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Causal relationship between tax structure and human development index in Nigeria

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Abstract

This study examined the causal relationship between tax structure and the Human Development Index (HDI) in Nigeria over the period 2006–2025. The study adopted an ex-post facto research design and utilized annual secondary time series data. Data on Company Income Tax, Customs and Excise Duties, and Petroleum Profit Tax were sourced from NGX Tax Pro Max, while data on the Human Development Index were obtained from the Nigerian Bureau of Statistics (NBS). The Autoregressive Distributed Lag (ARDL) estimation technique was employed for data analysis after establishing the stationarity properties of the variables using the Augmented Dickey-Fuller (ADF) unit root test. The ARDL Bounds Cointegration Test, Error Correction Model (ECM), and Pairwise Granger Causality Test were further conducted to determine the long-run relationship, speed of adjustment, and direction of causality among the variables. The findings revealed that Company Income Tax, Customs and Excise Duties, and Petroleum Profit Tax each maintain positive and statistically significant relationships with the Human Development Index in Nigeria. The ARDL Bounds Cointegration Test confirmed the existence of a stable long-run equilibrium relationship between tax structure and human development, while the Error Correction Model produced a negative and statistically significant error correction coefficient of -0.6814, indicating that approximately 68.14% of short-run disequilibrium is corrected within one period. Furthermore, the Pairwise Granger Causality Test revealed a unidirectional causal relationship running from Company Income Tax, Customs and Excise Duties, and Petroleum Profit Tax to the Human Development Index, with no evidence of reverse causality. The study concluded that an efficient and well-diversified tax structure significantly contributes to improving human development by strengthening government revenue and enhancing its capacity to finance critical sectors such as education, healthcare, and infrastructure. The study therefore recommended that government should strengthen corporate tax administration, modernize customs and excise duty collection systems, improve transparency and accountability in the management of petroleum tax revenues, broaden the domestic tax base, and ensure that tax revenues are efficiently allocated to programmes that directly improve human development outcomes in Nigeria.

Keywords: Tax structure; Revenue; Human development Index; Company Income Tax; Custom and Excise Duties

1. Introduction

Human development has increasingly become one of the most comprehensive indicators for assessing the socio-economic progress of nations because it extends beyond traditional measures of economic growth to encompass improvements in people's well-being, educational attainment, health status, and standard of living (Nwaiwu, 2025). The concept emerged prominently through the United Nations Development Programme (UNDP) in 1990 as an alternative to measuring development solely by Gross Domestic Product (GDP), emphasizing that the ultimate objective of development is to expand people's capabilities and opportunities rather than merely increase national income. Consequently, the Human Development Index (HDI) was developed as a composite index comprising life expectancy at birth, expected and mean years of schooling, and Gross National Income (GNI) per capita. The index has since become an internationally recognized benchmark for evaluating the quality of development across countries and for assessing whether economic growth translates into improved living standards for the population. Recent global evidence

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indicates that while many countries have experienced recovery in HDI following the COVID-19 pandemic, progress remains uneven, particularly among developing economies where fiscal constraints continue to limit investments in education, healthcare, and social protection (Appah et al., 2023).

Globally, governments have increasingly recognized that sustainable improvements in human development require substantial public investment in social infrastructure and essential public services. The financing of these investments depends largely on the ability of governments to mobilize adequate domestic revenue through efficient taxation (Burutola et al., 2025). Taxation remains one of the most sustainable sources of public finance because it provides governments with predictable resources for funding education, healthcare delivery, transportation networks, housing, environmental protection, and other developmental programmes. Beyond revenue generation, taxation also promotes income redistribution, strengthens governance, enhances state capacity, and supports the achievement of the Sustainable Development Goals (SDGs). International development institutions have therefore consistently emphasized that effective domestic resource mobilization through taxation is indispensable for achieving inclusive and sustainable human development, particularly in developing countries where dependence on external borrowing and foreign aid remains significant (Nmorsi et al., 2026).

The relationship between taxation and human development has become increasingly important in recent years because many developing economies continue to experience widening developmental deficits despite recording improvements in economic output. In several low- and middle-income countries, economic growth has not translated proportionately into better educational outcomes, improved healthcare systems, or higher standards of living. This disconnect has intensified discussions regarding the effectiveness of fiscal policy and the structure of government revenue. Rather than focusing solely on the volume of tax revenue collected, increasing attention is now directed towards the composition or structure of taxation, recognizing that different categories of taxes possess varying capacities to generate stable revenue, influence economic activities, and finance long-term developmental objectives. Tax structure therefore represents an essential component of fiscal policy because it determines the sustainability, efficiency, and equity of government revenue generation.

In Nigeria, human development continues to present a significant policy concern despite the country's abundant natural and economic resources. As Africa's largest economy by population and one of the continent's major oil-producing nations, Nigeria possesses considerable revenue-generating potential (Nwaiwu, 2025). Nevertheless, the country continues to face persistent challenges relating to poverty, unemployment, inadequate healthcare services, poor educational outcomes, income inequality, and infrastructural deficits. According to the United Nations Development Programme, Nigeria remains within the low human development category despite improvements recorded over the past two decades, with inequality significantly reducing the country's overall human development performance. The 2023/2024 Human Development Report further indicates that Nigeria's HDI value remains below global averages for comparable emerging economies, reflecting persistent structural constraints that limit improvements in citizens' welfare (Nmorsi et al., 2026).

One of the major fiscal challenges confronting Nigeria has been the relatively low level of domestic revenue mobilization compared with the country's developmental needs. Although petroleum resources have historically constituted the dominant source of public revenue, volatility in global crude oil prices, production disruptions, exchange rate fluctuations, and the global transition towards renewable energy have exposed the vulnerability of excessive dependence on oil revenue. Consequently, successive governments have introduced various fiscal reforms aimed at broadening the tax base, improving tax administration, and increasing non-oil revenue generation. These reforms have emphasized strengthening Company Income Tax, improving Customs and Excise Duty administration, modernizing tax collection systems, and enhancing Petroleum Profit Tax administration to ensure greater fiscal sustainability.

Company Income Tax (CIT) represents one of the most important direct taxes within Nigeria's tax structure. It is imposed on the profits of incorporated companies operating within the country and constitutes a significant source of non-oil government revenue. Beyond its revenue-generating function, Company Income Tax promotes fiscal equity by requiring profitable corporations to contribute towards financing public goods and services. Efficient administration of Company Income Tax enhances government revenue available for investments in education, healthcare, water supply, transportation infrastructure, and social welfare programmes, all of which directly influence human development. As the Nigerian economy continues to diversify beyond the petroleum sector, Company Income Tax has assumed increasing importance in supporting sustainable public finance(Burutola et al., 2025).

Customs and Excise Duties (CED) also constitute an important component of Nigeria's tax structure. Customs duties are levied on imported goods entering the country, while excise duties are imposed on selected locally manufactured products. Apart from generating substantial revenue, customs and excise duties perform regulatory functions by protecting domestic industries, encouraging local production, discouraging excessive importation of harmful goods, and promoting industrial development. Revenue generated through customs administration provides government with additional fiscal resources required for financing developmental programmesthat improve public welfare. Improvements in customs modernization, digital trade facilitation, and anti-smuggling measures have further strengthened the contribution of customs revenue to Nigeria's fiscal performance.

Petroleum Profit Tax (PPT) remains one of the most strategic components of Nigeria's tax system due to the country's historical dependence on the petroleum industry. Petroleum Profit Tax is imposed on the profits of companies engaged in petroleum exploration and production activities. For several decades, petroleum taxation has accounted for a substantial proportion of government revenue and foreign exchange earnings. Revenue generated through Petroleum Profit Tax has financed numerous public sector investments, including roads, hospitals, educational institutions, electricity projects, and other critical infrastructure. However, fluctuations in international oil prices and global energy market uncertainties have highlighted the importance of improving efficiency in petroleum tax administration while simultaneously diversifying the country's overall tax structure(Nwaiwu, 2025).

Theoretical and empirical discussions increasingly suggest that the effectiveness of tax structure should not be evaluated merely by the amount of revenue collected but by the extent to which such revenue translates into measurable improvements in citizens' welfare. Efficient tax administration accompanied by transparent public expenditure management enhances public confidence in government institutions and strengthens the developmental impact of taxation. Conversely, weak tax administration, corruption, tax evasion, illicit financial flows, and inefficient utilization of public resources can significantly weaken the contribution of taxation to human development even where substantial revenue is generated. This underscores the importance of examining not only revenue mobilization but also the developmental implications of different components of the tax structure.

Existing empirical studies have produced mixed findings regarding the relationship between taxation and human development. While several studies report that increased tax revenue contributes positively to improvements in education, healthcare, and overall welfare, others argue that institutional weaknesses, governance failures, and inefficient public expenditure often reduce the effectiveness of taxation in promoting human development(Burutola et al., 2025). Furthermore, many previous Nigerian studies have concentrated primarily on the relationship between tax revenue and economic growth, government expenditure, or macroeconomic performance, with relatively fewer studies specifically examining the causal relationship between individual components of tax structure and the Human Development Index. The few existing studies often combine different tax variables without separately evaluating the contributions of Company Income Tax, Customs and Excise Duties, and Petroleum Profit Tax to human development outcomes.

Given Nigeria's ongoing fiscal reforms, increasing emphasis on domestic resource mobilization, and the country's persistent human development challenges, there is a compelling need to provide updated empirical evidence on the relationship between tax structure and the Human Development Index. Understanding whether improvements in specific tax components contribute meaningfully to human development is essential for designing effective fiscal policies capable of supporting sustainable development. It is against this background that this study investigates the causal relationship between Company Income Tax, Customs and Excise Duties, Petroleum Profit Tax, and the Human Development Index in Nigeria.

1.1. Statement of the Problem

Human development has remained one of the principal objectives of public policy across both developed and developing economies because it reflects the extent to which governments are able to improve the quality of life of their citizens through investments in health, education, and income-enhancing opportunities. Over the years, taxation has been recognized as one of the most reliable instruments for mobilizing domestic resources required to finance these developmental priorities. The Organisation for Economic Co-operation and Development (OECD) maintains that an efficient tax system enables governments to generate sustainable revenue for public service delivery, reduce dependence on external borrowing, and strengthen long-term economic and social development. Similarly, the United Nations Development Programme (UNDP) emphasizes that effective domestic resource mobilization through taxation is indispensable for achieving the Sustainable Development Goals and improving human development outcomes, particularly in developing economies.

Historically, Nigeria has experienced persistent challenges in translating public revenue into tangible improvements in human development despite decades of substantial tax collections and significant natural resource endowments(Appah et al., 2023). Since the discovery of crude oil in commercial quantities, the country's fiscal system has largely revolved around petroleum revenue, resulting in relatively limited attention to the diversification of domestic tax sources. Although successive governments have implemented numerous tax reforms aimed at strengthening Company Income Tax, Customs and Excise Duties, Petroleum Profit Tax, and overall tax administration, the anticipated improvements in human development have remained relatively modest. Nigeria continues to face considerable deficits in healthcare delivery, educational quality, access to basic infrastructure, poverty reduction, and employment creation. The country's Human Development Index has consistently remained below the global average, suggesting that increases in government revenue have not been matched by proportional improvements in citizens' welfare(Burutola et al., 2025).

The persistence of these developmental challenges raises fundamental concerns regarding the effectiveness of Nigeria's tax structure in supporting sustainable human development. While tax revenues have generally increased over time due to various fiscal reforms, including improvements in tax administration, digitalization of tax processes, expansion of the tax base, and reforms within the petroleum sector, concerns remain regarding revenue leakages, tax evasion, administrative inefficiencies, corruption, weak fiscal transparency, and the inefficient allocation of public resources. Consequently, questions continue to arise as to whether the existing tax structure generates sufficient developmental outcomes or merely increases government revenue without corresponding improvements in education, healthcare, and living standards.

From a theoretical perspective, there is no unanimous agreement regarding the relationship between tax structure and human development. The Benefit Theory of Taxation argues that taxes collected by government should be translated into public goods and services that directly improve citizens' welfare. According to this perspective, efficient tax administration should enhance government expenditure on education, healthcare, infrastructure, and social protection, thereby improving the Human Development Index. Likewise, the Ability-to-Pay Theory contends that taxation should be structured according to the economic capacity of taxpayers, enabling governments to mobilize sufficient revenue from profitable individuals and corporations for developmental purposes. In contrast, some public choice theorists argue that higher tax revenue does not automatically translate into improved human development because governance failures, institutional weaknesses, bureaucratic inefficiencies, and corruption may prevent tax resources from being effectively transformed into public welfare. These competing theoretical perspectives have continued to generate debate regarding whether improvements in tax revenue necessarily produce corresponding improvements in human development outcomes.

Empirical evidence on the relationship between tax structure and human development has also remained inconclusive. Some studies have reported positive relationships between taxation and human development, arguing that increased tax revenue enhances government expenditure on social infrastructure and consequently improves educational attainment, healthcare delivery, and living standards(Appah et al., 2023). For instance, recent evidence suggests that broader tax mobilization can support improvements in human development through increased fiscal capacity. Conversely, other empirical studies have reported weak, insignificant, or even negative relationships between certain tax components and the Human Development Index, attributing such outcomes to inefficient public expenditure, governance challenges, and institutional constraints. For example, studies have found differing effects of Company Income Tax, Petroleum Profit Tax, and other tax categories on human development in Nigeria, reflecting the absence of consensus in the literature.

Another important gap in the literature relates to the measurement of tax structure itself. Many previous Nigerian studies have focused primarily on the aggregate effect of total tax revenue or examined taxation in relation to economic growth, gross domestic product, government expenditure, or capital formation rather than human development. Others have concentrated on individual taxes such as Value Added Tax or Personal Income Tax while giving limited attention to the combined contributions of Company Income Tax, Customs and Excise Duties, and Petroleum Profit Tax. Furthermore, a considerable proportion of earlier studies estimated linear relationships using conventional regression techniques without adequately examining the existence of both short-run dynamics and long-run equilibrium relationships among the variables. Consequently, there remains limited empirical evidence regarding the causal relationship between these major components of Nigeria's tax structure and the Human Development Index using the Autoregressive Distributed Lag (ARDL) framework(Nwaiwu, 2025).

In addition, recent fiscal reforms introduced by the Federal Government have significantly altered Nigeria's tax administration landscape through enhanced digital tax systems, improved tax compliance initiatives, customs modernization, and broader domestic revenue mobilization strategies. These developments have created the need for updated empirical evidence capable of reflecting current fiscal realities and determining whether improvements in the tax structure are translating into measurable gains in human development. Existing studies conducted before these reforms may no longer adequately capture the contemporary dynamics between taxation and human development.

It is against these historical, theoretical, and empirical contentions that this study investigates the causal relationship between Company Income Tax, Customs and Excise Duties, Petroleum Profit Tax, and the Human Development Index in Nigeria. By examining the individual contributions of these major components of tax structure using the ARDL approach, the study seeks to provide empirical evidence capable of informing fiscal policy decisions aimed at strengthening domestic revenue mobilization and promoting sustainable human development.

2. Literature Review

2.1. Conceptual Framework

2.1.1. Tax Structure

Tax structure refers to the composition, design, classification, and relative contribution of different tax instruments within a country's overall taxation system. It encompasses the various categories of taxes imposed by government, the applicable tax rates, assessment procedures, collection mechanisms, tax administration, and the distribution of tax burdens across individuals, businesses, and sectors of the economy (Burutola et al., 2025). Tax structure determines how governments mobilize domestic resources to finance public expenditure and achieve macroeconomic objectives such as economic growth, income redistribution, fiscal stability, and sustainable development (OECD, 2023). According to the International Monetary Fund (2024), an efficient tax structure promotes revenue adequacy, economic efficiency, equity, administrative simplicity, and taxpayer compliance while minimizing distortions in production, investment, and consumption decisions. The World Bank (2023) further explains that countries with diversified tax structures are generally more fiscally resilient because dependence on a single source of revenue exposes governments to economic shocks and commodity price volatility.

Nigeria operates a multi-tier tax system consisting of federal, state, and local government taxes administered under different legal frameworks. Major federally collected taxes include Company Income Tax, Petroleum Profit Tax, Customs and Excise Duties, Value Added Tax, Capital Gains Tax, and Stamp Duties. The Federal Inland Revenue Service (FIRS) remains the principal agency responsible for administering most federal taxes, while the Nigeria Customs Service administers Customs and Excise Duties (Federal Inland Revenue Service, 2024). A well-designed tax structure enhances fiscal sustainability by providing stable government revenue necessary for financing education, healthcare, social welfare, environmental protection, and infrastructure development. Conversely, weak tax administration, widespread tax evasion, narrow tax bases, overdependence on petroleum revenues, and inefficient public expenditure significantly reduce the developmental impact of taxation in many developing countries, including Nigeria (IMF, 2024; OECD, 2023).

2.1.2. Human Development Index

Human Development Index (HDI) is a composite indicator developed by the United Nations Development Programme (UNDP) under the leadership of Mahbub ul Haq in 1990, with significant conceptual contributions from Nobel Laureate Amartya Sen. The HDI was introduced to provide a broader measure of development beyond conventional economic indicators such as Gross Domestic Product (GDP). It emphasizes that the true objective of development is the expansion of people's capabilities, opportunities, and freedoms rather than merely increasing national income (UNDP, 2025).

The Human Development Index combines three fundamental dimensions of human well-being. The first dimension is a long and healthy life, measured using life expectancy at birth. The second dimension is knowledge, measured through expected years of schooling and mean years of schooling. The third dimension is a decent standard of living, measured using Gross National Income per capita adjusted for purchasing power parity. These three indicators are normalized and aggregated into a composite index ranging from zero to one, with higher values indicating greater levels of human development (UNDP, 2025). The HDI has become one of the most widely accepted international measures for comparing development performance across countries because it captures both economic and social dimensions of development simultaneously. According to the United Nations Development Programme (2025), countries with higher HDI values generally demonstrate better educational outcomes, improved healthcare systems, higher incomes, lower poverty rates, stronger institutions, and greater overall quality of life.

2.2. Theoretical Framework

2.2.1. The Ability-to-Pay Theory

The Ability-to-Pay Theory was propounded by Arthur Cecil Pigou (1920) in his seminal work *The Economics of Welfare*. The theory emerged as an alternative to earlier theories of taxation that emphasized reciprocity between taxpayers and government services. Pigou argued that taxation should not be determined by the direct benefits individuals receive from government but by their relative economic capacity to contribute toward financing public expenditure (Pigou, 1920). According to this theory, individuals and corporations possessing greater income, wealth, or profitability should contribute proportionately more to government revenue than those with lower economic capacity. The central idea is that taxation should promote equity by ensuring that the burden of taxation is distributed according to taxpayers' ability to bear such burdens rather than according to the benefits they receive from government services (Musgrave & Musgrave, 1989; Burutola et al., 2025).

The theory distinguishes between horizontal equity and vertical equity. Horizontal equity requires individuals with similar economic capacity to pay similar amounts of tax, while vertical equity advocates that taxpayers with greater earning capacity should bear proportionately higher tax burdens (Stiglitz & Rosengard, 2015). Progressive taxation therefore becomes an essential principle under the Ability-to-Pay Theory because it minimizes inequality while enabling governments to mobilize sufficient resources for developmental purposes. The theory assumes that income and wealth can be objectively measured, taxpayers possess varying capacities to contribute to government revenue, and governments utilize tax proceeds efficiently for societal welfare. It further assumes that citizens accept tax obligations when they perceive the tax burden to be fair and equitable (Bird &Zolt, 2014).

2.3. Empirical Review

Inegbedion and Yamah (2026) investigated the relationship between tax revenue and economic development in Nigeria over the period 1980 to 2024. The study adopted an ex post facto research design using annual time series data obtained from the Central Bank of Nigeria, Federal Inland Revenue Service, and the United Nations Development Programme. Human Development Index (HDI) was employed as the measure of economic development, while Company Income Tax Revenue (CITR), Petroleum Profit Tax Revenue (PPTR), Customs and Excise Duties Revenue (CEDR), and Value Added Tax Revenue (VATR) served as explanatory variables. The study utilized the Autoregressive Distributed Lag (ARDL) model and Error Correction Model (ECM) to estimate both the long-run and short-run relationships among the variables. The findings revealed that Company Income Tax and Value Added Tax contributed positively to improvements in Human Development Index, whereas Petroleum Profit Tax exhibited inconsistent effects across the estimation periods. Customs and Excise Duties showed a weak contribution to human development. The study concluded that tax revenue remains an important determinant of economic development provided tax resources are efficiently managed. However, the study concentrated on long-run and short-run relationships without examining the direction of causality among tax structure variables and HDI, thereby justifying the present study.

Nmorsi, Egungwu and Nduka (2026) investigated the effect of tax revenue on economic development in Nigeria using annual time series data covering the period from 1993 to 2023. The study adopted an ex post facto research design and obtained secondary data from the Central Bank of Nigeria, Federal Inland Revenue Service, and United Nations Development Programme. Human Development Index was employed as the measure of economic development, while Company Income Tax, Petroleum Profit Tax, Customs and Excise Duties, Personal Income Tax, Education Tax, and Value Added Tax constituted the explanatory variables. The researchers employed the Autoregressive Distributed Lag (ARDL) estimation technique to analyse both the long-run and short-run relationships among the variables. The findings revealed that Company Income Tax and Value Added Tax exerted significant positive relationships with Human Development Index, whereas Customs and Excise Duties maintained a negative but statistically insignificant relationship with HDI. Petroleum Profit Tax also demonstrated a positive but insignificant relationship with HDI. The study concluded that improving tax administration and expanding the tax base would enhance human development outcomes in Nigeria. Nevertheless, the study concentrated on estimating effects rather than establishing causal relationships among tax structure variables and Human Development Index, which is the principal objective of the present study.

Ndubuisi, et al, (2026) examined the relationship between tax revenue and human capital development in Nigeria. The study adopted an ex post facto research design using annual secondary data obtained from the Central Bank of Nigeria, Federal Inland Revenue Service, and the World Development Indicators. Human Development Index served as the dependent variable representing human capital development, while Company Income Tax, Petroleum Profit Tax, Customs and Excise Duties, Education Tax, and Value Added Tax were adopted as explanatory variables. The Augmented Dickey-Fuller unit root test was used to determine stationarity, after which the Ordinary Least Squares Log-Log model was employed for estimation. The findings showed that Company Income Tax and Value Added Tax significantly improved Human Development Index, Petroleum Profit Tax exerted a positive but insignificant relationship with HDI, while Customs and Excise Duties demonstrated a negative and insignificant relationship. The study recommended improved allocation of tax revenue to education and healthcare to promote sustainable human capital development. However, the study estimated functional relationships without examining the direction of causality among the variables, thereby justifying the present study.

Ezenwobi and John-Akamelu (2025) examined the relationship between tax revenues and economic development in Nigeria using the Human Development Index (HDI) as the proxy for economic development. The study adopted an ex-post facto research design and utilized annual secondary data obtained from the Central Bank of Nigeria (CBN), the Federal Inland Revenue Service (FIRS), and the National Bureau of Statistics (NBS) covering the period from 2004 to 2023. The explanatory variables comprised Company Income Tax (CIT), Petroleum Profit Tax (PPT), Value Added Tax (VAT), and Personal Income Tax (PIT), while HDI served as the dependent variable. Robust Least Squares (RLS) regression technique was employed for the analysis. The findings revealed that Company Income Tax exhibited a positive but statistically insignificant relationship with HDI, while Petroleum Profit Tax demonstrated a significant negative relationship with HDI. The study concluded that the composition of tax revenue influences human development differently depending on the tax source. Although the study examined similar tax variables and HDI, it focused on the effects of tax revenue on development rather than the causal relationship among tax structure components and HDI, thereby creating a methodological gap that the present study seeks to address through causality analysis.

Ochuka and Ezenwafor (2025) assessed the effects of taxation on sustainable development in Nigeria using Human Development Index as a measure of sustainable development. The study adopted an ex-post facto research design and collected annual secondary data covering the period from 2000 to 2023 from the Federal Inland Revenue Service, Central Bank of Nigeria, National Bureau of Statistics and World Bank databases. The explanatory variables consisted of Company Income Tax, Petroleum Profit Tax, Customs and Excise Duties and Value Added Tax, while Human Development Index represented the dependent variable. Ordinary Least Squares regression technique was employed for the analysis. The empirical findings showed that Company Income Tax had a positive and statistically significant relationship with HDI, whereas Petroleum Profit Tax and Customs and Excise Duties exhibited negative and statistically insignificant relationships with HDI. The study concluded that effective utilization of tax revenue is essential for achieving sustainable development. Nevertheless, its emphasis remained on estimating the effects of taxation rather than determining causal relationships among the variables.

3. Methodology

This study adopts the ex-post facto research design. The choice of this design is informed by the fact that the study relies on historical macroeconomic data that already exist and cannot be manipulated by the researcher. Ex-post facto design is suitable for investigating causal relationships among economic variables where the researcher has no control over the independent variables. Specifically, the study examines whether changes in the components of Nigeria's tax structure, namely Company Income Tax (CIT), Customs and Excise Duties (CED), and Petroleum Profit Tax (PPT), exhibit causal relationships with the Human Development Index (HDI). The design is appropriate because it permits the empirical analysis of historical trends and causal linkages using time series econometric techniques without interfering with the observed phenomena.

The study utilizes secondary time series data covering the period 1994 to 2025. Secondary data are appropriate because they are obtained from official government publications and recognized databases, thereby ensuring reliability, consistency, and authenticity. Data on Company Income Tax (CIT), Customs and Excise Duties (CED), and Petroleum Profit Tax (PPT) are sourced from NGX Tax Pro Max, while data on the Human Development Index (HDI) are obtained from the Nigerian Bureau of Statistics (NBS). The selected period provides recent evidence on the interaction between tax revenue structure and human development outcomes in Nigeria.

The study specifies the relationship between tax structure and human development using functional, mathematical, and econometric models.

$$HDI = f(C{\scriptstyle\,\prime}\, I{\scriptstyle\,\prime}\, TCEDPPT)$$

$$HDI = \beta_0 + \beta_1 CIT + \beta_2 CED + \beta_3 PPT$$

$$HDI_t = \beta_0 + \beta_1 CIT_t + \beta_2 CED_t + \beta_3 PPT_t + \varepsilon_t$$

Where: HDI = Human Development Index at time t, CIT = Company Income Tax at time t, CED = Customs and Excise Duties at time t, PPT = Petroleum Profit Tax at time t, β_0= Constant term, $\beta_1 - \beta_3$= Parameters to be estimated, ε_t= Stochastic error term

The study employs the Autoregressive Distributed Lag (ARDL) estimation technique to examine the causal relationship between tax structure and the Human Development Index in Nigeria. The ARDL approach is preferred because it is suitable for small sample sizes and can accommodate variables integrated of different orders, provided none is integrated of order two, I(2). Prior to estimation, the time series properties of the variables will be examined using unit root tests to determine their order of integration. The ARDL Bounds testing procedure will subsequently be employed to determine the existence of a long-run relationship among the variables. Where cointegration exists, both the long-run coefficients and the associated Error Correction Model (ECM) will be estimated to capture the speed of adjustment from short-run disequilibrium to long-run equilibrium. To determine the direction of causality among the variables, the study will further employ the Granger causality test within the ARDL framework. Diagnostic tests, including tests for serial correlation, heteroskedasticity, normality of residuals, and model stability using the CUSUM and CUSUMSQ tests, will also be conducted to ensure the robustness, reliability, and stability of the estimated model. The study finalizes with the Granger Causality test.Unlike correlation and regression analyses, which only establish the existence of relationships among variables, the Granger causality test examines whether past values of one variable contain useful information for predicting the current values of another variable. The test does not imply causation in the strict philosophical sense but rather establishes predictive causality based on the temporal precedence of variables. The null hypothesis for each pairwise test states that one variable does not Granger-cause the other. The decision rule is to reject the null hypothesis if the probability value associated with the F-statistic is less than the 5 percent significance level (0.05).

4. Results

Table 1 Augmented Dickey-Fuller (ADF) Unit Root Test Results

Variables	ADF Statistic at Level	5% Critical Value	Prob. Value	Order of Integration	ADF Statistic at First Difference	5% Critical Value	Prob. Value	Order of Integration (Final Decision)
HDI	-2.0847	-3.0207	0.2473	Non-Stationary	-5.8731	-3.0404	0.0003	I(1)
CIT	-4.2865	-3.0207	0.0081	I(0)	-	-	-	I(0)
CED	-1.7639	-3.0207	0.3926	Non-Stationary	-6.1254	-3.0404	0.0001	I(1)
PPT	-3.8642	-3.0207	0.0174	I(0)	-	-	-	I(0)

Source: Researcher's Computation (2026) using EViews 13.

The findings indicate that HDI and CED are integrated of order one [I(1)], whereas CIT and PPT are integrated of order zero [I(0)]. None of the variables was integrated of order two [I(2)], thereby fulfilling the underlying assumption for the application of the ARDL bounds testing procedure. The coexistence of I(0) and I(1) variables further justifies the choice of the ARDL methodology, as it is specifically designed to estimate both short-run dynamics and long-run relationships in models comprising variables with mixed orders of integration. Consequently, the study proceeds to the ARDL bounds cointegration test to determine whether a stable long-run equilibrium relationship exists between tax structure and the Human Development Index in Nigeria.

Table 2 Autoregressive Distributed Lag (ARDL) Estimation Results for the Relationship between Tax Structure and Human Development Index in Nigeria

Variable	Coefficient	Standard Error	t-Statistic	Probability
HDI(-1)	0.6248	0.1485	4.2074	0.0012
CIT	0.000421	0.000138	3.0507	0.0114
CIT(-1)	0.000193	0.000094	2.0538	0.0678
CED	0.000286	0.000119	2.4035	0.0354
CED(-1)	-0.000114	0.000071	-1.6056	0.1368
PPT	0.000174	0.000058	3.0018	0.0126

PPT(-1)	0.000082	0.000047	1.7445	0.1093
Constant	0.2816	0.0635	4.4342	0.0009

Model Summary Statistics

Statistic	Value
R-squared	0.9278
Adjusted R-squared	0.9016
F-statistic	35.8421
Prob(F-statistic)	0.000001
Durbin-Watson Statistic	2.0618

Source: Researcher's Computation (2026) using EViews 13.

The overall significance of the model is confirmed by the F-statistic of 35.8421 with a corresponding probability value of 0.000001, which is well below the conventional significance level of 0.05. This result indicates that the explanatory variables jointly exert a statistically significant relationship with the Human Development Index. The Durbin-Watson statistic of 2.0618 is very close to the benchmark value of two, suggesting the absence of first-order serial correlation among the residuals and indicating that the estimated coefficients are reliable for inference. The coefficient of the lagged dependent variable, HDI(-1), is 0.6248 and is statistically significant at the 5 percent level with a probability value of 0.0012. This finding demonstrates that previous improvements in the Human Development Index significantly influence current human development performance, reflecting persistence in human development outcomes over time. The positive coefficient further suggests that improvements achieved in previous periods tend to be sustained in subsequent periods.

Company Income Tax (CIT) exhibits a positive coefficient of 0.000421 and is statistically significant with a probability value of 0.0114. This implies that increases in Company Income Tax revenue are associated with improvements in the Human Development Index. The result suggests that revenue generated from corporate taxation may enhance the government's fiscal capacity to finance investments in education, healthcare, and other social services that contribute to human development. The lagged value of CIT also retains a positive coefficient, although it is not statistically significant at the 5 percent level, indicating that the immediate contribution of Company Income Tax is more pronounced than its delayed effect.

Customs and Excise Duties (CED) also record a positive coefficient of 0.000286, which is statistically significant at the 5 percent level with a probability value of 0.0354. This finding indicates that revenue generated from customs and excise duties contributes positively to improvements in human development. The positive relationship may reflect the role of trade-related tax revenue in supporting government expenditure on public infrastructure and social welfare programmes. However, the lagged coefficient of CED is negative and statistically insignificant, implying that any delayed influence of customs and excise revenue on human development is weak and does not materially affect long-run development outcomes.

Petroleum Profit Tax (PPT) similarly demonstrates a positive and statistically significant relationship with the Human Development Index. The estimated coefficient of 0.000174 with a probability value of 0.0126 indicates that increases in petroleum profit tax revenue are associated with improvements in human development. Given the strategic importance of petroleum revenue to Nigeria's public finances, this result suggests that effective utilization of petroleum tax receipts can significantly enhance investments in critical sectors that improve citizens' quality of life. Although the lagged coefficient of PPT remains positive, its probability value exceeds the 5 percent threshold, indicating that its delayed effect is statistically insignificant.

Table 3 ARDL Bounds Cointegration Test Results for Tax Structure and Human Development Index in Nigeria

Test Statistic	Value
F-Statistic	6.1847
Number of Regressors (k)	3

Pesaran, Shin and Smith (2001) Critical Bounds Values

Significance Level	Lower Bound I(0)	Upper Bound I(1)	Decision
10%	2.72	3.77	Cointegration
5%	3.23	4.35	Cointegration
2.5%	3.69	4.89	Cointegration
1%	4.29	5.61	Cointegration

Source: Researcher's Computation (2026) using EViews 13.

The results presented in Table 4.4 indicate that the computed F-statistic of 6.1847 exceeds both the lower and upper critical bound values at the 10 percent, 5 percent, 2.5 percent, and 1 percent significance levels. Most importantly, the computed F-statistic is greater than the upper bound critical value of 4.35 at the 5 percent significance level and also exceeds the more stringent upper bound value of 5.61 at the 1 percent significance level. According to the decision rule of the ARDL Bounds testing procedure, when the calculated F-statistic exceeds the upper critical bound, the null hypothesis of no cointegration is rejected. From an econometric perspective, the confirmation of cointegration validates the estimation of the long-run coefficients and the associated Error Correction Model (ECM). Since the variables share a stable long-run relationship, estimating only the short-run dynamics would provide an incomplete representation of the relationship among the variables. The Error Correction Model therefore becomes necessary to capture both the speed and direction through which short-run disequilibrium adjusts toward the established long-run equilibrium.

Table 5 Error Correction Model (ECM) Results for the Relationship between Tax Structure and Human Development Index in Nigeria

Variable	Coefficient	Standard Error	t-Statistic	Probability
D(CIT)	0.000316	0.000121	2.6114	0.0248
D(CED)	0.000247	0.000108	2.2870	0.0415
D(PPT)	0.000158	0.000061	2.5902	0.0259
ECM(-1)	-0.6814	0.1167	-5.8396	0.0001
Constant	0.0187	0.0064	2.9218	0.0146

Model Summary Statistics

Statistic	Value
R-squared	0.8546
Adjusted R-squared	0.8268
F-statistic	30.6749
Prob(F-statistic)	0.000003
Durbin-Watson Statistic	2.0145

Source: Researcher's Computation (2026) using EViews 13.

The Error Correction Model results presented in Table 4.5 demonstrate that the estimated short-run model is statistically reliable and consistent with the findings obtained from the ARDL Bounds Cointegration Test. The coefficient of determination (R^2) of 0.8546 indicates that approximately 85.46 percent of the short-run variations in the Human Development Index are explained by changes in Company Income Tax, Customs and Excise Duties, Petroleum Profit Tax, and the error correction mechanism. The adjusted R-squared value of 0.8268 further confirms that the explanatory variables possess substantial predictive power after adjusting for the degrees of freedom. Furthermore, the Durbin-Watson statistic of 2.0145 suggests that the residuals are free from first-order serial correlation, implying that the estimated model satisfies one of the important assumptions of classical regression analysis.

The coefficient of the Error Correction Term, ECM(-1), is -0.6814, and it is statistically significant with a probability value of 0.0001. The negative sign conforms to theoretical expectation and confirms the existence of a stable long-run equilibrium relationship among the variables. The magnitude of the coefficient indicates that approximately 68.14 percent of any short-run disequilibrium in the Human Development Index is corrected within one period. This relatively high speed of adjustment implies that whenever shocks cause deviations from the long-run equilibrium, the system adjusts rapidly to restore equilibrium. The statistical significance of the error correction coefficient further validates the long-run relationship established by the ARDL Bounds Cointegration Test and confirms that the estimated ECM is correctly specified.

The short-run coefficient of Company Income Tax (D(CIT)) is positive (0.000316) and statistically significant at the 5 percent level with a probability value of 0.0248. This finding suggests that increases in Company Income Tax revenue generate immediate improvements in the Human Development Index. The result implies that corporate tax revenue provides additional fiscal resources that can be channelled towards the provision of education, healthcare, social infrastructure, and other development-oriented expenditures capable of improving the welfare of the population in the short run.

Similarly, Customs and Excise Duties (D(CED)) exhibit a positive and statistically significant coefficient of 0.000247 with a probability value of 0.0415. This indicates that increases in customs and excise revenue contribute positively to short-run improvements in human development. The finding suggests that revenues generated from trade-related taxes strengthen government finances and support expenditures on essential public services, thereby enhancing living standards within the economy.

The coefficient of Petroleum Profit Tax (D(PPT)) is also positive (0.000158) and statistically significant with a probability value of 0.0259. This result indicates that petroleum tax revenue contributes positively to short-run improvements in the Human Development Index. Given the strategic role of the petroleum sector in Nigeria's public revenue generation, the finding implies that efficient collection and effective utilization of petroleum tax receipts can improve government investment in sectors that directly influence health, education, and overall quality of life.

Table 6 Pairwise Granger Causality Test Results between Tax Structure and Human Development Index in Nigeria

Null Hypothesis	Obs.	F-Statistic	Probability	Decision
CIT does not Granger Cause HDI	18	5.2847	0.0218	Reject H_0
HDI does not Granger Cause CIT	18	1.4932	0.2614	Do Not Reject H_0
CED does not Granger Cause HDI	18	4.7635	0.0336	Reject H_0
HDI does not Granger Cause CED	18	0.9846	0.4017	Do Not Reject H_0
PPT does not Granger Cause HDI	18	6.1178	0.0142	Reject H_0
HDI does not Granger Cause PPT	18	1.2785	0.3094	Do Not Reject H_0

Source: Researcher's Computation (2026) using EViews 13.

The Granger causality results provide strong empirical evidence that the major components of Nigeria's tax structure—Company Income Tax, Customs and Excise Duties, and Petroleum Profit Tax—possess significant predictive influence on the Human Development Index. The absence of reverse causality from the Human Development Index to the respective tax variables indicates that improvements in human development do not significantly influence the generation of these tax revenues within the study period. Rather, the direction of causality consistently runs from tax structure to human development, suggesting that government revenue mobilization through these tax components serves as an important driver of improvements in education, healthcare, and living standards.

The findings therefore reinforce the earlier ARDL and Error Correction Model results, which established significant relationships between tax structure and the Human Development Index. They also support the theoretical proposition of the Benefit Theory of Taxation, which argues that taxes collected by government should be utilized to provide public goods and services that enhance citizens' welfare. The results further imply that sustained improvements in tax administration, revenue mobilization, and the efficient utilization of tax proceeds are likely to generate long-term improvements in human development in Nigeria.

5. Discussion of Findings

The ARDL estimation results demonstrated that Company Income Tax maintained a positive and statistically significant relationship with the Human Development Index in Nigeria. This finding suggests that increases in company income tax revenue are associated with improvements in human development outcomes. The implication is that corporate tax revenue enhances the government's fiscal capacity to finance investments in education, healthcare, public infrastructure, and other social services that improve the quality of life of citizens. This finding supports the Benefit Theory of Taxation, which argues that taxes collected from economic agents should be utilised in providing public goods and services that benefit society. As government mobilises greater revenue from profitable corporate entities, the availability of resources for developmental expenditure increases, thereby promoting improvements in human development indicators. The result is also consistent with the Ability-to-Pay Theory, which maintains that entities with greater economic capacity should contribute proportionately more to government revenue. Company Income Tax is largely imposed on profitable firms that possess the financial capacity to contribute to national development without significantly impairing economic efficiency. Consequently, effective mobilisation and utilisation of corporate tax revenue can facilitate improvements in public welfare through increased government spending on essential social services. Empirically, the finding aligns with studies by Ojong, Ogar and Arikpo (2021), who reported that improved tax revenue mobilisation enhances government expenditure on social infrastructure and contributes positively to national development. Similarly, Adegbie and Fakile (2020) found that efficient corporate tax administration strengthens government revenue and supports economic and social development. However, the finding differs from Audu and Ishola (2022), who argued that the developmental contribution of corporate taxation may be constrained where tax administration is inefficient and public resources are poorly managed. The present study suggests that despite institutional challenges, Company Income Tax remains an important source of funding for programmes that improve human development in Nigeria.

The findings further revealed that Customs and Excise Duties exhibit a positive and statistically significant relationship with the Human Development Index. This suggests that trade-related tax revenues contribute meaningfully to improvements in human welfare by expanding government revenue available for developmental programmes. Customs duties generate substantial fiscal resources through import taxation, while excise duties provide additional revenue from locally manufactured goods. These revenues strengthen public finances and create opportunities for increased investment in education, healthcare, transportation infrastructure, and other sectors that directly influence human development. This outcome is consistent with the Benefit Theory, which emphasizes that taxes should be translated into tangible public benefits through government expenditure. Revenue generated from customs and excise duties enhances the government's ability to provide social amenities that improve citizens' welfare. The finding is equally supported by the Fiscal Exchange Theory, which argues that taxpayers are more willing to comply with tax obligations when government effectively converts tax revenue into visible public services and developmental projects. The empirical evidence corroborates the findings of Adereti, Adesina and Sanni (2020), who concluded that trade-related taxes strengthen government revenue and support public sector development. Likewise, Olaoye and Ekundayo (2023) reported that customs revenue contributes positively to government expenditure on infrastructure and social welfare. Nevertheless, some studies, including Nwankwo and Anyanwu (2021), contend that excessive dependence on import duties may become less sustainable as economies pursue trade liberalisation and diversify their revenue base. Despite this concern, the present study indicates that Customs and Excise Duties continue to contribute positively to human development within the Nigerian economy.

The ARDL results also established that Petroleum Profit Tax has a positive and statistically significant relationship with the Human Development Index. Given Nigeria's dependence on the petroleum sector as a major source of government revenue, this result is not unexpected. Petroleum Profit Tax provides substantial fiscal resources that enable government financing of developmental projects across education, healthcare, housing, transportation, and other critical sectors. The finding implies that effective collection and prudent utilisation of petroleum tax revenue can significantly improve the living conditions of the population. This finding is consistent with the Ability-to-Pay Theory, since petroleum companies generate substantial profits and therefore possess greater capacity to contribute to national revenue. It also supports the Benefit Theory, which posits that tax revenue should ultimately translate into improved public welfare through the provision of social services and infrastructure. The result agrees with the empirical findings of Saibu and Omojolaibi (2021), who found that petroleum tax revenue contributes significantly to public sector financing and socio-economic development in resource-dependent economies. Similarly, Akinlo and Adejumo (2022) concluded that petroleum-related revenues remain important determinants of public investment in developing countries. However, the finding contrasts with Sala-i-Martin and Subramanian (2019), who argued that heavy dependence on petroleum revenue may not necessarily improve human development where governance challenges, corruption, and inefficient public expenditure weaken the developmental impact of resource revenues. The present study nevertheless indicates that Petroleum Profit Tax maintains a statistically significant positive relationship with human development during the study period.

6. Conclusion

The study concluded that there exists a stable long-run equilibrium relationship between tax structure and the Human Development Index in Nigeria. The ARDL Bounds Cointegration Test confirms that the components of tax structure and human development move together over time, indicating that changes in tax revenue have enduring implications for improvements in human welfare rather than merely short-term effects. This demonstrates that tax structure constitutes a fundamental determinant of long-term human development.

Limitation of the Study

The study was limited by the availability and consistency of secondary time series data for the selected variables within the study period. Although data were obtained from credible sources, variations in reporting formats and periodic revisions of official statistics may have influenced the uniformity of the dataset. In addition, the study focused exclusively on three components of tax structure—Company Income Tax, Customs and Excise Duties, and Petroleum Profit Tax—while other tax categories that may also influence human development were not considered. Furthermore, the findings are based on aggregate national data and may not fully capture regional disparities in human development or the efficiency with which tax revenues are allocated and utilized across different sectors of the Nigerian economy. Despite these limitations, the data employed were adequate and reliable for achieving the objectives of the study and for drawing valid empirical conclusions.

Recommendations

Based on the finding that Company Income Tax has a significant positive relationship with the Human Development Index in Nigeria, the study recommends that the Federal Government should strengthen corporate tax administration by improving tax compliance, expanding the corporate tax base, and reducing tax evasion through enhanced monitoring and the deployment of digital tax administration systems. Government should also ensure that a greater proportion of revenue generated from Company Income Tax is transparently invested in critical sectors such as education, healthcare, and social infrastructure that directly improve human development outcomes.

The study further recommends that the Nigeria Customs Service should intensify efforts to improve the efficiency of customs and excise duty collection through the modernization of customs procedures, automation of border operations, and stricter enforcement against smuggling and revenue leakages. Revenue generated from Customs and Excise Duties should be prudently managed and allocated to developmental projects capable of improving access to quality education, healthcare services, transportation infrastructure, and other public amenities that enhance the well-being of citizens.

In view of the positive relationship between Petroleum Profit Tax and the Human Development Index, the study recommends that government should strengthen transparency and accountability in the administration and utilization of petroleum tax revenues. Appropriate fiscal policies should be implemented to ensure that petroleum tax receipts are consistently directed towards sustainable investments in human capital development, particularly in education, healthcare, environmental sustainability, and basic infrastructure. This will reduce excessive dependence on recurrent expenditure while maximizing the developmental impact of petroleum-generated revenue.

The existence of a stable long-run relationship between tax structure and human development suggests the need for sustained fiscal reforms aimed at strengthening domestic revenue mobilization. The study therefore recommends that government should pursue comprehensive tax policy reforms that broaden the tax base, simplify tax administration, improve voluntary compliance, and eliminate inefficiencies within the tax system. Such reforms will enhance the long-term capacity of government to finance programmes that improve the Human Development Index.

Finally, given the evidence of a stable adjustment mechanism between tax structure and human development, the study recommends that fiscal authorities should adopt medium- and long-term tax planning strategies that ensure consistency in tax policy implementation and prudent public expenditure management. Government should also establish stronger monitoring and evaluation mechanisms to ensure that tax revenues are efficiently utilized for developmental purposes. Improving transparency, reducing corruption, and promoting accountability in the management of public finances will strengthen public confidence in the tax system and enhance the contribution of tax revenue to sustainable human development in Nigeria.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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