EXPLORING THE CAUSAL NEXUS BETWEEN TAX COMPOSITION, INFRASTRUCTURE, AND ECONOMIC PERFORMANCE IN NIGERIA

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ABSTRACT
This study investigates the causal relationships among tax composition, infrastructure investment, and economic performance in Nigeria from 1993 to 2022, employing the Granger causality test within a linear regression framework. Tax composition was dis-aggregated into value-added tax (VAT), personal income tax (PIT), company income tax (CIT), petroleum profit tax (PPT), and customs and excise duties (CED), while infrastructure was measured by infrastructural development. Findings reveal a unidirectional causality from VAT and CIT to economic performance, indicating these taxes' significant impact on growth. A bidirectional relationship is observed for PIT, suggesting mutual reinforcement between personal income and economic activity. PPT also exerts a unidirectional effect on growth, while CED shows no significant causality. Notably, economic performance influences infrastructure development unidirectionally, challenging the infrastructure-led growth hypothesis. These insights underscore the varied impacts of different tax components on Nigeria's economic performance. Policy recommendations include enhancing tax administration, promoting tax education, and fostering policies that support compliance and optimal allocation of tax revenues to stimulate growth and infrastructure. This analysis provides a nuanced understanding of fiscal strategies for sustainable development, highlighting areas where targeted tax reform can yield significant economic benefits.
Keywords: tax composition, infrastructure, economic performance, causality, Nigeria.
JEL Classification: H21, H54, O4.

1. INTRODUCTION

A country's ability to generate and control resources to finance its infrastructure needs and daily expenses determines its economic growth. Taxation provides developing nations with a stable and predictable fiscal condition to encourage growth and finance their social and physical infrastructure demands, which in turn reduces poverty and enhances sustainable growth.

Payment of tax by individuals and corporate bodies represents a major source of financial resources for meeting government expenditures (Stolovia, 2024; Adekanmbi et al., 2022).

Historically, tax revenues, particularly those from oil, have dominated, but they have also shown volatility due to global oil price fluctuations. Meanwhile, non-oil tax revenues (e.g., VAT, corporate, and personal income taxes) have remained underutilized despite reforms, such as increasing the VAT rate in 2020 to 7.5% (Obadiaru et al., 2024). By developing a proper tax structure and implementing an equitable tax administration approach, a nation can achieve its tax goals. As a result, a functioning tax system should generate enough revenue to fund essential expenditures without excessive public sector borrowing and finance the required level of public spending as efficiently and effectively as possible. We can classify the economic effect of taxes into two categories: the micro-effect, which involves the efficient use of resources and income distribution, and the macro-effect, which addresses output, costs, employment, and development. A beneficial tax system increases government revenue, redistributes income, and provides infrastructure that helps businesses grow, resulting in economic growth. The government-created enabling environment will encourage the establishment of new businesses as well as the survival of existing ones. Therefore, the effectiveness of a tax system hinges on the interpretation and application of tax law (Otuedon & Ogodogun, 2024; Ogbonna & Amah, 2021).

Infrastructure, encompassing public capital, public structures, and basic amenities, serves as a catalyst for attracting significant investments in the private sector across its diverse business forms (Opadeji et al., 2023). Infrastructure directly enhances economic performance by supplementing production inputs through the productivity effect, or indirectly through adjustment costs, private capital, and labor productivity (Olaniyi et al., 2023). Studies indicate that inadequate infrastructure, largely due to mismanagement and corruption, hinders productivity and investment. For example, erratic power supply limits industrial growth, while poor transport networks increase logistics costs (Otuedon & Ogodogun, 2024; Adebosin et al., 2022; Ukolobi & Oboro, 2021). Thus, taxation is a significant fiscal instrument for transferring funds to the government from both the public and private sectors to facilitate and meet developmental goals (Sebil, 2023).

Due to the inefficiency and ineffectiveness of the policies, the Nigerian government's attempts to increase tax revenue through measures like registering firms and corporations under the FIRS and implementing value-added tax in 1994 have resulted in little to no increase in tax revenue (Bank-Ola, 2021). However, the introduction of the Tax Identification Number (TIN) by the Nigerian government in 2008 has increased the target level of tax collection since 2009, according to statistics (FIRS, 2019). Also, the worrisome state of infrastructural facilities in Nigeria has become a great concern as the tax revenue allocated and spent on infrastructure has not yielded significant results over time.

The objective of this study is to explore the causal nexus that exist among tax composition, infrastructure and economic performance in Nigeria from 1993 to 2022. The balance of paper is organized as follows. Section 2 provides an extensive review of the relevant literature on the link between tax composition, infrastructure and economic performance. Section 3 discusses the data, methodology, section four presents the empirical results, analysis and discussions. Finally, Section 5 provides conclusion and policy recommendations from the empirical findings.

2. LITERATURE REVIEW

Tax, an imposed and unrequited transfer of resources from the private to the public sectors, is a tool used by the government to generate funds. It is levied by the government on the income, profit, or wealth of individuals, groups of people, and corporations. The goal of taxation is not only to raise funds for government expenditures but also to contribute to income redistribution, economic stabilization, and resource allocation while supporting economic growth.

Tax composition, which can either be progressive, regressive, or proportional, entails both direct taxes, whose burden cannot be shifted, and indirect taxes, whose burden can be shifted (Maganya, 2020). However, the Nigerian tax system faces several challenges, including the non-availability of tax statistics; the inability to prioritize tax efforts; tax multiplicity; poor tax administration; and regulatory challenges—all of which contribute to its inefficiency. Measured by the cost of tax administration, tax flexibility, and tax certainty, tax efficiency allows a firm or an individual to pay no or less tax than usual and aims to minimize tax liability when faced with various financial decisions. By reducing the administrative burden and any economic distortions caused by the tax, it reduces the cost of complying with the tax code, benefiting not only taxpayers but also the economy. This is because tax collection is not an objective of tax policy but rather a requirement.

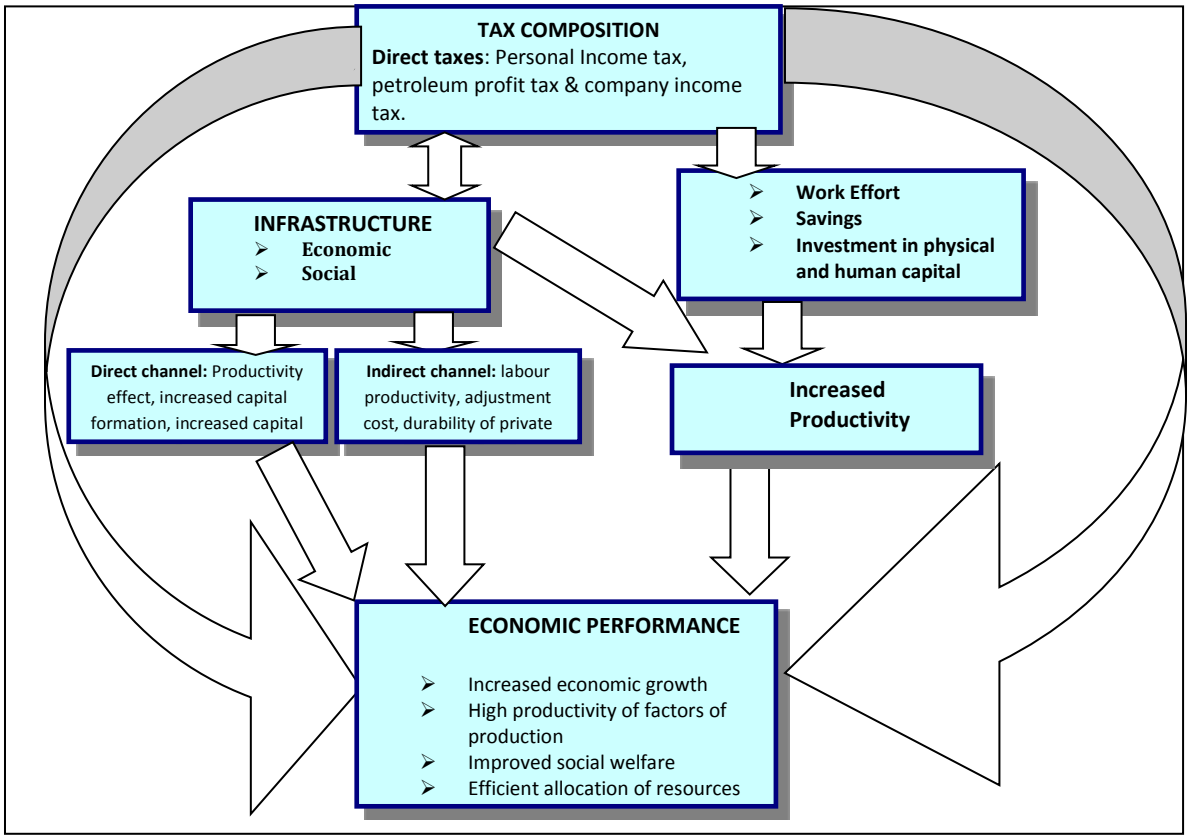
Infrastructure facilitates productivity by providing adequate utilities and networks that facilitate productive activities, provide consumption goods, reduce poverty, improve living standards, and contribute to macroeconomic stability (Timilsina et al., 2023; Olaniyi et al., 2023). Empirical evidence links tax policies and infrastructure investments to economic outcomes. For instance, higher corporate and VAT revenues positively impact GDP when efficiently reinvested in public goods. However, underfunding of infrastructure persists, as tax revenues often fail to meet public expenditure needs. Studies highlight that a 10% increase in infrastructure investment could boost GDP growth by up to 1.5% annually if accompanied by fiscal discipline and accountability (Adesuyi et al, 2024; Obadairu et al, 2024; Temidayo et al, 2022). We typically measure economic performance in terms of achieving either long-term growth, such as sustainable growth and development, or short-term growth, such as economic stabilization in response to sudden and unpredictable events known as economic shocks. Thus, the level of economic performance in any country directly depends on the development of infrastructure.

Figure 1 depicts the conceptual linkages among tax composition, infrastructure, and economic performance. It demonstrates that tax composition, which comprises both direct and indirect taxes, increases economic performance through productivity effects on work effort, savings, and investment. Investment in both human and physical capital, which comes from both public and private savings, boosts the economy's productivity and consequently its overall performance. Economic infrastructure is the set of essential facilities and services (roads and highways, airports, seaports, and electricity) that contribute directly to the economic production and distribution process. In contrast, social infrastructures are the fundamental facilities or residual components that support the various economic activities.

Infrastructure boosts economic performance through two channels: direct and indirect. As a pure public good, infrastructure directly contributes through productivity effects or as a supplement to other production inputs. Infrastructure investment boosts private input productivity, hence enhancing economic performance (Nadiri & Mamuneas, 1996; Agenor & Moreno-Dodson, 2006). In contrast, infrastructure indirectly contributes to an economy's performance through private capital longevity, adjustment costs, and labor productivity. Infrastructure development directly impacts a country's economic performance, as widely acknowledged. Infrastructure enhances the quality of life by providing social amenities and

consumer products, as well as contributing to macroeconomic stability (Olaniyi et al., 2024; Pradhan, R.P. (2021) Adesoye, 2014). However, taxes primarily fund infrastructure investment, a core factor for improved economic performance that supplements private investments.

Figure 1: Nexus of Tax Composition, Infrastructure and Economic Performance.



Source: *Authors' Compilation, 2024*

2.2 THEORETICAL REVIEW

The Benefit or *Quid Pro Quo* Theory of Taxation

Knut Wicksell initially developed this theory in 1896 and espoused by Erik Lindahl in 1919 based on the assumption that there is an exchange or contractual relationship between taxpayers and the state. They argued that taxes are to be imposed on individuals according to the benefit conferred on them. Hence, the more benefit a person derives from the activities of the state, the more he should pay to the government.

Endogenous Growth Model

Endogenous growth is long-term economic growth driven by internal economic forces, particularly those governing the opportunities and incentives to create technological innovation. Taxes are seen as a tool to finance public goods, including infrastructure, education, and research and development (R&D), which in turn foster economic growth. For instance, Barro (1990) and Lucas (1988) argue that taxes, especially on capital, can influence the level of savings and investment in the economy. Infrastructure however plays a central role in the endogenous growth model, as it provides the necessary foundation for both private and public sector activities. Infrastructure is viewed not only as a physical asset but as an investment that can increase the productivity of workers and firms. According to Barro (1990), investments in infrastructure, such as roads, energy, and telecommunications, can have direct positive effects

on growth by reducing transaction costs, improving the efficiency of production, and facilitating the diffusion of knowledge and technology. Public investment in infrastructure, funded by taxes, can generate positive externalities that increase the productivity of private capital.

The literature on the causal factors between tax composition, infrastructure, and economic performance has yielded mixed results due to the distortionary nature of taxes. Usman & Adegbite (2015) and Gopar et al. (2017) found that taxation did not cause economic growth in Nigeria. But research like Chigbu et al. (2011), Usman and Adegbite (2015), Afolayan and Okoli (2015), Osho et al. (2019), Nwaocha et al. (2019), Etim et al. (2020), Adeniran and Uguru (2020) on Nigeria, Hassan (2015) on Pakistan, and Ameyaw et al. (2016) on Ghana found that taxation led to economic growth in only one direction, while Maganya (2020) found a two-way link. Additionally, studies conducted by Akinlabi et al. (2011) on Nigeria, Alam et al. (2021) on Pakistan, Ghosh (2020) on India, and Wang et al. (2012) on Korea discovered a unidirectional causal relationship between infrastructure and economic growth.

Globally, non-distortionary taxes like consumption taxes are often advocated for their growth-enhancing potential (Ukolobi & Oboro, 2021). However, in Nigeria, reliance on indirect taxes like VAT remains limited, even after the 2020 rate increase to 7.5%. Studies like Adesuyi et al, 2024 suggest that insufficient mobilization of non-oil tax revenues contributes to chronic underfunding of infrastructure (Obadiaru & Okon, 2024). This differs from findings in other developing economies where shifts from direct to indirect taxation have more effectively financed public investment in infrastructure. While infrastructure is widely recognized as a critical driver of productivity, research such as Adebosin et al, 2022; Temidayo et al, 2022; Akinlabi, et al, 2011 notes that Nigeria's infrastructure development is constrained more by governance failures than by inadequate funds, inefficiency and corruption which diminishes the impact of tax revenues on growth outcomes. By integrating Nigeria-specific data with comparative international evidence, the study adds nuance to debates on the causal nexus oftax composition, infrastructure and economic performance.

3. METHODOLOGY

3.1 Theoretical Framework

The Barro (1990) endogenous growth model, which identified public infrastructure investment as the core endogenous factor driving economic growth, serves as the foundation for this study. These public investments are enhanced through taxes and complement private investments, and since public investments raise the productivity of private investments, higher taxes can be associated with an increase or a decrease in overall growth.

3.2 Model Specification

The Granger (1969) Causality Test was utilised to assess the direction of causality, if any, between the independent variables and economic performance. The Granger causality that is normally tested in the context of linear regression models is attributed to the studies of Owolabi-Merus (2015) and Ameyaw et al. (2016). It is used to determine the ability of a variable to predict the future values of another variable.

The hypotheses are stated as follows:

Null Hypothesis (H_0): Y_t does not Granger cause X_{t+1}

Alternate Hypothesis (H_1): Y_t does Granger cause X_{t+1}

However, if the p-values are less than a significance level (0.05) for at least one of the lags, reject the null hypothesis and if otherwise, accept the null hypothesis.

The study specifies a causal effect model by Granger (1969) as;

$$RGDP_t = \sum_{i-1}^{m} \alpha_i \, RGDP_{t-1} + \sum_{j-1}^{n} \delta_j \, TC_{t-j} + \varepsilon_{1t} \quad (1)$$

$$TC_t = \sum_{i-1}^{m} \gamma_i \, RGDP_{t-1} + \sum_{j-1}^{n} \varphi_j \, TC_{t-j} + \varepsilon_{2t} \quad (2)$$

$$RGDP_t = \sum_{i-1}^{m} \aleph_i \, RGDP_{t-1} + \sum_{j-1}^{n} \phi_j \, INFR_{t-j} + \varepsilon_{3t} \quad (3)$$

$$INFR_t = \sum_{i-1}^{m} \sigma_i \, RGDP_{t-1} + \sum_{j-1}^{n} \varpi_j \, INFR_{t-j} + \varepsilon_{4t} \quad (4)$$

Where: $RGDP$ is Real GDP , a proxy for economic performance (Olaniyi et al, 2024; Ekeocha et al, 2022), $INFR_t$ is measured by infrastructure investment, and $TC_t$is tax composition which is is dis-aggregated into Petroleum Profit Tax (PPT), Company Income Tax (CP), Custom and Excise Duties(CES), value-added tax (VAT), and Personal Income Tax (PIT) to account for both direct and indirect taxes for the period under investigation. While ε_{1t} to ε_{4t}be indicated as the disturbances assumed to be uncorrelated. This study used annual time series data spanning 30 years (1993-2022) for Nigeria. The study utilized secondary data published by the Central Bank of Nigeria (CBN) Statistical Bulletin (2023) and the World Development Indicators (WDI, 2023).

4. RESULTS AND DISCUSSION OF FINDINGS

4.1 RESULTS

The result of the causality relationship is presented in Table 1.

Table 1. Result of the causal relationships that exist among tax composition, infrastructure, and economic performance in Nigeria.

Null Hypothesis:	**Obs.**	**F-Stat.**	**Prob.**
LNVAT does not Granger Cause LNRGDP	28	4.658	0.020**
LNRGDP does not Granger Cause LNVAT	28	0.007	0.993
LNPIT does not Granger Cause LNRGDP	28	4.016	0.032**
LNRGDP does not Granger Cause LNPIT	28	3.707	0.040**
LNCP does not Granger Cause LNRGDP	28	4.437	0.024**
LNRGDP does not Granger Cause LNCP	28	0.700	0.507
LNPPT does not Granger Cause LNRGDP	28	3.951	0.034**
LNRGDP does not Granger Cause LNPPT	28	0.723	0.496
LNCES does not Granger Cause LNRGDP	28	3.187	0.060***
LNRGDP does not Granger Cause LNCES	28	0.187	0.831
INFR does not Granger Cause LNRGDP	28	1.539	0.236
LNRGDP does not Granger Cause INFR	28	5.610	0.010**

Note: ***P*< 0.05, ****P*< 0.10; LNRGDP, LNVAT, LNPIT, LNCP, LNPPT, LNCES, INFR remain as defined above

Source: Author's compilation, 2024.

The Granger causality test is a statistical hypothesis test used to measure or determine the ability of the value of one time series to predict another with inferences drawn at 5% level of significance. Table 1 demonstrates that the relationship between value-added tax and economic performance significantly rejects the null hypothesis of no Granger causality at the 5% significance level. This implies that there exists a unidirectional relationship that runs from value-added tax to economic performance in this relationship, indicating that value-added tax can be used to predict economic performance in Nigeria. Similar to company income tax and economic performance, the null hypothesis of no Granger causality for the relationship between company income tax and economic performance was rejected but otherwise for the causal relationship between economic performance and company income tax. This implies that this result is also a unidirectional causality that only runs from company income tax to economic performance.

However, the relationship between personal income tax and economic performance is bidirectional. This implies that personal income can lead to a cause-effect change in economic performance and vice versa. Further, petroleum profit tax could also only exert a unidirectional relationship that runs from itself to economic performance. At 5% level of significance, we fail to reject the null hypothesis of no Granger causality for both the relationship between customs and excise duties and economic performance as well as the relationship between economic performance and customs and excise duties. This implies the absence of any cause-effect relationship between the two variables at the 5% level, although this could change if we consider a significance level of 10%.

Finally, the null hypothesis of no Granger causality for the relationship between infrastructure and economic performance could not be rejected. As a result, we conclude that the causal relationship between infrastructure and economic performance is unidirectional, running only from economic performance to infrastructure, implying that economic performance can be used to predict infrastructure.

4.2 DISCUSSION OF FINDINGS

The result of the causal relationship shows that there exists only a unidirectional relationship that runs from value-added tax to economic performance. This result implies that, although economic performance can enhance many economic and financial variables, it does not appear to lead to value-added tax. This result is consistent with the results of Hassan (2015), Afolayan (2015), and Okoli (2015) but contradicts the inferences of Usman and Adegbite (2015). Further, the causality result reveals the existence of a bi-causal relationship between personal income tax and economic performance.

Economic performance's significant cause-effect relationship with personal income tax implies that even if other factors are perfect and economic performance does not reach a high level of growth, it will be difficult for average income to cover both the full living expenses and tax payment. This result, however, contradicts the work of Hassan (2015) but supports the findings of Maganya (2020).

Also, the result of company income tax revealed that only a unidirectional causal relationship exists, and it runs from company income tax to economic performance. This result also implies that economic performance does not have a significant cause-effect relationship on company income tax. This result contradicts the findings of Chigbu et al. (2011) but supports the finding of Etim et al. (2020). For the result of petroleum profit tax, the result shows that only a

unidirectional relationship occurs and it runs from petroleum profit tax to economic performance. This result agrees with the studies of Chigbu et al. (2011); Ojukwu and Odoemelam (2020); Etim et al. (2020) but contradicts the findings of Usman and Adegbite (2015); Gopar, et al. (2017). For the result of custom and excise duties, the result shows that only a unidirectional relationship occurs and it runs from custom and excise duties to economic performance. This result agrees with the result of Chigbu et al. (2011); Hassan (2015) but disagrees with the findings of Gopar, et al. (2017).

Lastly, the result of the causality between infrastructure and economic performance shows that a unidirectional causality running from economic performance to infrastructure exists. This result suggests that it is the economic performance that will drive the explosion of infrastructural development and not the other way around. This result contradicts the assumptions of the infrastructure-led development theory and the findings of Owolabi-Merus (2015). However, the result agrees with the findings of Canning and Pedroni (2008).

5. CONCLUSION AND RECOMMENDATIONS

This study examined the causal link among tax composition, infrastructure, and economic performance in Nigeria from 1993 to 2022 using the Granger causality test. The result indicates that any expectation of a causal effect of economic performance on customs and excise duties, company tax, petroleum profit tax, and value-added tax may be unnecessary. This is because the causality from economic performance to these variables is insignificant. This explanation also holds for the cause-effect relationship of infrastructure to economic performance. Based on the findings, the study hereby recommends that policymakers should create proper tax education and awareness to encourage voluntary tax compliance as this will enhance tax revenue to fund infrastructural development which in turn will enhance the performance of the economy. Also, policymakers should design a framework that entertains customers' feedback and eliminates tax loopholes.

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