D. J., Itua, P. O. (2024). Non-Oil Tax Revenue and Infrastructural Development in Nigeria. Central European Economic Journal, 11(58), 200-213.

DOI: 10.2478/ceej-2024-0014

To link to this article: https://doi.org/10.2478/ceej-2024-0014

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Central European Economic Journal

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Non-Oil Tax Revenue and Infrastructural Development in Nigeria

Abstract
In Nigeria, there has been a decline in oil revenue. This has impacted negatively on infrastructural development. This paper seeks to examine the effect of non-oil revenue as an alternative source of revenue for infrastructural development. The research design of the study was the ex post facto research design. The source of data was the secondary source and a time series of data from 1981 to 2021 was used in carrying out the research. The Autoregressive Distributed Lagged (ARDL) bounds test was used to determine the long-run and short-run relationship between the dependent and independent variables. It was observed that the variables are co-integrated, and as such, a long-run and short-run relationship exists among the explanatory variables. Furthermore, the ARDL short-run estimation result shows that the non-oil tax variables (proxied by VAT, CUSTD, and CIT) have a positive and significant effect on infrastructural development (proxied by total electricity production measured in Gigawatt hours (GWh) in Nigeria. In tandem, the ARDL long-run estimation results reveal that value-added tax, customs duties, and company income tax have a positive and significant impact on infrastructural development in Nigeria. Hence, an increase in the non-oil tax revenue base will boost infrastructural development in Nigeria in the long run. This finding is in tandem with the ARDL short-run estimation result. Therefore, it is inferred that Nigeria can experience infrastructural development when genuine commitment is made to explore an increase in non-oil revenue generation instead of being over-dependent on oil revenue.

Keywords
Autoregressive Distributive Lag | Non-Oil Tax Revenue | Infrastructural Development

JEL Codes
H2; H27

1. Introduction

Taxation is seen globally as a useful vehicle for accelerating economic growth and development. This is because taxes serve many useful purposes, some of which are economic, political, and social. Specifically, through taxation, the government generates revenue, controls production and consumption, ensures equitable distribution of income, and allocates national resources (Asada, 2005). The political economy theory of fiscal policy suggests that taxes may either promote or inhibit economic growth through their effects on decisions regarding spending in infrastructural development. Therefore, if any policy changes have to enhance growth and reduce poverty, they must be accompanied by public investment in infrastructural development. The sources of government revenue are classified into oil tax revenue and non-oil tax revenue; tax revenue on oil are taxes imposed on earnings of oil corporations, while non-oil tax revenues are taxes imposed on earnings and profits of sectors other than oil (Otekunrin et al., 2023). It is well known that taxes constitute a major revenue source for the government in the financing of public infrastructural investment (Kudła et al., 2018). This source of government revenue is used to finance most of the government's expenditures, like health infrastructure, which can translate into a

healthy population for economic growth (Mustapha et al., 2022). In Nigeria for instance, tax revenue constitutes a major source of non-oil revenue.

An important part of the reality for many low-income countries is that, even as governments and donor agencies prioritise new infrastructure investment projects, the existing public capital stock is degrading more rapidly than it ought to and is contributing less to infrastructural development than its potential would suggest. Hence, closing the 'infrastructure gap' entails more than simply increasing public investment rates. The global recognition of tax revenue as a precursor to infrastructure development is one of the main focuses of many governments today.

At present, Nigeria is faced with a huge infrastructural deficit, which is estimated to be above $100 billion annually. This is approximately 189.77 percent of the nation's 2023 budget (Asaju, 2023). To bridge this gap, the government needs to focus on other sectors of the economy.

The International Monetary Fund (IMF) advised after a study of developing countries' revenue profiles in 1994 that "[d]eveloping countries must be able to raise the revenues required to finance the services demanded by their citizens and the infrastructure (physical and social) that will enable them to move out of poverty." Revenue from taxation is a veritable and major source of fiscal strength for governments all over the world. In advanced economies, tax revenues form a critical component of inflows for governments to pursue sustainable economic planning, growth, and development. Investment in the transportation network, electricity, communication networks, water and sanitation, and health and education infrastructure helps a society increase its wealth and its citizen's standard of living. Despite these apparent benefits of a robust infrastructure, Nigeria, over the years, has failed to develop its infrastructure. A World Bank report stated that for Nigeria to fill its infrastructure gaps, an annual expenditure of $14.2 billion would be required annually for the next ten years.

The World Bank (2010) notes that rapidly growing economies, such as China, support the view that higher levels of efficient tax expenditure have been important contributors to infrastructural development and poverty reduction (World Bank, 2014). On the other hand, evidence from Latin America and developing economies in Africa over the past decade has shown the crowding out of infrastructure spending by governments in favour of entitlement spending, revenue sharing, and, in some cases, debt service, leading to misappropriation of tax revenue which impacts negatively on the build-up of critical infrastructure expected to drive and sustain economic growth performance (World Bank, 2014).

Over the years, the Nigerian state has suffered from infrastructural deficits despite its revenue from oil. Unemployment, high mortality rate due to the poor health care system, massive brain drain due to poor remuneration and educational funding, infrastructure deficit, hyperinflation, and other issues have plagued Nigeria as a country (Ajiteru et al., 2018). The rising expense of running government combined with the decline in revenue has driven different states in Nigeria to formulate long-term plans and procedures to further enhance the revenue base. In spite of the various means of revenue accessible to the different levels of government as determined in the 1999 Nigeria constitution, since the 1970s, more than 80% of the yearly revenue of the three levels of government comes from oil (Ajiteru et al., 2018). Notwithstanding, the serious decrease in the cost of oil lately has prompted a decline in the consolidated revenue available for sharing to the three tiers of government. The urgent need for government at all levels to generate revenue internally from sources other than oil has become an utmost priority for federal and state governments. Infrastructural development is a *sine qua non* for the present-day definition of economic development.

Infrastructural development requires funds, and sufficient revenue is needed to plan, deploy, and sustain infrastructure at all levels of government. The required revenue for development, like the building of government schools, construction of roads, provision of portable drinking water, construction of bridges, and so on, is generated from grants, royalties, fines, haulages, and taxes.

Nigeria is a mono-product economy that depends heavily on revenue from oil. Therefore, the crash in global oil prices ultimately leads to a drop in oil-based revenue and, in effect, oil tax revenue and a consequent decline in total tax revenue. Tax revenue is the revenue generated by the government of a jurisdiction from oil and non-oil activities (Adeusi et al., 2020). The over-dependence on oil has not been the best for Nigeria as a country (Wadike et al., 2022). This has led to the government making conscious efforts to shift from focusing on oil-based tax revenue to non-oil tax revenue to increase infrastructural development.

Prior studies into the relationship between non-oil taxes and their effect on infrastructural development, such as Owolabi and Okwu (2011); Okoye and Gbegi

(2013); Umeora (2013); Anyaduba and Aronwman (2015); Oladipupo and Ibadin (2016); and Oliver et al. (2017), revealed a limited coverage of non-oil taxes and its attendant effect on infrastructural development. The non-oil taxes that were predominantly considered were company income tax, value-added tax, and tertiary education tax. Therefore, there is a need to consider more non-oil taxes that have increased potential effects on infrastructural development. Also, most previous research on non-oil tax revenue and infrastructural development was estimated using the Ordinary Least Square regression (OLS), and this method has certain limitations when it has to do with the stationarity properties associated with time series data.

This study intends to deploy the ARDL model approach to cointegration. Finally, previous studies in Nigeria (Owolabi & Okwu, 2011; Okoye & Gbegi, 2013; Umeora, 2013; Ayanduba & Aronwman, 2015; Oladipupo & Ibadin, 2016; Oliver et al., 2017; Ajiteru et al., 2018; Onwuka & Christian, 2019; Okoror et al., 2019; Mustapha et al, 2022) used total capital expenditure as a proxy for infrastructural development, which is not a true reflection on measuring infrastructural development because of other cost element that may not necessarily translate into infrastructural development. Hence, this study proxies infrastructural development as total electricity production measured in Gigawatt hours (GWh), which, to the best of the researcher's knowledge, no study in a developing country like Nigeria has used. The study attempts to fill these gaps as the major point of departure from the previous literature reviewed.

2. Literature Review

2.1. Theoretical Framework

Research of this nature has been anchored on several theories. In this paper, the main theory discussed is the political economy theory of fiscal policy. The political economy theory of fiscal policy was propounded by Adam Smith. The theory suggests that governments raise tax revenues and use the collected resources to finance infrastructural investment spending for the provision of public goods and services as well as targeted development projects. The theory's focus is that the motivation for tax revenues is to enhance the fiscal capacity of the state to undertake infrastructural development that can stimulate growth and economic performance. Empirical evidence demonstrates that in periods of low tax revenues, public spending on infrastructure is often the first item to suffer from government expenditure compression (Palley, 2006; Clement et al., 2003; Roy, et al., 2006; Schade, 2005; Baldacci et al., 2004). This is partly due to the fact that the deleterious effects of reduced public investment are felt with long lags. In contrast, other components of government budgets, such as transfers and public sector wage bills, have higher and more immediate political costs. The extent of the effect of revenue generation on public investment spending may differ, given differences in macroeconomic conditions, the structure of the economy and level of development (Randolph, 1995; Rodrik, 1998; Clement et al., 2003; Drether, 2006).

The World Bank (2010), in tandem with the expectations from the political economy theory of fiscal policy, notes that rapidly growing economies, such as China, provide support for the view that higher levels of efficient public expenditure have been important contributors to infrastructural development and poverty reduction (World Bank, 2014). On the other hand, evidence from Latin America over the past decade has shown the crowding out of infrastructure spending by governments in favour of entitlement spending, revenue sharing, and, in some cases, debt service, leading to misappropriation of tax revenue, which impacts negatively on the build-up of critical infrastructure expected to drive and sustain economic growth performance. The rigorous study of the link between infrastructure and economic performance did not commence until the seminal paper by Aschauer (1989). Since then, a large number of studies have estimated the relationship between developed and developing countries. Given the lower stock of infrastructure assets in developing countries, it is often a serious constraint to growth. The marginal productivity of infrastructure investment and maintenance is high when such investments are effectively implemented.

According to the theory, countries need all types of infrastructure, such as transportation and telecommunication infrastructure, to sustain commerce and trade, more so in a globalised competitive world. Fuel and energy services are necessary for agriculture and modern industrial functions. Water and sanitation services are essential to support population settlements in both urban and rural areas. Whether provided by the public or the private sector, the extent and quality of infrastructure services are critical for growth and development.

2.2. Non-Oil Tax Revenue and Infrastructural Development

Mustapha et al. (2022) investigated tax revenue collections and healthcare infrastructural development in Nigeria for a period covering 2013 to 2020. The study utilised secondary data from the Central Bank of Nigeria (CBN) Statistical Bulletin and the Office of Federal Inland Revenue for analysis. The multiple linear regression method was adopted for data analysis. The result of the study found that petroleum profit tax and value-added tax strongly influenced infrastructural development in Nigeria's healthcare sector. It is recommended that taxes be collected efficiently and effectively in order to boost infrastructural development in the healthcare sector.

Ajiteru et al. (2018) examined the relationship between tax revenue and infrastructural development in Osun State. The study adopted a survey research design with the population involving the government officials at the Ministry of Finance of Osun state. The purposive sampling technique was employed to arrive at a total of one hundred and two (102) respondents for questionnaire administration. The statistical tool used for analysing the data obtained includes frequency distributions, simple percentages and measures of central tendency. The study concluded that there was a relationship between tax revenue and infrastructural development in Osun state.

Onwuka and Christian (2019) investigated revenue generation as a tool for infrastructural development in Nigeria. The scope of the study focused on Nigeria's total revenue generated, infrastructural development and economic growth from 1981 to 2018. The Ordinary Least Square regression analysis was employed using the STATA 13 statistical package. The study reveals that revenue generated has a significant effect on infrastructural development in Nigeria.

Oladipupo and Ibadin (2016) examined the impact of non-oil taxation on the infrastructural development in Nigeria for a period covering of 1981-2011. The study made use of the OLS multiple regression analysis and revealed a positive and significant relationship between the infrastructural development and some tax revenue components, indicating that policy measures to expand tax revenue through more effective tax administration will positively impact the infrastructural development in Nigeria.

Anyaduba and Aronwman (2015) examined the effect of federally collected taxes on infrastructural development in Nigeria between 1980 and 2014. The Error Correction Model was used for data estimation, and the findings from the study revealed that company income tax and Tertiary education tax (TET) have a significant impact on the level of infrastructural development, while Value-added tax was not significant. The study went on to recommend that the administration of taxes, especially VAT, should be done in a way that collection and remittance cannot be evaded so that its effect may be properly seen in the extent of infrastructural facilities.

Adesoji and Chike (2013) evaluated the effect of internal revenue generation on infrastructural development in Lagos State, Nigeria. They used primary data obtained from a well-structured questionnaire issued to select respondents from the Lagos State Inland Revenue Office. The data was analysed using Spearman's rank correlation. The result showed that there is a positive relationship between internally generated revenue and infrastructural development.

Ajiteru et al. (2018) undertook a study in Osun state to examine the relationship between tax revenue and infrastructural development. Adopting a survey research design, a purposive sampling technique was used to select a total of 102 respondents from a population of government officials at the Ministry of Finance in the state. The data was analysed using descriptive statistics, and it was discovered that tax revenue is a very strong tool for infrastructural development in a State where the people are not well informed about the importance of tax and the government is not effectively and efficiently utilising the tax revenue.

Babatunde (2018) examined government spending on infrastructure in Nigeria, covering a period between 1980 and 2016. The study used secondary and primary data and analysed the data using descriptive statistics. The study revealed that government spending on transport and communication, education, and health infrastructure has significant effects on economic growth, while that of agriculture and natural resources infrastructure recorded a significant inverse effect on economic growth in Nigeria.

Oliver et al. (2017) investigated the effect of the Federal Government of Nigeria's tax resources on Nigeria's infrastructural development, covering a period from 2006 to 2015. Data was sourced from the CBN Statistical Bulletin and the National Bureau of Statistics. Data estimation was done using the multiple linear regression technique. Results revealed that tax revenue resources (CIT and VAT) had a positive and

insignificant effect on infrastructural development in Nigeria.

Ofoegbu et al. (2016) studied the effect of tax revenue on Nigeria's economic development, using HDI and GDP as proxies for economic development. The study covered a period of nine (9) years between 2005-2014. Using the Ordinary Least Square (OLS) regression technique for data analysis, it was revealed that there is a positive and significant relationship between tax revenue and economic development and that measuring the effect of tax revenue on economic development using HDI gives a lower relationship than measuring the relationship with GDP.

Adejoh and Sule (2013) investigated the degree to which the development of selected local governments was affected by revenue generation. Both primary and secondary data were collected and analysed using simple least square regression. Findings revealed that there is a significant relationship between the revenue generated and development, poor development of the areas, lack of basic social amenities to the rural people and lack of revenue to maintain the existing infrastructures.

Mbanda and Chitiga-Mabugu (2017) perform a dynamic CGE analysis to investigate the impacts of increasing public economic infrastructure investment on economic growth and employment in South Africa, financing infrastructure investment through a government deficit, direct tax on firms and thirdly, a combination of both. Variables used for the model capture factors such as economic infrastructure, economic growth, unemployment, the wage rate, labour demand, formal and informal labour and spillover effects. The findings of the study reveal that increasing public infrastructure investment has an overall positive impact on the economy. The study indicates that increasing public infrastructure investment also increases, among other things, GDP and employment in South Africa, regardless of which method is used to fund infrastructure investment increases. The study further finds that private investment suffers crowding-out effects. The study covered public spending, but again, it did not look into spending sources as noted earlier; understanding the spending sources can provide deeper insight into policy recommendations regarding areas with revenue potentials to sustain public expenditure.

Most studies focus on examining the effect of some of the explanatory variables on economic growth (Ofoegbu et al., 2016; Mbanda & Chitiga-Mabugu, 2017; Babatunde, 2018; and Maganya, 2020), but there is a paucity of studies on the effect of company income tax, customs duties, and value-added tax on infrastructural development (proxied by total electricity production measured in Gigawatt hours) in Nigeria.

3. Methodology

This study on the effect of non-oil tax on infrastructural development adopts the longitudinal research design. Secondary data from the CBN statistical bulletin, Publication of the Federal Inland Revenue Service (FIRS) and annual abstract of Statistics from the Office of the National Bureau of Statistics for various years was utilised in this study. The data covered the period from 1981 to 2021. The variables of interest are the dependent variable (infrastructural development) and independent variables (company income tax, customs duties, value-added tax, economic growth, government capital expenditure, oil revenue and total public debt).

3.1. Infrastructural Development

This means improving the quality of infrastructure provided by a government to its citizens. In this study, infrastructural development is proxied by total electricity production measured in Gigawatt hours (GWh). Power is one of the infrastructures that governments around the world are expected to provide. This creates a platform for small and medium-scale enterprises and industries to thrive. There cannot be any meaningful development without the provision of power. Hence, it is a key variable in infrastructural development.

3.2.1. Company Income Tax

Company income tax, also known as corporate income tax or business tax, is a tax imposed on the net income or profit of corporations or other business entities. It is typically levied by governmental entities, such as national or federal governments, on the earnings generated by businesses within their jurisdiction. In this paper, company income tax is measured as the total value of company Income Tax Collected by the Federal Government.

3.2.2. Customs Duties

Customs duties, also known as import duties, are taxes levied on goods imported into the country. In this study, it is measured as the total value of customs and excise duties collected by the Nigerian Customs Service.

3.2.3. Value-Added Tax

Value-added tax (VAT) is chargeable on the supply of taxable goods and services except items specifically stated as exempt or zero-rated. In this article, VAT is being measured as the total value of value-added tax collected by the Federal Government of Nigeria.

3.2.4. Economic Growth

Economic growth is an increase in the production and consumption of goods and services within a country over time. In this paper, it is proxied as Gross Domestic Product (GDP).

3.2.5. Government Capital Expenditure

This is the portion of the government's spending allocated to investment in physical assets or infrastructure. This variable was proxied as total government capital expenditure in a fiscal year.

3.2.6. Oil Revenue

Oil revenue is the income derived by a country from the exploitation, production, sale, and export of crude oil and related petroleum products. In this paper, it is proxied as the total government oil revenue annually in Naira.

3.2.7. Government Debt

Government public debt, also known as national or sovereign debt, refers to the total amount of money that a government owes to domestic and foreign creditors. In this article, it is measured as the total government public debt in Naira.

3.2 Model Specification

The data analysis technique that is utilised in this study is the ARDL model approach to cointegration. The ARDL (Autoregressive Distributed lagged) bounds test was adopted in testing for cointegration among the variables. This test was employed as it is the most suitable given that the variables were not integrated of the same order.

The study adapted the model of Okoror et al.(2019). Their original model was given as:

$$INFDEV = \lambda_0 + \lambda_1 CIT + \lambda_2 DEBT + \varepsilon$$

Where: INFDEV = Infrastructural Development; CIT = Company Income Tax; DEBT= Public Debt; ε = Error term.

This study modified this model by expanding the number of tax variables to include VAT and Customs duties (CUSTD). Also, other control variables were added to reduce the effect of omission variable bias. The control variables added include government expenditure, economic growth and oil revenue. These variables were selected given Nigeria's peculiarity. First, Nigeria is an oil-driven economy, and hence, its budget relies heavily on oil revenue. Therefore, modelling infrastructural development without oil revenue, which is the main source of funding, may lead to omission variable bias. Second, like other developing economies, Nigeria is highly dominated by large fiscal sectors. Hence, government capital expenditure was included to capture this fiscal action of the government. Lastly, economic growth was introduced as infrastructural development can be seen as a consequence of economic growth.

Therefore, the model for estimation in this study is given as;

$$INFDEV = \lambda_0 + \lambda_1 VAT + \lambda_2 CUSTD + \lambda_3 CIT + \lambda_4 GOVTCE + \lambda_5 ECONG + \lambda_6 OILR + \lambda_7 DEBT + \varepsilon$$

Where: $\lambda_1, \lambda_2, \lambda_3, \lambda_4, \lambda_4\lambda_5, \lambda_6\lambda_7 > 0$; and $\lambda_0 \neq 0$; INFDEV = Infrastructural Development proxy by total electricity production measured in Gigawatt hours (GWh); CIT = Company income tax; CUSTD = Custom duties; VAT = Value-added tax; ECONG = Economic Growth proxy by GDP; GOVTCE = Government Capital Expenditure; OILR = Oil Revenue; DEBT = Total Public Debt; ε = Error term.

Table 1. ADF unit root test

Variables	Statistics for variables in levels			Statistics for variables in 1st order difference			Order of integration
	ADF Computed	ADF Critical	Status	ADF Computed	ADF Critical	Status	
INFDEV	3.1547	2.9369	Stationary	-	-	-	I(0)
VAT	3.0654	2.9604	Stationary	-	-	-	I(0)
CUSTD	1.7353	2.9369	Non -stationary	5.0983	2.9398	Stationary	I(1)
CIT	7.0656	2.9540	Stationary	-	-	-	I(0)
GOVTCE	4.5855	2.9604	Stationary	-	-	-	I(0)
ECONG	12.5474	2.9369	Stationary	-	-	-	I(0)
OILR	1.4726	2.9369	Non -stationary	6.4604	2.9389	Stationary	I(1)
DEBT	1.1352	2.9389	Non -stationary	6.5047	2.9434	Stationary	I(1)

Source: Authors' computation (2024), based on data of the CBN and FIRS using Eviews 12

4. Results and Discussion

4.1. Unit root test

The first task in estimating time series is to examine the time series properties of the selected variables. This is in order to ascertain whether or not the variables are stationary. This test is necessary because using non-stationary time series data produces unreliable and spurious results, leading to poor understanding and forecasting. In this study, the unit root test was based on the Augmented Dickey-Fuller (ADF) unit root test at a 5% critical level. The result presented in Table 1 shows that infrastructural development, value-added tax, company profit tax, government capital expenditure and economic growth were stationary in levels. This means no unit root exists in these variables; hence, they are said to be integrated in order zero. However, customs duties, oil revenue, and public debt were not stationary at this level, showing the presence of unit roots in these variables. However, after differencing once, the variables became stationary. This shows that these sets of variables are integrated into order one.

4.2. ARDL Test for Cointegration

The ARDL (Autoregressive Distributed lagged) bounds test was adopted to test for cointegration among the variables. This test was employed as it is the most suitable given that the variables were not integrated in the same order. The result of the ARDL bounds test is presented in Table 2. It is observed that the F-Statistics has a value of 36.4926. This is greater than the upper and lower bounds, even at a 1% level. Therefore, the ARDL Bound test non-hypothesis of no long-run relation is rejected. This implies that variables are co-integrated, and, as such, a long-run relationship exists among the seven selected variables.

4.3. Short-Run Analysis

Table 3 reveals that sign expectation was met for all the non-oil tax variables, economic growth, government expenditure and public debt; however, sign expectation was not met for oil revenue. The coefficient of determination is 0.9820. This shows that about 98% of the systematic variation in infrastructural development was explained by variations in the group of selected explanatory variables. The F-Statistics of 60.8303 and a probability value of 0.0000 further confirm the goodness of fit of the model. The F-Statistics is highly significant at 1%, indicating the selected explanatory variables are significant determinants of the dependent variable.

The Error Correction Variable (ECM) is properly signed and significant at a 5% level. It has a coefficient of -0.3489, a t-ratio of -2.3122, and a corresponding p-value of 0.0315. This shows that 34% of the short-run disequilibrium is adjusted for every period. Since this was statistically significant, it shows that the model is dynamically stable and also confirms that cointegration exists among the variables.

The non-oil tax revenue variables (value-added tax, customs duties and company income tax) have positive signs, and their impacts on the dependent variable were statistically significant at a 5% level. This shows that in the short run, the non-oil tax revenue variables have a positive and significant effect on infrastructural development in Nigeria. Hence, an increase in non-oil tax revenue will lead to an increase in infrastructural development in Nigeria.

Among the control variables, government capital expenditure, economic growth and public debt have positive effects. Their coefficients were 7.1070, 0.1380 and 0.1686 for government capital expenditure, economic growth and public debt, respectively. The corresponding t-ratio for government capital expenditure, economic growth and public debt were 8.2451, 2.4166 and 1.9075, respectively. This reveals that the impact of government capital expenditure on infrastructural development was statistically significant at a 1% level, while that of economic growth and public debt were significant at 5% and 10%, respectively. Oil revenue has a negative sign in the current period and a positive sign in the lagged period. The impact was not statistically significant in the current period, even at the 10% level. However, it was significant in its lagged period value at a 5% level.

4.4. Long run Analysis

Table 4 shows that all the non-oil tax revenue variables have positive signs and were statistically significant at a 5% level. From the table, VAT has a coefficient of 0.0002 with a t-ratio of 2.360 and a corresponding p-value of 0.0285. Customs duties and company income tax have coefficients of 0.6426 and 0.0002, respectively. Their t-ratios were 1.9567 and 2.3202 for customs duties and company income tax, respectively. This shows that in the long run, VAT, customs duties and company income tax have significant and positive impacts on infrastructural development in Nigeria. Hence, an increase in the non-oil tax revenue base will boost infrastructural development in Nigeria in the long run.

Among the control variables, economic growth and public debt have negative signs. The impact of economic growth was not statistically significant, even at a 10% level. The coefficient was -0.0041 with a t-ratio of -0.1066. This implies that economic growth periods in Nigeria were not accompanied by improvement in the country's infrastructural base. This is a clear case of economic growth without development. On the other hand, the coefficient of public debt is -0.0383, with a t-ratio of -2.6275 and a corresponding p-value of 0.0116. This shows that the impact of public debt on infrastructural development in Nigeria is negative but significant at 5%. This implies that public debt in Nigeria is crowding out investment in the country's infrastructural base. This shows that Nigeria is experiencing debt overhang. This could be that a large proportion of revenue that would have been used to improve the infrastructural base of the economy is diverted into public debt servicing.

Table 2. Cointegration test results

Test Statistic	Value	k
F-statistic	36.4926	7
Critical Value Bounds		
Significance	I(0) Bound	I(1) Bound
10%	2.03	3.13
5%	2.32	3.5
2.5%	2.6	3.84
1%	2.96	4.26

Source: Authors' computation (2024), based on data of the CBN and FIRS using Eviews 12

Oil revenue has a positive sign with a coefficient of 0.5275. The corresponding t-ratio and p-values are 1.0824 and 0.2919 respectively. This shows that though oil revenue has a positive impact on infrastructural development, the impact is not statistically significant. This can be interpreted to mean that the country's infrastructural base is not benefiting significantly from its rich oil wealth.

4.5. Post-estimation Diagnostic Tests

Diagnostic tests were conducted on the estimate obtained to ascertain its reliability and stability. These tests included a multicollinearity test, a serial correlation test, a heteroscedasticity test, a normality test, and a stability test.

4.5.1. Multicollinearity Test

One of the least square estimator's basic assumptions is that the explanatory variables should not be perfectly or near perfect collinear. To test whether this assumption was violated, the Variance Inflation

Table 3. ARDL Short run Estimation Result

Cointegrating Form				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(VAT)	0.0001	0.0000	12.2540	0.0000
D(VAT(-1))	0.0001	0.0000	13.3917	0.0000
D(CUSTD)	6.2248	1.1651	5.3425	0.0000
D(CIT)	0.0003	0.0000	6.9280	0.0000
D(GOVTCE)	7.1070	0.8620	8.2451	0.0000
D(ECONG)	0.1380	0.0571	2.4166	0.0253
D(ECONG(-1))	-0.1582	0.0590	-2.6807	0.0144
D(OILR)	-0.0958	0.0836	-1.1449	0.2658
D(OILR(-1))	0.2092	0.0819	2.5554	0.0189
D(DEBT)	0.1686	0.0883	1.9075	0.0709
ecm(-1)	-0.3489	0.1509	-2.3122	0.0315

Source: Authors' Computation (2024), based on data of the CBN and FIRS using Eviews 12

Table 4. ARDL Long-run estimate result

Long Run Coefficients				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
VAT	0.0002	0.0001	2.3601	0.0285
CUSTD	0.6426	0.3264	1.9568	0.0463
CIT	0.0002	0.0001	2.3203	0.0310
GOVTCE	0.5424	2.3260	0.2332	0.8180
ECONG	-0.0042	0.0392	-0.1067	0.9161
OILR	0.5275	0.4874	1.0824	0.2919
DEBT	-0.0383	0.0146	-2.6275	0.0116
C	1896.62	232.34	8.1632	0.0000

Source: Authors' Computation (2024), based on data of the CBN and FIRS using Eviews 12

Factor (VIF) test for multicollinearity was conducted. Table 5 shows that the VIF is less than ten for all the selected variables. This reveals that the existence of serious multicollinearity among the explanatory variables cannot be established.

4.5.2. Test For Serial Correlation

In testing for the presence of serial correlation among the error terms, the Breusch-Godfrey serial correlation test was adopted. The method was adopted as it is valid for the ARDL model and also has the capacity to test for serial correlation generated by a higher-order autoregressive scheme. Table 5 reveals that Breusch-Godfrey F-Statistics is 0.8169 with a probability value of 0.4575. The corresponding Chi-square probability value is 0.1973. Since the probability value is greater than 0.05, the null hypothesis, which states that there is no serial correlation among the residuals, is accepted. This shows that there is no serial correlation among the residuals in the model.

4.5.3. Test for Heteroscedasticity

The Breusch-Pagan-Godfrey test was conducted to test for heteroscedasticity in the model. This is to

Table 5. Post-estimation diagnostic tests

S/N	Variable		Variance Inflation Factor
1	VAT		8.8932
2	CUSTD		2.1933
3	CIT		2.6182
4	GOVTCE		4.7330
5	ECONG		4.9302
6	OILR		2.9674
7	DEBT		5.7118
F-statistic	0.8170	Prob. F(2,18)	0.4575
		Prob. Chi-Square (2)	0.1973
Breusch-Pagan-Godfrey test			
F-Statistics	0.7061	Prob. F(18,20)	0.7689
		Prob. Chi-Square (18)	0.6514
		Prob. Chi-Square (18)	0.9977
Ramsey RESET test			
	Value	Df	Probability
t-statistic	0.5747	19	0.5723
F-statistic	0.3302	(1, 19)	0.5723

Source: Authors' computation (2024), based on data of the CBN and FIRS using Eviews 12

ascertain if the assumption of constant variance of the stochastics disturbance term is violated. Table 5 shows the F-Statistics is 0.7061 with a probability value of 0.7689. The corresponding chi-square probability value is 0.6514 with a probability value that is greater than 0.05; the null hypothesis, which states that there is no heteroscedasticity, is accepted. This shows that the variances of the residual are homoscedastic.

4.5.4. Ramsey Regression Equation Specification Error Test (RESET)

The Ramsey RESET test was adopted to test if the model was correctly specified. This test is a general specification test for the linear regression model. More specifically, the Ramsey RESET test is used to test if non-linear combinations of the fitted values help explain the response variable. Table 5 shows that the squares of the fitted values have a t-statistics of 0.5746 and a corresponding probability value of 0.5723. The F-Statistic is 0.3303 with a corresponding probability value of 0.5723. Since the probability value is greater than 0.05, it clearly shows that the impact of the squares of the fitted value is statistically different from zero. Hence, the null hypothesis, which states that there is no sign of model misspecification, cannot be rejected. This implies that the model is properly specified, and hence, the model is statistically stable and can be reliable for forecasting. As observed, value-added tax appeared positive and significant at 5%. The long-run and short-run estimate results have a p-value of 0.0285 and 0.0000; and positive t-statistics of 2.3601 and 13.392. This shows that in the long run and short run, the value-added tax has a positive and significant effect on infrastructural development in Nigeria. VAT serves as a vehicle for the promotion of infrastructural development because of its contributions to sectoral performance, government tax revenue and wealth creation in Nigeria. According to the Nigerian Bureau of Statistics (2020), Nigerians' consumption patterns are high. Since VAT is a form of consumption tax, the government can raise more revenue to support infrastructural development by expanding its tax net in this area. The findings are in line with some studies (see, for example, Babatunde, 2022; Oliver et al., 2017 and Anyaduba & Aronwman, 2015). They posit that effective VAT collection is a driver for infrastructural development in developing economies like Nigeria. The effect of custom and excise duties on infrastructural development in Nigeria has p-values of 0.0463 and 0.0000 and positive t-statistics of 1.9567 and 5.3424. This suggests that in the long run and short run, the custom and excise duties have a positive

and significant effect on infrastructural development in Nigeria. Hence, an increase in customs and excise duties will lead to an increase in infrastructural development in Nigeria. Customs duties are one of the major sources of government revenue and contribute to the budgetary inflows. When this revenue is adequately received and effectively utilised, infrastructural development is bound to occur. Results show that the effect of company income tax on infrastructural development has a p-value of 0.0310 and 0.0000 and positive t-statistics of 2.3203 and 6.9279. This suggests that in the long run and short run, the company income tax has a positive and significant effect on infrastructural development in Nigeria. Hence, an increase in CIT will lead to an increase in infrastructural development in Nigeria due to the number of companies under the jurisdiction of the Federal Inland Revenue Services. This supports the position of Oliver et al. (2017).

5. Conclusion and Recommendations

This study has attempted to empirically examine the impact of non-oil revenue on infrastructural development in Nigeria. The proxies for the non-oil tax revenue are company income, customs duties and value-added tax, while the dependent variable infrastructural development was proxy by total electricity production measured in Gigawatt hours (GHh). The period covered is from 1981 to 2021. The Pre-estimation test (ARDL unit root test and cointegration test) was conducted, and the short-run and long-run analyses of ARDL estimation were employed to determine the long-run and short-run relationships in the model. The findings reveal that VAT, CUSTD and CIT all have a positive and statistically significant impact on infrastructural development. This is in tandem with the studies of Worlu and Emeka (2012); Okoror, et al. (2019); Mustapha et al. (2022); Owolabi and Okwu (2010); Okoye and Gbegi (2013); Umeora (2013); Baghebo and Edoumiekumo (2012); and Amunonimim, et al. (2012). However, this is contrary to the findings of Van-Beek (2007), Chin and Lai (2009), and Odusola (2006). Finally, we recommend that the government should encourage corporate bodies by introducing fair tax policies to improve tax compliance. Second, the Nigerian Customs Services should mitigate or eliminate any form of non-automated customs duties collection which can lead to leakages in the revenue collection process and finally, the relevant tax authorities should embark on a massive tax enlightenment campaign to sensitise taxpayers/potential taxpayers on the benefits of paying tax. This study is not without limitations; the researchers focused on one variable to explain infrastructural development as a dependent variable. Other researchers may consider using two or more variables as a composite variable of several infrastructural components.

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