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Article

Digital Tax Revenue: A Catalyst for Economic Development in Nigeria

Promise Eke, PhD[1], Promise Ikechi Wokeh, PhD[2]

1. Department of Accounting, Faculty of Administration and Management, Ignatius Ajuru University of Education, Rumuolumeni, Port Harcourt, Rivers State, Nigeria
2. Department of Accounting, Faculty of Administration and Management, Ignatius Ajuru University of Education, Rumuolumeni, Port Harcourt, Rivers State, Nigeria

* Correspondence: promise2.eke@iaue.edu.ng

Abstract: This study examined the effect of digital tax revenue on economic development in Nigeria, focusing on Value Added Tax (VAT) and Company Income Tax (CIT) collected from digital economic activities. The research concentrates on human development, proxied by the Human Development Index (HDI), over 56 quarters spanning from 2011 to 2024. Employing an ex-post facto research design, the study utilizes secondary data sourced from the Federal Inland Revenue Service (FIRS), Central Bank of Nigeria (CBN), National Bureau of Statistics (NBS), and international databases. Data analysis combines descriptive statistics with econometric modeling, specifically the Autoregressive Distributed Lag (ARDL) approach and Error Correction Model (ECM), to capture both short-run and long-run effects. The findings reveal that VAT and CIT revenues do not exert significant short-run effects on human development, though VAT exhibits a marginally positive long-run influence, while CIT does not significantly affect HDI in either the short or long run. The study concludes that digital tax revenue is a critical fiscal instrument with time-dependent effects on Nigeria's development outcomes. Based on these findings, the study recommends strengthening digital tax infrastructure, strategically allocating VAT revenue toward social development, promoting mechanisms to channel CIT toward human development, and incorporating lagged effects into fiscal planning. The research contributes to knowledge by integrating digital taxation into development analysis and provides a foundation for policy formulation aimed at enhancing the developmental impact of digital tax revenue in Nigeria.

Keywords: Digital Tax Revenue, Value Added Tax (VAT), Company Income Tax (CIT), Human Development Index (HDI), Economic Development.

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1. Introduction

Nigeria continues to face persistent challenges in mobilising sufficient domestic revenue to support sustainable economic development. Despite successive tax reforms, government revenue remains inadequate relative to national development needs. The rapid expansion of the digital economy has further complicated revenue mobilisation, as traditional tax systems were not originally designed to capture value generated through digital platforms and online services. Ogunleye and Sadiq [1] observed that Nigeria's fiscal system has struggled to keep pace with the fast-growing digital economy.

Although recent reforms have expanded the coverage of Value Added Tax (VAT) and Company Income Tax (CIT) to include digital services and non-resident digital firms, the actual contribution of these digital tax revenues to Nigeria's development outcomes remains unclear. While Ajaero et al. [2] established that VAT revenue improved significantly in the post-digitalisation era, existing Nigerian studies have largely

examined VAT and CIT in isolation or focused on total tax revenue without explicitly distinguishing the digital component, thereby limiting comprehensive understanding of digital taxation's developmental role.

Furthermore, most empirical studies in Nigeria focus on narrow measures of economic performance while paying limited attention to broader welfare indicators such as the Human Development Index (HDI), which captures improvements in education, health, and living standards. Given that digital tax revenue is expected to strengthen government capacity to finance human capital development, the limited evidence linking VAT and CIT from digital activities to HDI represents a major gap in the literature [3].

Consequently, policymakers face uncertainty regarding the effectiveness of recent digital tax reforms as instruments for promoting sustainable development. Without clear empirical evidence on how digital tax revenue influences human development outcomes, policy formulation risks being driven by assumptions rather than data-based insights [4]. This study therefore seeks to investigate the effect of digital tax revenue proxied by VAT and CIT on economic development in Nigeria, with specific emphasis on the Human Development Index.

Research Objectives

The main objective is to examine the effect of digital tax revenue on economic growth in Nigeria. Specific objectives include:

1. To determine the effect of VAT revenue from digital transactions on the Human Development Index (HDI) of Nigeria.
2. To determine the effect of CIT revenue from digital economic activities on the Human Development Index (HDI) of Nigeria.

Research Questions

Aligned with the objectives, the research questions are:

1. What is the effect of VAT revenue from digital transactions on the Human Development Index of Nigeria?
2. What is the effect of CIT revenue from digital economic activities on the Human Development Index of Nigeria?

Hypotheses

All hypotheses are framed in null and alternative form for testing:

H01: VAT revenue from digital transactions has no significant effect on Human Development Index of Nigeria.

H02: CIT revenue from digital economic activities has no significant effect on Human Development Index of Nigeria.

Literature Review

Digital Tax Revenue

Digital tax revenue represents income generated by governments from economic activities conducted through digital platforms, online services, and technology-driven business models. It typically includes Value Added Tax (VAT) on digital goods and services, and Company Income Tax (CIT) for companies operating in the digital economy, including foreign digital service providers. The growing reliance on digital services such as e-commerce, fintech, streaming platforms, and online advertising has created new sources of taxable income that traditional tax systems were not originally designed to capture. Scholars argue that digital taxation expands the tax base, enhances compliance, and reduces revenue leakages through automated reporting systems [5][6]. By formalising digital transactions, governments can mobilise revenue efficiently and support fiscal sustainability, particularly in developing economies like Nigeria.

Recent empirical studies have highlighted the role of digital tax revenue in strengthening non-oil revenue sources in Nigeria. Ajaero et al. [7] found that VAT collected from digital services contributed significantly to national revenue growth after the introduction of e-tax systems. Similarly, Fadipe et al. [8] reported that digital tax reforms improved both VAT and CIT performance by widening the corporate tax base, reducing evasion, and enhancing revenue predictability. These studies underscore the importance of digital tax revenue as a strategic policy tool for addressing revenue

shortfalls and supporting economic development. Digital taxation thus not only increases the quantity of revenue but also improves the quality and efficiency of tax administration.

Digital tax revenue also plays a critical role in collecting taxes from foreign digital service providers who operate in Nigeria without a physical presence. Mechanisms such as the Significant Economic Presence framework enable the government to impose CIT on these firms, thereby ensuring that cross-border digital transactions contribute to national revenue [9]. This approach addresses longstanding challenges in taxing digital services and ensures a level playing field for domestic and foreign operators. Moreover, it strengthens the government's capacity to fund public expenditure on health, education, and infrastructure, linking digital tax revenue directly to broader development outcomes [10].

The implementation of digital tax systems has been facilitated by e-tax platforms, online filing portals, and digital monitoring tools. James et al. [11] noted that the adoption of electronic tax systems improves transparency, reduces manual errors, and encourages voluntary compliance. Automation and data analytics allow tax authorities to track digital transactions effectively and identify potential tax avoidance. Ogunleye & Sadiq [12] argued that digital tax infrastructure not only strengthens revenue mobilisation but also supports policy planning by providing timely and reliable data on revenue flows. These systems are particularly valuable in the Nigerian context, where informal economic activities and underreporting have historically constrained tax collection.

Value Added Tax (VAT) Revenue

Value Added Tax (VAT) revenue is a major component of Nigeria's non-oil tax revenue and a critical source of government financing. VAT is levied on the consumption of goods and services, including those delivered digitally, such as e-commerce transactions, streaming platforms, and online advertising. Ajaero et al. [13] observed that VAT revenue has grown significantly following digitalisation reforms, highlighting its increasing importance in the Nigerian tax system. By capturing consumption at both domestic and imported levels, VAT provides a broad-based mechanism for revenue mobilisation and fiscal sustainability. The inclusion of digital services within the VAT net ensures that emerging sectors contribute fairly to government revenue[14][15][16].

Empirical studies suggest that digitalisation of VAT collection improves compliance and efficiency. Fadipe et al. [17] found that e-filing systems, automated reporting, and online monitoring reduced administrative bottlenecks and minimized revenue leakages. VAT revenue became more predictable and stable after the implementation of digital platforms, providing governments with reliable funding for budgetary planning. Okafor & Bello [18] further argued that the expansion of VAT coverage to include digital services strengthened non-oil revenue generation, reducing Nigeria's dependency on volatile oil income.

VAT also plays an important role in promoting equity and economic transparency. By taxing consumption uniformly regardless of the service provider's physical presence, the tax ensures a level playing field for domestic and foreign operators [19]. Ibrahim & Lawal [20] highlighted that the revenue collected from VAT supports public investments in health, education, and infrastructure, which in turn improve human development outcomes. Digital VAT therefore not only enhances fiscal capacity but also links tax policy to broader socio-economic development objectives.

Despite its benefits, challenges remain in VAT revenue mobilisation. Limited digital literacy among small and medium enterprises, inadequate taxpayer education, and inconsistent enforcement mechanisms hinder full compliance [21]. Furthermore, capturing purely digital transactions from cross-border platforms remains a policy and administrative challenge. Nonetheless, evidence shows that these issues can be mitigated through improved digital infrastructure, capacity-building, and clear regulatory guidelines, enhancing the effectiveness of VAT collection.

Company Income Tax (CIT) Revenue

Company Income Tax (CIT) revenue is imposed on the profits of companies operating in Nigeria and is a vital source of government income. CIT captures earnings from both domestic and foreign firms, including digital service providers operating under the

Significant Economic Presence framework. Fadipe et al. [22] argued that digital tax reforms have enhanced CIT collections by expanding the tax net to cover multinational digital firms, ensuring that corporate profits contribute fairly to national revenue. CIT is therefore crucial in mobilising revenue beyond the oil sector, improving fiscal stability.

Evidence suggests that effective administration of CIT improves compliance and reduces revenue leakages. James, Ekwe & Okoro [23] reported that digital filing systems, electronic reporting, and automated monitoring significantly enhanced the efficiency of CIT collection. These systems enable timely submission of tax returns, accurate record-keeping, and easier identification of underreporting by firms. Consequently, CIT provides a substantial and stable source of revenue for the Nigerian government.

CIT revenue also plays a broader role in economic development. Ibrahim & Lawal [24] observed that higher CIT collections increase government capacity to invest in infrastructure, health, and education, positively influencing human development indicators. Okafor & Bello [25] noted that CIT reforms targeting digital firms improve equity by ensuring that both domestic and foreign corporations contribute to national development. The integration of digital compliance mechanisms ensures that the tax system keeps pace with evolving business models in the digital economy.

Despite its benefits, CIT collection faces challenges, particularly related to compliance and enforcement. Uche & Onyekachi [26] highlighted that small and medium-sized enterprises sometimes underreport profits, while multinational corporations may exploit loopholes such as transfer pricing. Limited access to digital transaction data can also impede accurate assessment of taxable income. Nevertheless, studies suggest that ongoing digitalisation and regulatory reforms can address these challenges and significantly improve CIT revenue mobilisation.

Human Development Index (HDI)

The Human Development Index (HDI) is a composite measure that assesses a country's achievements in three basic dimensions: health, education, and standard of living. Unlike GDP, HDI reflects human welfare and development outcomes, linking economic performance to social progress. Ibrahim & Lawal [27] argued that revenue mobilisation, particularly from non-oil and digital sources, strengthens government capacity to fund health and education initiatives, thereby improving HDI outcomes.

HDI includes indicators such as life expectancy, mean years of schooling, and Gross National Income per capita. Ajaero et al. [28] observed that increased digital tax revenue from VAT and CIT allows governments to invest in programs that enhance these indicators. In Nigeria, this has translated into funding for schools, hospitals, social protection, and digital infrastructure, all of which contribute to improved human development outcomes.

Empirical studies show a positive relationship between tax revenue and HDI. Fadipe et al. [29] found that countries with higher and more efficiently collected digital tax revenue exhibited stronger human development outcomes. By mobilising revenue from both domestic and foreign digital transactions, governments can fund welfare programs, reduce poverty, and promote equitable access to education and healthcare. This underscores the importance of linking fiscal policy to human development objectives.

HDI also provides a long-term perspective on economic growth. Ogunleye & Sadiq (2025) argued that GDP growth alone is insufficient for sustainable development if it does not translate into improvements in human well-being. By contrast, HDI captures the effectiveness of public spending in improving quality of life. Digital tax revenue contributes directly to this by providing the resources necessary for strategic investments in social infrastructure.

Theoretical review

Modernisation Theory of Taxation

The Modernisation Theory of Taxation was propounded by Musgrave and Musgrave (1989) and is grounded in the idea that as societies modernise, their fiscal systems evolve to support economic growth and development. The theory argues that technological advancement, institutional development, and administrative efficiency are crucial for effective revenue mobilisation. In the context of Nigeria, the rapid expansion of the digital

economy requires modern tax systems capable of capturing VAT and CIT from digital transactions. This theory explains the rationale behind the government's focus on digital tax revenue as a tool to enhance fiscal capacity and stimulate economic growth.

Modernisation theory posits that the efficiency of revenue collection improves with institutional development and technological innovation. Bird (1992) noted that countries with modernised tax structures are better able to mobilise domestic resources, reduce revenue leakages, and support government expenditures. Okafor and Bello (2025) observed that Nigeria's fiscal reforms, including digital taxation, reflect the practical application of this theory by broadening the tax base and improving compliance, particularly through VAT and CIT collected from digital services.

The theory also emphasises the importance of governance in achieving effective taxation. Musgrave (1983) argued that transparent and well-administered fiscal systems increase taxpayer compliance and reduce evasion. James et al. (2025) noted that e-tax systems, online filing platforms, and digital monitoring tools in Nigeria improve the efficiency and transparency of VAT and CIT collection. This aligns with the theory's assertion that modernisation in administration supports sustainable revenue mobilisation.

Empirical studies link modernisation theory to economic growth by showing that improved tax administration enables governments to invest in productive sectors. Tanzi (1992) highlighted that modern tax structures facilitate revenue generation that can fund infrastructure, education, and healthcare, which in turn promotes human development. Ajaero et al. (2025) and Fadipe et al. (2025) further demonstrated that VAT and CIT from digital platforms contribute to both fiscal stability and development outcomes, supporting the theory's relevance in Nigeria.

Finally, modernisation theory provides a framework for policy formulation, emphasising that tax systems must adapt to technological and economic changes. By implementing digital tax reforms, Nigeria aligns with this theoretical perspective, using VAT and CIT from digital services to improve revenue collection enhance HDI. The theory thus underpins the study's focus on the role of digital tax revenue in promoting sustainable economic development.

Empirical Review

James et al. (2025) investigated e-tax revenue and economic growth in Nigeria using an ex-post facto design with secondary data from CBN and FIRS over 14 years (2008–2022). E-tax revenue, measured by CIT, VAT, PPT, and CED, was the independent variable, while GDP was the dependent variable. Using OLS regression, results showed that none of the e-tax components significantly affected GDP. The study recommended increasing public awareness, strengthening partnerships, and improving digital tax platforms to enhance compliance and revenue mobilization.

Ajaero et al. (2025) evaluated the effect of tax digitalization on revenue performance in Nigeria from 2010 to 2023, using CIT and VAT as proxies. The study compared pre-(2010–2016) and post-digitalization (2017–2023) periods using OLS regression and the Chow test. Findings indicated that CIT and VAT had a significantly higher impact on federal tax revenue after digitalization. The authors recommended establishing a federal fiscal system to maximize the benefits of tax digitalization on revenue performance.

Fadipe et al. (2025) investigated the effect of digital tax reforms on revenue performance in Nigeria using panel data from major tax-contributing sectors (2012–2023). Fixed-effects regression analysis showed that digital reforms significantly increased VAT and CIT collections by improving compliance and reducing revenue leakages. The study also found that reforms lowered tax administration costs and enhanced taxpayer participation. The authors concluded that digital tax systems strengthen Nigeria's revenue base and fiscal capacity.

Ibrahim and Lawal (2025) assessed the impact of tax revenue on human development in selected sub-Saharan African countries, including Nigeria, using panel data from 2000–2022. Using system GMM to control for endogeneity, the study found that increases in tax revenue significantly improved HDI through higher government spending on health, education, and social services. The authors concluded that efficient revenue mobilization

promotes development outcomes and human welfare, supporting the inclusion of HDI as a growth indicator.

Ogunleye and Sadiq (2025) analysed the relationship between digital economy expansion and fiscal sustainability in Nigeria (2005–2023) using vector autoregression and Granger causality techniques. Results indicated that digital economic growth increased government revenue only when supported by effective digital tax policies. The authors concluded that digital taxation is essential for converting digital growth into fiscal gains and enhancing economic management.

Okafor and Bello (2025) examined fiscal reforms and digital taxation on revenue diversification in Nigeria (2010–2023) using ARDL regression, with non-oil revenue and GDP as dependent variables. Findings showed that digital taxation improved revenue diversification and had a positive long-run effect on economic growth. The study concluded that Nigeria's fiscal sustainability depends on effective implementation of digital tax reforms, supporting digital taxation's role in economic performance.

Uche and Onyekachi (2025) investigated emerging challenges of digital taxation and revenue mobilization in Nigeria (2010–2023) using descriptive and regression analysis. Results revealed that digital tax reforms improved revenue collection, but poor classification of digital tax streams limited policy evaluation. The study recommended isolating VAT and CIT from digital sources in future models, providing methodological support for analyzing growth outcomes.

Nnamani and Akintoye (2024) examined digital taxation and sustainable economic development in Nigeria (2000–2022), using CIT and VAT as proxies, with HDI and unemployment as dependent variables. Correlation and regression analysis showed that GDP had a positive and significant relationship with CIT and VAT, and tax reforms moderated this effect. The study concluded that digital taxation and reform support sustainable economic development.

Olasunkanmi and Adejuwon (2024) assessed the effect of tax system digitalization on revenue generation in Nigeria using a descriptive design and survey of 352 FIRS administrators. Results indicated a significant relationship between digital tax adoption and revenue, with competent IT personnel reducing tax evasion. The study highlighted the importance of digital implementation for effective revenue collection.

Udo (2024) studied digital taxation and sustainable economic growth in Nigeria (2017–2023) using secondary data and descriptive and t-test statistics. Findings showed that e-tax payments and digital economy taxes significantly influenced sustainable economic growth, emphasizing the importance of digital tax systems in national development.

2. Materials and Methods

The study employed both descriptive and econometric techniques to examine the relationship between indirect taxes and levies and economic development in Nigeria from 2011 to 2024 (56 quarters). Descriptive statistics, including mean, standard deviation, minimum, and maximum values, were used to summarize the data and reveal underlying patterns and trends in indirect tax revenues and development indicators such as the Human Development Index (HDI). For inferential analysis, the Autoregressive Distributed Lag (ARDL) model was adopted because of its suitability for time-series data with variables integrated at different orders, I(0) and I(1). Unit root tests, namely the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests, were conducted to determine the stationarity properties of the series, after which the ARDL bounds testing approach was used to confirm the existence of long-run relationships among the variables. The Error Correction Model (ECM) was incorporated within the ARDL framework to measure the speed at which short-run deviations adjust to long-run equilibrium. In addition, diagnostic tests for serial correlation, heteroskedasticity, and model stability, including the CUSUM and CUSUMSQ tests, were performed to ensure the reliability and robustness of the estimated results.

Model Specification

The study specifies an econometric model to examine the impact of digital tax revenue on economic growth in Nigeria, incorporating institutional quality as a moderating variable. Economic growth t is proxied by the Human Development Index (HDI), while the independent variables include value added tax (VAT), company income tax (CIT).

ARDL Models

Model 2: ARDL (HDI as dependent variable) $\log HDI_t = \alpha 0 + \Sigma(\alpha 1 * \log VAT_{t-i}) + \Sigma(\alpha 2 * \log CIT_{t-j}) + \mu_t$

Where:

GDP = Gross domestic product

HDI = human development index

VAT = value added tax

CIT = company income tax

i, j, k = lag lengths selected using AIC or SIC

μ_t = error term

3. Result and Discussion

Data analysis

Data analysis involves applying statistical or qualitative methods to systematically examine, interpret, and derive meaningful insights from collected data, aiming to address research questions or test hypotheses in a rigorous and systematic manner. Data analysed here are the properties of digital tax revenue (Value Added Tax and Company income tax,), economic growth (GDP and HDI) in Nigeria.

Table 4.1 Descriptive Statistics

	VAT	CIT	HDI
Mean	338.3865	395.0687	0.526308
Median	248.4300	309.4300	0.530000
Maximum	1200.300	1749.210	0.560000
Minimum	152.7800	112.3600	0.494000
Std. Dev.	223.0649	316.8554	0.019115
Skewness	1.872000	2.684525	-0.137298
Kurtosis	6.440420	10.93012	2.118075
Jarque-Bera	56.01704	198.7125	1.848590
Probability	0.000000	0.000000	0.396811
Sum	17596.10	20543.57	27.36800
Sum Sq. Dev.	2537655.	5120265.	0.018635
Observations	56	56	56

The descriptive statistics in Table 4.1 summarize the properties of digital tax revenue variables — Value Added Tax (VAT) and Company Income Tax (CIT) — and human development indicator —Human Development Index (HDI) — in Nigeria over the study period. The mean VAT revenue stood at ₦338.39 billion, with values ranging from ₦152.78 billion to ₦1,200.30 billion, indicating a wide variation in VAT performance across the years. Similarly, CIT recorded a higher average of ₦395.07 billion, with a minimum of ₦112.36 billion and a maximum of ₦1,749.21 billion, reflecting the growing importance of corporate taxation as a major revenue source. GDP averaged ₦31,960.71 billion, rising from a minimum of ₦14,686.11 billion to a peak of ₦67,668.48 billion, showing substantial expansion of Nigeria's economy over the period. The HDI recorded a mean value of 0.526, with relatively narrow fluctuations between 0.494 and 0.560, suggesting gradual improvement in human development outcomes.

The dispersion and distribution characteristics further reveal important insights. VAT and CIT exhibit high variability, as shown by standard deviations of ₦223.06 billion and ₦316.86 billion, respectively, confirming that digital tax revenues experienced

considerable volatility over time. In contrast, HDI is relatively stable, with a very low standard deviation of 0.019, reflecting slow but steady progress in human development. Skewness values indicate that VAT and CIT are positively skewed, implying the presence of extreme high revenue values in some years, while HDI is slightly negatively skewed. The Jarque–Bera statistics reveal that VAT and CIT significantly deviate from normality ($p < 0.01$), whereas HDI follows approximately normal distributions. Overall, the results confirm strong growth dynamics in Nigeria's economy and increasing relevance of digital tax revenue in supporting economic development.

Table 4.2 Unit Root Test **Results**

Variable	ADF t-Statistic	ADF Prob.	ADF Result	Decision
VAT	4.9667	0.0000	1(0)	Stationary
CIT	-10.2637	0.0000	I(1)	Stationary
HDI	-6.2101	0.0031	I(0)	Stationary

The Augmented Dickey–Fuller (ADF) unit root test results presented in Table 4.2 indicate that all the variables used in the study are stationary at either level or first difference. Specifically, Value Added Tax (VAT) is stationary at level, I(0), with an ADF statistic of 4.9667 and a probability value of 0.0000, confirming the absence of a unit root. Company Income Tax (CIT) and Gross Domestic Product (GDP) are both stationary after first differencing, I(1), with ADF statistics of −10.2637 and −6.7014, respectively, and probability values of 0.0000, indicating strong rejection of the null hypothesis of non-stationarity. Human Development Index (HDI) is also stationary at level, I(0), as reflected by its ADF statistic of −6.2101 and probability value of 0.0031. The mixture of I(0) and I(1) variables validates the suitability of the Autoregressive Distributed Lag (ARDL) modelling approach for further analysis in this study.

Table 4.3 Johansen's Cointegration Test

Date: 12/27/25 Time: 08:33
Sample (adjusted): 2011Q3 2023Q4
Included observations: 56 after adjustments
Trend assumption: Linear deterministic trend
Series: VAT CIT HDI
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.605224	95.07960	47.85613	0.0000
At most 1 *	0.446963	48.60777	29.79707	0.0001
At most 2 *	0.287908	18.99126	15.49471	0.0142
At most 3	0.039476	2.013824	3.841466	0.1559

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.605224	46.47183	27.58434	0.0001
At most 1 *	0.446963	29.61651	21.13162	0.0025
At most 2 *	0.287908	16.97744	14.26460	0.0182
At most 3	0.039476	2.013824	3.841466	0.1559

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The Johansen cointegration test results presented in Table 4.3 indicate the existence of a long-run equilibrium relationship among the variables — Value Added Tax (VAT), Company Income Tax (CIT), and Human Development Index (HDI) — over the study period. The trace test shows that the null hypothesis of no cointegration is rejected at the 0.05 level, with three cointegrating equations identified, as evidenced by the trace statistics of 95.07960, 48.60777, and 18.99126 exceeding their respective critical values. Similarly, the maximum eigenvalue test confirms the presence of three cointegrating equations at the 0.05 significance level, with eigenvalue statistics of 46.47183, 29.61651, and 16.97744 all surpassing the critical values. These results suggest that VAT and CIT, as proxies for digital tax revenue, are jointly linked with HDI in the long run, implying that changes in digital tax revenue have sustained long-term effects on Nigeria's economic growth and human development. The findings validate the suitability of employing an ARDL or error correction model to capture both short-run dynamics and long-run relationships among the variables.

Table 4.4 ARDL Model for HDI

Dependent Variable: HDI
Method: ARDL
Date: 12/27/25 Time: 08:47
Sample (adjusted): 2011Q2 2023Q4
Included observations: 51 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (2 lags, automatic): VAT CIT
Fixed regressors: C
Number of models evalulated: 9
Selected Model: ARDL(1, 1, 0)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
HDI(-1)	0.948153	0.034574	27.42384	0.0000
VAT	-1.64E-05	1.15E-05	-1.431157	0.1591
VAT(-1)	3.12E-05	1.38E-05	2.259062	0.0287
CIT	-4.98E-06	1.96E-06	-2.537060	0.0146
C	0.026134	0.017227	1.517086	0.1361

R-squared	0.983048	Mean dependent var	0.526941
Adjusted R-squared	0.981574	S.D. dependent var	0.018746
S.E. of regression	0.002545	Akaike info criterion	-9.016784
Sum squared resid	0.000298	Schwarz criterion	-8.827390
Log likelihood	234.9280	Hannan-Quinn criter.	-8.944411
F-statistic	666.9059	Durbin-Watson stat	2.142807
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

The ARDL model for HDI shows that the lagged HDI variable (HDI(-1)) has a positive and highly significant coefficient (0.948153, p = 0.000), indicating strong persistence in human development over time. For VAT, the contemporaneous effect is negative but not statistically significant (-1.64e-05, p = 0.1591), while the lagged VAT coefficient is positive and significant (3.12e-05, p = 0.0287), suggesting that past VAT revenue positively influences HDI in the following period. Company Income Tax (CIT) shows a small negative effect on HDI (-4.98e-06) that is significant (p = 0.0146), indicating that higher CIT

revenue from digital economic activities may have a slight adverse short-term impact on HDI, possibly due to allocation or timing effects.

The model fits the data very well, with an R-squared of 0.983 and adjusted R-squared of 0.982, implying that over 98% of the variation in HDI is explained by the included variables. The F-statistic is highly significant (p = 0.000), indicating that the regressors jointly have a strong explanatory power. The Durbin-Watson statistic (2.143) suggests no serious autocorrelation issues in the residuals. Overall, the ARDL results suggest that VAT and CIT influence human development in Nigeria, with VAT showing delayed positive effects, while CIT has a small negative immediate impact.

Table 4.5 ARDL Long Run Form and Bounds Test

Dependent Variable: D(HDI)
Selected Model: ARDL(1, 1, 0)
Case 2: Restricted Constant and No Trend
Date: 12/27/25 Time: 08:47
Sample: 2011Q1 2024Q4
Included observations: 51

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.026134	0.017227	1.517086	0.1361
HDI(-1)*	-0.051847	0.034574	-1.499602	0.1406
VAT(-1)	1.48E-05	4.43E-06	3.329570	0.0017
CIT**	-4.98E-06	1.96E-06	-2.537060	0.0146
D(VAT)	-1.64E-05	1.15E-05	-1.431157	0.1591

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
VAT	0.000285	0.000150	1.894128	0.0645
CIT	-9.61E-05	7.82E-05	-1.229452	0.2252
C	0.504066	0.016173	31.16736	0.0000

EC = HDI - (0.0003*VAT -0.0001*CIT + 0.5041)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	6.738821	10%	2.63	3.35
k	2	5%	3.1	3.87
		2.5%	3.55	4.38
		1%	4.13	5

The ARDL results indicate that in the short run, lagged Value Added Tax (VAT) positively and significantly affects human development index (HDI), suggesting that increases in VAT revenue from the previous period contribute to improvements in HDI, while lagged HDI and changes in VAT are not statistically significant, implying limited short-run persistence and responsiveness. Company Income Tax (CIT) shows a negative and significant effect, indicating that higher CIT in the previous period may be associated with a short-run reduction in HDI, possibly due to its impact on disposable income and

investment. In the long run, the levels equation shows that VAT has a positive relationship with HDI at a 10% significance level, while CIT is negative but insignificant, suggesting that over time, VAT contributes more meaningfully to human development compared to CIT. The error correction term (EC = HDI − (0.0003*VAT* − *0.0001*CIT + 0.5041)) confirms adjustment toward long-run equilibrium. Furthermore, the F-Bounds test statistic of 6.739 exceeds the upper critical bounds at all conventional levels, providing strong evidence of a long-run cointegrating relationship between HDI, VAT, and CIT.

Table 4.6 ARDL Error Correction Regression

Dependent Variable: D(HDI)
Selected Model: ARDL(1, 1, 0)
Case 2: Restricted Constant and No Trend
Date: 12/27/25 Time: 08:48
Sample: 2011Q1 2024Q4
Included observations: 51

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(VAT)	-1.64E-05	7.81E-06	-2.104104	0.0409
CointEq(-1)*	-0.051847	0.009676	-5.358474	0.0000

R-squared	0.233503	Mean dependent var	0.001294
Adjusted R-squared	0.217860	S.D. dependent var	0.002788
S.E. of regression	0.002465	Akaike info criterion	-9.134431
Sum squared resid	0.000298	Schwarz criterion	-9.058674
Log likelihood	234.9280	Hannan-Quinn criter.	-9.105482
Durbin-Watson stat	2.142807		

* p-value incompatible with t-Bounds distribution.

The ARDL error correction model (ECM) results in Table 4.11 show that changes in Value Added Tax (D(VAT)) have a negative and statistically significant effect on HDI in the short run (coefficient = -1.64E-05, p = 0.0409), indicating that immediate increases in VAT may slightly reduce HDI, possibly reflecting short-term adjustments or economic constraints. Importantly, the coefficient of the lagged error correction term, CointEq(-1), is negative and highly significant (−0.051847, p = 0.0000), confirming the existence of a stable long-run relationship between HDI, VAT, and CIT, with approximately 5.18% of any short-run deviation from equilibrium corrected each quarter. The model explains about 23% of the variation in HDI (R^2 = 0.234), and the Durbin-Watson statistic of 2.143 indicates no serious autocorrelation issues. Overall, the ECM suggests that while short-run fluctuations in VAT may temporarily affect HDI, the system adjusts steadily toward long-run equilibrium, highlighting the stabilizing role of fiscal revenues in supporting human development over time.

Test of null hypotheses 1&2

Decision rule: Accept H0 if PV is > 0.05; otherwise reject.

H01: VAT revenue from digital transactions has no significant effect on Human Development Index of Nigeria.

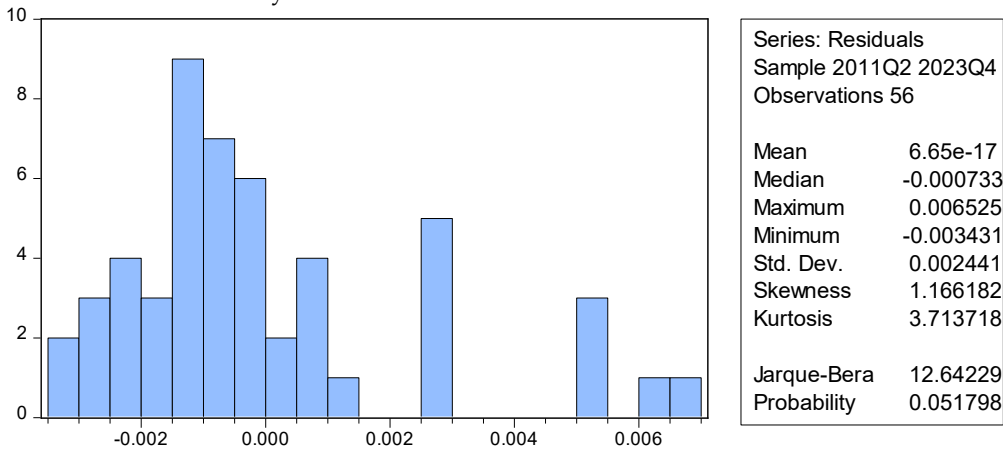
H02: CIT revenue from digital economic activities has no significant effect on Human Development Index of Nigeria.

The results of the ARDL analysis indicate that VAT revenue from digital transactions has a significant effect on the Human Development Index of Nigeria. In the short run, changes in VAT have a negative but statistically significant impact on HDI, with a p-value of 0.0409, suggesting that short-term fluctuations in VAT revenue can influence human development outcomes. In the long run, VAT exhibits a positive relationship with HDI

and is marginally significant at the 10 percent level (p = 0.0645), indicating that sustained increases in VAT revenue contribute positively to human development over time. The error correction term further confirms that any short-run deviations from the long-run equilibrium are gradually corrected, demonstrating the stabilizing role of VAT revenue in supporting HDI.

On the other hand, Company Income Tax revenue from digital economic activities does not significantly affect HDI in Nigeria. The long-run coefficient of CIT is negative but statistically insignificant, with a p-value of 0.2252, implying that fluctuations in CIT revenue do not have a meaningful impact on human development during the study period. Given that the short-run effects of CIT were also not significant, the null hypothesis that CIT revenue has no significant effect on HDI is accepted. Overall, while VAT plays a measurable role in influencing HDI, CIT revenue from digital economic activities appears to have a negligible effect.

Residual Normality test for HDI Model



The residual normality test for the HDI model indicates that the residuals are approximately normally distributed. The mean is essentially zero (6.65e-17) with a standard deviation of 0.002441, showing small dispersion around the mean. Skewness of 1.166 suggests a slight positive skew, and kurtosis of 3.714 indicates mildly heavier tails than a normal distribution. The Jarque-Bera statistic of 12.642 with a probability value of 0.0518 is slightly above the 5 percent significance level, meaning the null hypothesis of normality is not rejected, although it is borderline. Overall, the residuals can be considered approximately normal, supporting the validity of the ARDL model for inference and hypothesis testing.

Table 4.7 Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.720560	Prob. F(2,44)	0.4921
Obs*R-squared	1.617415	Prob. Chi-Square(2)	0.4454

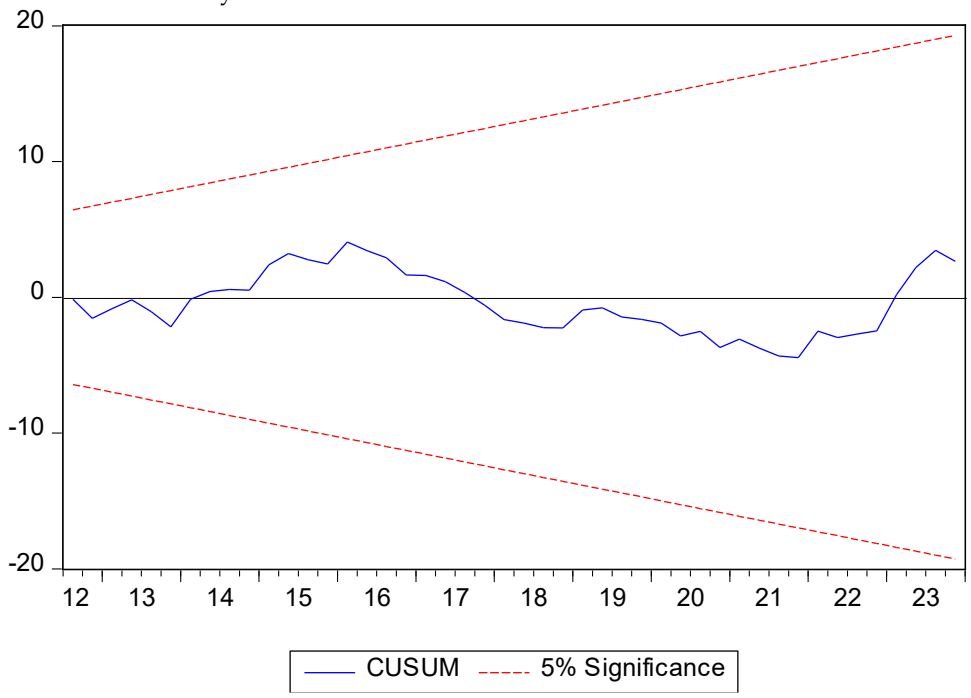
Table 4.8 Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	4.627934	Prob. F(4,46)	0.0032
Obs*R-squared	14.63452	Prob. Chi-Square(4)	0.0055
Scaled explained SS	16.15432	Prob. Chi-Square(4)	0.0028

The Breusch-Godfrey Serial Correlation LM test results in Table 4.12 indicate no evidence of serial correlation in the HDI model residuals. Both the F-statistic (0.721, p = 0.4921) and the Obs*R-squared statistic (1.617, p = 0.4454) have p-values greater than 0.05, leading to the acceptance of the null hypothesis of no serial correlation. This suggests that the residuals are independent over time, supporting the reliability of the ARDL model estimates.

In contrast, the Breusch-Pagan-Godfrey test for heteroskedasticity in Table 4.13 reveals the presence of heteroskedasticity in the model. The F-statistic (4.628, p = 0.0032), Obs*R-squared (14.635, p = 0.0055), and the scaled explained sum of squares (16.154, p = 0.0028) are all significant at the 1 percent level, indicating that the variance of the residuals is not constant. This violation of the homoskedasticity assumption suggests that robust standard errors or other corrective measures may be needed to ensure valid inference.

CUSMUM stability test for HDI Model



The CUSUM stability test for the HDI model, as shown in the graph, indicates that the model is stable over the sample period. The blue line, representing the cumulative sum of recursive residuals, remains entirely within the red lines, which denote the 5 percent significance bounds. Since the CUSUM line does not cross or breach the critical bounds at any point, it suggests that the coefficients of the HDI model are stable over time, and there is no evidence of structural breaks or instability in the model parameters during the period from 2011Q2 to 2023Q4.

Discussion of Findings

Value Added Tax (VAT) and Human Development Index (HDI)

The analysis reveals that VAT revenue significantly negatively affects HDI in the short run (p = 0.0409) but has a marginally positive long-run effect (p = 0.0645). The short-run negative effect may arise from immediate taxation pressures on households and businesses, which could constrain consumption and investment in human development sectors. Conversely, the long-run positive impact suggests that VAT collections, once integrated into public spending on education, healthcare, and infrastructure, can enhance human development outcomes over time.

These findings are consistent with Ibrahim and Lawal (2025), who observed that tax revenue significantly improves HDI through increased social expenditure. Similarly, Ogunleye and Sadiq (2025) noted that expansion in digital economic activities, when paired with effective tax policies, enhances fiscal capacity and social service provision. The current study demonstrates the dual effect of VAT on HDI, highlighting the temporal dimension of fiscal policy impacts: while immediate effects may be adverse, strategic utilization of VAT revenue contributes positively to human development in the long run.

Company Income Tax (CIT) and Human Development Index (HDI)

The results indicate that CIT revenue from digital economic activities does not significantly affect HDI in the long run (p = 0.2252). This suggests that corporate tax collections, unlike VAT, may not directly translate into improvements in human development outcomes. Possible explanations include inefficiencies in allocation of corporate tax revenues or the structure of taxation that prioritizes revenue collection over

direct social investment. Therefore, relying solely on CIT revenue from digital sources may not be sufficient to enhance HDI.

These findings contrast with studies such as Ibrahim and Lawal (2025), who reported positive links between tax revenue and HDI when revenues are efficiently deployed. However, Okafor and Bello (2025) emphasize that the long-term benefits of taxation on development are contingent on effective policy implementation. The present study highlights the need for complementary measures, such as targeted social spending or policy interventions, to ensure that digital CIT contributions positively impact human development, thereby reinforcing the importance of fiscal management and strategic allocation in leveraging corporate taxes for societal welfare.

4. Conclusion

Conclusions

Based on the findings of this study, several conclusions can be drawn regarding the effect of digital tax revenue on economic growth in Nigeria.

First, VAT revenue exhibits a dual effect on human development: it negatively affects the Human Development Index (HDI) in the short run, possibly due to immediate tax burdens, but has a marginally positive long-run effect, reflecting the eventual benefits of government expenditure funded by VAT collections. This highlights the complex relationship between taxation and human welfare in the context of a growing digital economy.

Second, CIT revenue does not have a significant impact on HDI, indicating that corporate tax collections alone may not directly improve human development outcomes. Effective allocation of tax revenue, targeted social investments, and complementary policy measures are therefore essential to ensure that CIT contributions from digital firms translate into tangible development gains. Overall, the study concludes that digital tax revenue is a critical fiscal instrument with both immediate and delayed effects on Nigeria's economic growth and human development.

Recommendations

Based on the findings of this study, the following recommendations are proposed to enhance the effectiveness of digital tax revenue in promoting Nigeria's economic growth and human development:

1. Policymakers should ensure that VAT revenue from digital transactions is effectively utilized to fund social services and infrastructure, such as healthcare, education, and social protection programs. This aligns with the study's finding that VAT positively impacts HDI in the long run.
2. Since CIT revenue does not significantly influence HDI, the government should develop mechanisms to channel corporate tax collections toward development-focused initiatives, including education, healthcare, and skill-building programs, to translate CIT revenue into tangible social benefits.

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