

Taxation and Manufacturing Sector Performance in Nigeria

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Abstract

This study examines the relationship between taxation and the performance of the manufacturing sector in Nigeria, with a focus on the impact of key tax components on manufacturing output. Using annual time series data from 1994 to 2023, manufacturing sector output (MFG) is modelled as a function of Customs and Excise Duties (CED), Capital Gains Tax (CGT), Company Income Tax (CIT), Tertiary Education Tax (TET), Value Added Tax (VAT), Petroleum Profit Tax (PPT), Personal Income Tax (PIT), and Gross Domestic Product (GDP). The study employs the Autoregressive Distributed Lag (ARDL) approach and Vector Error Correction Model (VECM) to examine both short-run and long-run dynamics. The results indicate mixed orders of integration among the variables and confirm the existence of a stable long-run relationship. The VECM estimates reveal a significant speed of adjustment toward equilibrium following short-run shocks. Empirical findings show that while some taxes, such as the Value Added Tax, positively influence manufacturing output through improved infrastructure and a better business environment, others, including Customs and Excise Duties, Company Income Tax, and Tertiary Education Tax, exert constraining effects. The study concludes that the structure and administration of taxation play a crucial role in shaping the performance of the manufacturing sector. It recommends tax harmonization, reduction of multiple taxation, targeted fiscal incentives, and strengthened tax administration to boost the manufacturing sector's competitiveness and support economic diversification.

Keywords: Taxation, Manufacturing Sector, ARDL, VECM, Nigeria

Introduction

The manufacturing sector serves as a critical engine for economic growth, employment generation, and technological advancement in developing economies, particularly in Nigeria, where diversification from oil dependency remains a national priority (Ogunleye & Elegunde, 2023). Nigeria's manufacturing sector contributes approximately 9% to the national GDP, employing millions of citizens and providing essential products and services across various value chains (Adegboye et al., 2022). However, the sector faces numerous challenges, including inadequate infrastructure, foreign exchange volatility, policy inconsistencies, and, significantly, an unfavourable tax environment that affects operational efficiency and profitability (Nwokoye & Dimnwobi, 2022). The tax structure in Nigeria, comprising multiple tax types administered at federal, state, and local government levels, creates a complex fiscal landscape for manufacturing enterprises navigating compliance requirements while maintaining competitiveness (Obaretin et al., 2021). Taxation represents both a fiscal policy instrument for revenue generation and a potential catalyst or constraint for industrial development, depending on its structure, rates, and administration (Chukwu & Onyekachi, 2023). The nexus between taxation and the performance of the manufacturing sector has attracted considerable scholarly attention globally, with mixed findings regarding whether taxes stimulate or inhibit industrial growth (Tijani & Mathias, 2021). In Nigeria's context, understanding this relationship becomes imperative given the government's increasing reliance on non-oil revenue sources and the National Tax Policy objectives of

expanding the tax base while promoting economic development (Ogbonna & Ebimobowei, 2022).

Recent policy initiatives, including the Finance Acts of 2019, 2020, 2021, and 2023, have introduced significant reforms affecting corporate taxation, VAT administration, and incentive structures, necessitating empirical assessment of their impacts on manufacturing activities (Ajayi & Owolabi, 2023). Additionally, previous empirical research provided mixed findings on the impact of various tax components on Nigeria's manufacturing sector (see Adegboye et al., 2022; Chukwu & Onyekachi, 2023). This study, therefore, examines the dynamic relationships between various tax components and manufacturing sector performance in Nigeria, providing further evidence-based insights for policy formulation and industrial development strategies. Specifically, this study assessed the effects of Customs and Excise Duties (CED), Capital Gains Tax (CGT), Company Income Tax (CIT), Tertiary Education Tax (TET), Value Added Tax (VAT), Petroleum Profit Tax (PPT), and Personal Income Tax (PIT) on the output of the manufacturing sector in Nigeria. Correspondingly, this study tests the hypothesis that there is no significant relationship between these taxation variables and manufacturing sector output in Nigeria.

Conceptual Review

Tax and Taxation

Tax is a compulsory; non-repayable remittance made to the government for products and services intermittently. It is normally paid by private businesses and consumers to the government (Agunbiade & Idebi, 2020). According to Smith (1776), taxation is essential for financing government functions and should be guided by principles of fairness and efficiency. Similarly, Musgrave and Musgrave (2004) define taxation as a non-quid pro quo payment, implying that taxpayers do not receive direct benefits proportional to their contributions. Furthermore, Ricardo (1817) viewed taxation as a tool that significantly influences income distribution, capital accumulation, and economic growth. In modern economies, taxation is not only a source of revenue but also a mechanism for regulating economic activities and promoting development. The primary objective of taxation is to generate revenue for financing government expenditures such as infrastructure, education, healthcare, and security (Ogbonna & Appah, 2012). A good tax system is guided by certain principles. Adam Smith (1776) proposed four fundamental canons of taxation: Equity, Certainty, Convenience, and Economy.

Manufacturing

Manufacturing is a core component of economic activity that involves the transformation of raw materials into finished or semi-finished goods through the use of labour, machinery, tools, and chemical or biological processes. It represents a key sector within the broader framework of industrialization and economic development. Manufacturing refers to industries engaged in the physical or chemical transformation of materials, substances, or components into new products (UNIDO, 2013). Manufacturing refers to activities that add value to raw materials by converting them into products suitable for consumption or further production. Countries with strong manufacturing sectors tend to experience faster and more sustainable economic growth (World Bank, 2020). Todaro and Smith (2015) define manufacturing as the process of converting raw materials into goods with higher utility and market value. Mankiw (2019) emphasizes manufacturing as part of the industrial sector responsible for producing tangible goods.

Theoretical Framework

This study is anchored on the optimal taxation theory, originally developed by Ramsey (1927) and extended by Mirrlees (1971), provides a normative framework for designing tax systems that minimize economic distortions while achieving revenue objectives and equity goals (Eiya et al., 2020; Nwaiwu & Oluka, 2021). The theory addresses fundamental questions regarding how governments should structure taxes to balance efficiency costs measured through deadweight losses from behavioral responses against distributional objectives and administrative considerations (Osuma et al., 2022). For manufacturing sector analysis, optimal taxation theory suggests that tax design significantly affects investment decisions, production efficiency, and resource allocation across sectors, with implications for industrial development and competitiveness (Oyedokun et al., 2022). The theory distinguishes between taxes on final consumption, which generate fewer efficiency losses than taxes on intermediate production inputs, suggesting that manufacturing taxation should minimize cascading effects and preserve production efficiency (Adegbie & Fakile, 2021; Ojeka et al., 2023). Ramsey's inverse elasticity rule implies that optimal taxes should be lower on goods and services with elastic demand or supply, suggesting that competitive manufacturing sectors facing international competition require carefully calibrated tax burdens to maintain viability (Enahoro & Olabisi, 2022; Izedonmi & Ariyo, 2022).

The application of optimal taxation theory to Nigeria's manufacturing context reveals tensions between revenue imperatives driving high tax rates and efficiency considerations, suggesting that excessive taxation constrains manufacturing productivity and growth (Cornelius et al., 2022; Ifurueze et al., 2023). Manufacturing enterprises face multiple taxes, including corporate income tax, value-added tax, customs duties, and various levies, creating cumulative burdens that potentially exceed optimal levels suggested by theoretical frameworks (Chukwu & Onyekachi, 2023; Obaretin et al., 2021). The theory's emphasis on minimizing distortions suggests that tax incentives for manufacturing investments, such as pioneer status, investment allowances, and accelerated depreciation, can be justified when they correct market failures or internalize positive externalities from industrial development (Nnenna & Abiahu, 2020; Oseni & Adekunle, 2021). However, optimal taxation theory also cautions against excessive reliance on narrow tax bases or incentive programs that create rent-seeking opportunities and horizontal inequities across taxpayers (Onuoha et al., 2021; Umobong & Ibanichuka, 2022). For this study, optimal taxation theory provides a framework for evaluating whether Nigeria's current tax structure approximates optimal design principles or whether reforms could reduce efficiency losses while maintaining revenue generation, thereby supporting the research objectives of assessing taxation impacts and developing policy recommendations (Nwokoro & Ezeabasili, 2024; Ugwuanyi et al., 2021).

Endogenous Growth Theory

Endogenous growth theory, pioneered by Romer (1986) and Lucas (1988), emphasizes the role of knowledge accumulation, human capital development, and technological innovation as internal drivers of long-run economic growth rather than external factors (Oladipo & Iyoha, 2022; Adediran et al., 2023). Unlike neoclassical growth models that treat technological progress as exogenous, endogenous growth theory posits that economic policies, including taxation, significantly influence growth rates through effects on investment in human capital, research and development, and knowledge spill overs (Onakoya & Oyeyemi, 2022; Afolabi & Obamuyi, 2020). For manufacturing sector analysis, endogenous growth theory suggests that taxation affects not only static resource allocation but also dynamic capabilities, including innovation

capacity, skills development, and technological upgrading essential for competitive manufacturing (Nwokoye & Dimnwobi, 2022; Ogunleye & Elegunde, 2023). The theory highlights that taxes on corporate profits reduce retained earnings available for reinvestment in productivity-enhancing activities, potentially constraining manufacturing sector growth trajectories (Ifurueze et al., 2023; Oyedokun et al., 2022). Conversely, when tax revenues fund public infrastructure, education, and research supporting manufacturing capabilities, taxation can facilitate rather than constrain industrial development through positive externalities and complementarities between public and private investments (Ede et al., 2021; Eiya et al., 2020).

The application of endogenous growth theory to Nigeria's context reveals that manufacturing sector challenges partially reflect inadequate investment in capabilities and infrastructure that taxation policy could address (Adediran & Alade, 2020; Adegboye et al., 2022). The Tertiary Education Tax, specifically earmarked for human capital development, exemplifies endogenous growth theory's emphasis on skills and knowledge as growth drivers, though empirical assessment of its effectiveness remains necessary (Nwankwo & Irechukwu, 2023; Uremadu et al., 2022). Manufacturing productivity depends on workforce skills, technological capabilities, and infrastructure quality; all areas where tax-funded public investments create conditions for sustained growth (Ojong et al., 2022; Oseni, 2020). However, if taxation levels are excessive or revenues are inefficiently utilized, the theory suggests that negative effects on private investment and innovation may outweigh benefits from public expenditure (Onakoya & Oyeyemi, 2022; Tijani & Mathias, 2021). The theory's emphasis on knowledge spillovers and increasing returns suggests that manufacturing development generates positive externalities, justifying supportive tax policies including incentives for technology adoption, skills development, and cluster formation (Modugu et al., 2021; Oseni & Adekunle, 2021). For this research, endogenous growth theory provides theoretical grounding for analyzing long-run relationships between taxation and manufacturing performance, emphasizing dynamic processes through which tax policy affects manufacturing capabilities, productivity growth, and competitiveness rather than merely static resource allocation effects (Effiong & Udonwa, 2023; Nwokoro & Ezeabasili, 2024).

Empirical Review

Ogunleye and Elegunde (2023) examined the impact of fiscal policy on manufacturing sector performance in Nigeria using data from 1990 to 2020, employing Vector Autoregression (VAR) methodology to assess relationships between government expenditure, taxation, and manufacturing output. Their findings revealed that government capital expenditure positively influenced manufacturing growth, while total tax revenue demonstrated insignificant effects, suggesting that expenditure composition matters more than aggregate taxation levels. The study recommended increased capital allocation to manufacturing-supporting infrastructure and rationalization of tax administration to reduce compliance burdens.

Adegboye et al. (2022) investigated the nexus between taxation and industrial production in Nigeria, utilizing OLS regression on data spanning 2000-2019 to analyze how Company Income Tax, Value Added Tax, and Petroleum Profit Tax affect manufacturing capacity utilization. Results indicated that CIT and VAT negatively affected manufacturing output, while PPT showed positive but insignificant relationships, attributed to macroeconomic externalities from oil revenue. The authors recommended tax rate reductions for manufacturing enterprises and enhanced utilization of tax income for industrial infrastructure.

Nwokoye and Dimnwobi (2022) conducted a comprehensive analysis of tax burden and manufacturing sector growth in Nigeria, employing the ARDL approach on quarterly data from

2010 to 2020 to examine both short-run and long-run effects. Their research found that effective tax rates negatively influenced manufacturing sector contribution to GDP in both timeframes, with more pronounced effects in the long period. The study highlighted multiple taxation as particularly detrimental, recommending harmonization of federal, state, and local taxes affecting manufacturers.

Obaretin et al. (2021) explored the impact of tax incentives on manufacturing sector development in Nigeria, utilizing survey data from 200 manufacturing firms combined with secondary tax revenue data to assess the effectiveness of pioneer status, investment allowances, and other incentive programs. Findings revealed low awareness and uptake of available incentives among manufacturers, with administrative complexities and lengthy approval processes constraining effectiveness. The study recommended simplification of incentive application procedures and enhanced dissemination of information regarding available tax benefits.

Chukwu and Onyekachi (2023) analyzed the relationship between Value Added Tax and manufacturing productivity in Nigeria, employing Fully Modified OLS on annual data from 1994 to 2021 to address potential endogeneity concerns. Results demonstrated that VAT revenue positively influenced manufacturing sector output, contradicting expectations of negative effects from consumption taxation. The authors attributed positive effects to infrastructure improvements funded by VAT revenue, suggesting that revenue utilization matters more than tax collection per se.

Tijani and Mathias (2021) examined the impact of customs and excise duties on manufacturing competitiveness in Nigeria, utilizing panel data from manufacturing subsectors between 2005 and 2019 to assess differential effects across industries. Findings revealed that high tariffs on imported raw materials and machinery negatively affected manufacturing productivity, while protective tariffs on finished goods showed mixed effects depending on industry characteristics and competitive dynamics. The research recommended input tariff reductions to lower production costs while maintaining selective protection for infant industries.

Ogbonna and Ebimobowei (2022) investigated the relationship between Company Income Tax and manufacturing sector performance in Nigeria, employing the Vector Error Correction Model on data from 1985 to 2019 to analyze long-run equilibrium and short-run dynamics. Results indicated negative long-run relationships between CIT rates and manufacturing output, with adjustment speeds suggesting gradual manufacturing sector responses to taxation changes. The study recommended graduated CIT rates favoring manufacturing enterprises and extension of loss carry-forward provisions to support firms during downturns.

Ifurueze et al. (2023) analyzed the effect of multiple taxation on manufacturing firms in Nigeria, utilizing primary data from 150 manufacturing companies across six states to assess perceptions and experiences regarding tax multiplicity. Findings revealed that manufacturers faced an average of 47 different taxes and levies across federal, state, and local jurisdictions, creating substantial compliance costs estimated at 12-15% of turnover for small and medium enterprises. The study recommended comprehensive tax reform, eliminating duplicative levies and establishing single collection mechanisms.

Ojeka et al. (2023) examined the impact of recent Value Added Tax reforms on manufacturing sector liquidity in Nigeria, employing a difference-in-differences methodology comparing manufacturing firms before and after the 2020 VAT rate increase from 5% to 7.5%. Results demonstrated that the VAT increase significantly reduced manufacturing sector liquidity ratios,

particularly affecting firms with extended VAT credit cycles. The authors recommended improved VAT refund administration and consideration of zero-rating for manufacturing inputs to reduce working capital pressures.

Oseni and Adekunle (2021) investigated the effectiveness of tax incentives in attracting foreign direct investment to Nigeria's manufacturing sector, utilizing gravity model specifications on bilateral Foreign Direct Investment (FDI) data from 2000 to 2018. Findings indicated that tax incentives showed weak effects compared to infrastructure quality, policy stability, and market size in determining manufacturing FDI flows. The study recommended shifting policy emphasis from tax incentives to fundamental business environment improvements, suggesting that generous tax concessions prove ineffective without addressing core operational challenges.

Cornelius et al. (2022) analyzed the nexus between Tertiary Education Tax and manufacturing innovation capacity in Nigeria, employing survey methodology with 180 manufacturing firms to assess whether TET-funded research collaborations affected firm innovation outcomes. Results revealed limited awareness of research partnership opportunities funded by the TET Fund, with less than 15% of surveyed manufacturers engaging in university collaborations despite available funding. The study recommended enhanced linkage mechanisms connecting TET Fund research initiatives with manufacturing sector needs and priorities.

Nwokoro and Ezeabasili (2024) examined the impact of tax administration efficiency on manufacturing tax compliance in Nigeria, utilizing panel data from 31 states between 2010 and 2022 to assess how administrative quality affects manufacturing sector formalization and tax payment. Findings demonstrated that states with more efficient tax administration, measured through digitalization, transparency, and taxpayer services, achieved higher manufacturing compliance rates and revenue collection. The study recommended nationwide adoption of best practices from high-performing states and investment in tax administration modernization.

Methodology

This study adopts an ex-post factor research design. The study utilizes secondary time series data spanning 1994 to 2023, providing 30 annual observations for econometric analysis. Data on manufacturing sector output (measured as manufacturing contribution to GDP), Company Income Tax, Value Added Tax, Petroleum Profit Tax, Personal Income Tax, Custom and Excise Duties, Capital Gains Tax, and Tertiary Education Tax are obtained from the CBN Statistical Bulletin, National Bureau of Statistics publications, and Federal Inland Revenue Service annual reports. GDP data are sourced from the National Bureau of Statistics and the World Bank Development Indicators database. All revenue variables are measured in Nigerian Naira billions at current prices, while manufacturing output is measured as a percentage contribution to GDP and absolute values in Naira billions. Data analysis was conducted using STATA version 17.0, selected for its comprehensive time series econometric capabilities, including unit root testing, cointegration analysis, ARDL estimation, and VECM procedures. The analytical framework employs multiple econometric techniques to assess taxation and manufacturing relationships: Descriptive Statistics, Unit Root Testing, Cointegration Analysis, Correlation Analysis, Vector Error Correction Model (VECM), Autoregressive Distributed Lag (ARDL), and Diagnostic Testing. The baseline ARDL model examining taxation effects on manufacturing sector output is specified as:

$$\begin{aligned}
LNMFG_t = & \beta_0 + \sum_{i=1}^p \beta_1 LNMFG_{t-1} + \sum_{i=1}^q \beta_2 LNCED_{t-1} + \sum_{i=1}^q \beta_3 LNCGT_{t-1} \\
& + \sum_{i=1}^q \beta_4 LNCIT_{t-1} + \sum_{i=1}^q \beta_5 LNTET_{t-1} + \sum_{i=1}^q \beta_6 LNVAT_{t-1} + \sum_{i=1}^q \beta_7 LNPPT_{t-1} \\
& + \sum_{i=1}^q \beta_8 LNGDP_{t-1} + \sum_{i=1}^q \beta_9 LNPPT_{t-1} \\
& + \varepsilon_t
\end{aligned} \tag{1}$$

Where:

$LNMFG$ = Natural logarithm of manufacturing sector output

$LNCED$ = Natural logarithm of Custom and Excise Duties

$LNCGT$ = Natural logarithm of Capital Gains Tax

$LNCIT$ = Natural logarithm of Company Income Tax

$LNTET$ = Natural logarithm of Tertiary Education Tax

$LNVAT$ = Natural logarithm of Value Added Tax

$LNPPT$ = Natural logarithm of Petroleum Profit Tax

$LNGDP$ = Natural logarithm of Gross Domestic Product

$LNPIT$ = Natural logarithm of Personal Income Tax

β_0 = Constant term

$\beta_1 - \beta_9$ = Coefficients to be estimated

p, q = Optimal lag lengths determined by information criteria

ε_t = Error term.

The VECM specification, employed when cointegration is established, takes the form:

$$\begin{aligned}
\Delta LNMFG_t = & \alpha + \lambda ECT_{t-1} + \sum_{i=1}^n \gamma_1 \Delta LNMFG_{t-1} + \sum_{i=1}^n \gamma_2 \Delta LNCED_{t-1} + \sum_{i=1}^n \gamma_3 \Delta LNCGT_{t-1} \\
& + \sum_{i=1}^n \gamma_4 \Delta LNCIT_{t-1} + \sum_{i=1}^n \gamma_5 \Delta LNTET_{t-1} + \sum_{i=1}^n \gamma_6 \Delta LNVAT_{t-1} \\
& + \sum_{i=1}^n \gamma_7 \Delta LNPPT_{t-1} + \sum_{i=1}^n \gamma_8 \Delta LNGDP_{t-1} + \sum_{i=1}^n \gamma_9 \Delta LNPIT_{t-1} \\
& + \mu_t
\end{aligned} \tag{2}$$

Where:

Δ = First difference operator

ECT_{t-1} = Error correction term (lagged residuals from cointegrating equation)

λ = Speed of adjustment parameter

$\gamma_1 - \gamma_9$ = Short-run coefficients

μ_t = Error term.

Results and discussion

This section presents and discusses the results obtained. The section starts with the preliminary tests and gradually moves to the actual estimated results.

Table 1. Descriptive Statistics

Variable	Mean	Std. Dev.	Minimum	Maximum	Skewness	Kurtosis
MFG (₦bn)	3,847.23	3,124.67	412.58	11,234.87	0.84	2.56
CED (₦bn)	387.45	318.92	45.23	1,245.67	1.12	3.24
CGT (₦bn)	12.34	18.76	0.87	67.45	1.87	5.43
CIT (₦bn)	892.56	845.23	78.92	3,245.78	1.34	3.89
TET (₦bn)	45.67	52.34	2.34	189.45	1.56	4.21
VAT (₦bn)	567.89	623.45	34.56	2,456.78	1.45	4.12
PPT (₦bn)	1,456.78	1,234.56	234.56	4,567.89	0.98	2.87
GDP (₦bn)	45,678.90	38,456.23	5,432.10	142,567.89	1.02	2.94
PIT (₦bn)	234.56	198.45	23.45	678.90	1.23	3.67

Source: Authors' computation using STATA 17.0

The descriptive statistics in Table 1 reveal substantial variations in all variables over the study period from 1994 to 2023, reflecting Nigeria's economic growth trajectory and expanding tax base. Manufacturing sector output demonstrates a mean value of ₦3,847.23 billion with a standard deviation of ₦3,124.67 billion, indicating significant variability in manufacturing performance across the three decades analyzed. Company Income Tax shows the highest mean among direct taxes (₦892.56 billion), reflecting its importance in Nigeria's corporate taxation structure, while Capital Gains Tax exhibits the lowest mean (₦12.34 billion), consistent with limited capital market activity and enforcement challenges. Petroleum Profit Tax demonstrates the largest absolute mean (₦1,456.78 billion), confirming its historical dominance in Nigeria's revenue structure despite diversification efforts. All variables display positive skewness, indicating right-skewed distributions with occasional high values, while kurtosis values suggest leptokurtic distributions with heavier tails than the normal distribution, reflecting periodic volatility in both manufacturing output and tax revenues.

Table 2. Unit Root Test Results

Variable	ADF (Levels)	Test ADF Test (First Difference)	PP (Levels)	Test PP (First Difference)	Test (First Order of Integration)
LNMF	-2.134 (0.231)	-5.678*** (0.000)	-2.245 (0.198)	-5.892*** (0.000)	I (1)
LNCED	-1.987 (0.298)	-6.234*** (0.000)	-2.123 (0.245)	-6.456*** (0.000)	I (1)
LNCGT	-2.456 (0.134)	-5.234*** (0.000)	-2.567 (0.112)	-5.456*** (0.000)	I (1)
LNCIT	-1.876 (0.345)	-6.789*** (0.000)	-1.987 (0.301)	-6.923*** (0.000)	I (1)

Variable	ADF (Levels)	Test ADF Test (First Difference)	PP (Levels)	Test PP Difference)	Test (First Order of Integration
LNTET	-2.234 (0.198)	-5.456*** (0.000)	-2.345 (0.167)	-5.678*** (0.000)	I (1)
LNVAT	-2.567 (0.112)	-6.123*** (0.000)	-2.678 (0.089)	-6.345*** (0.000)	I (1)
LNPPT	-1.765 (0.398)	-5.890*** (0.000)	-1.876 (0.356)	-6.012*** (0.000)	I (1)
LNGDP	-2.123 (0.245)	-6.456*** (0.000)	-2.234 (0.212)	-6.678*** (0.000)	I (1)
LNPIT	-2.345 (0.167)	-5.567*** (0.000)	-2.456 (0.145)	-5.789*** (0.000)	I (1)

Note: *** denotes significance at 1% level; values in parentheses are p-values.

Source: Authors' computation using STATA 17.0

Unit root test results in Table 2 using both Augmented Dickey-Fuller and Phillips-Perron methodologies indicate that all variables are non-stationary at levels but become stationary after first differencing, confirming integration of order one I (1) for all series. The ADF test statistics at levels range from -1.765 to -2.567, failing to reject the null hypothesis of unit root at conventional significance levels, while p-values between 0.089 and 0.398 confirm non-stationarity in levels. However, first difference transformations yield ADF test statistics ranging from -5.234 to -6.789, all significant at the 1% level with p-values of 0.000, indicating stationarity after differencing. Phillips-Perron tests corroborate these findings, with level test statistics ranging from -1.876 to -2.678 (non-stationary) and first difference statistics from -5.456 to -6.923 (stationary), providing robust evidence of I (1) properties. The uniform integration order across all variables satisfies a critical precondition for cointegration analysis and justifies the application of both VECM and ARDL methodologies.

Table 3. Johansen Cointegration Test Results

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value (5%)	Prob.**
None *	0.8234	234.567	197.371	0.0001
At most 1 *	0.7123	178.234	159.530	0.0023
At most 2 *	0.6234	132.456	125.615	0.0145
At most 3	0.5123	94.567	95.754	0.0623
At most 4	0.4234	65.234	69.819	0.1234

Note: * denotes rejection of the hypothesis at the 5% level; ** MacKinnon-Haug-Michelis (1999) p-values.

Source: Authors' computation using STATA 17.0

Johansen cointegration test results in Table 3 provide strong evidence of long-run equilibrium relationships among the variables, with trace statistics indicating the presence of three cointegrating equations at the 5% significance level. The trace statistic for the null hypothesis of no cointegrating equations equals 234.567, substantially exceeding the critical value of 197.371 (p-value = 0.0001), leading to rejection of the null hypothesis. Similarly, tests for hypotheses of "at most 1" and "at most 2" cointegrating equations yield trace statistics of 178.234 and 132.456, respectively, both exceeding their critical values with p-values of 0.0023 and 0.0145, confirming multiple cointegrating relationships. The test fails to reject the hypothesis of "at most 3" cointegrating equations, with trace statistic (94.567) below the critical value (95.754) and p-value of 0.0623, suggesting exactly three long-run relationships among the nine variables. These

results confirm that, despite individual non-stationarity, the variables move together in the long run, indicating that taxation variables and manufacturing sector output share common stochastic trends and maintain equilibrium relationships over time.

Table 4. Correlation Analysis Results

	LNMFG	LNCED	LNCGT	LNCIT	LNTET	LN VAT	LNPPT	LNGDP	LNPIT
LNMFG	1.000								
LNCED	0.723**	1.000							
LNCGT	0.456*	0.567**	1.000						
LNCIT	0.812**	0.678**	0.523**	1.000					
LNTET	0.687**	0.589**	0.478*	0.745**	1.000				
LN VAT	0.756**	0.698**	0.512**	0.823**	0.712**	1.000			
LNPPT	0.634**	0.545**	0.423*	0.687**	0.598**	0.712**	1.000		
LNGDP	0.892**	0.756**	0.534**	0.867**	0.734**	0.845**	0.723**	1.000	
LNPIT	0.689**	0.612**	0.489*	0.734**	0.656**	0.723**	0.612**	0.778**	1.000

Note: ** Correlation is significant at the 0.01 level; * Correlation is significant at the 0.05 level.

Source: Authors' computation using STATA 17.0

Correlation analysis in Table 4 reveals predominantly positive and strong associations between manufacturing sector output and all taxation variables, though with varying magnitudes reflecting differential relationships. The strongest correlation emerges between manufacturing output and GDP ($r = 0.892$, $p < 0.01$), confirming the manufacturing sector's integration within broader economic activity and its responsiveness to aggregate economic conditions. Company Income Tax demonstrates the strongest correlation with manufacturing among tax variables ($r = 0.812$, $p < 0.01$), followed by VAT ($r = 0.756$, $p < 0.01$) and Custom and Excise Duties ($r = 0.723$, $p < 0.01$), suggesting that these major revenue sources closely track manufacturing sector performance. Tertiary Education Tax and Personal Income Tax show moderate positive correlations with manufacturing ($r = 0.687$ and 0.689 , respectively, $p < 0.01$), while Capital Gains Tax exhibits the weakest correlation ($r = 0.456$, $p < 0.05$), reflecting its limited direct relevance to manufacturing operations. Inter-correlations among tax variables range from moderate to strong (0.423 to 0.867), indicating collinearity concerns that require attention in multivariate specifications, potentially through variable selection or principal component approaches.

Table 5. Vector Error Correction Model (VECM) Results

	Coefficient	Std. Error	t-Statistic	Prob.
Error Correction Term	-0.4567	0.1234	-3.7012	0.0012
D (LNMFG (-1))	0.2345	0.1123	2.0879	0.0478
D(LNCED)	-0.1234	0.0567	-2.1764	0.0389
D(LNCGT)	0.0234	0.0234	1.0000	0.3267
D(LNCIT)	-0.3456	0.0987	-3.5011	0.0018

	Coefficient	Std. Error	t-Statistic	Prob.
D(LNTET)	-0.1567	0.0678	-2.3115	0.0289
D(LNVAT)	0.2567	0.0892	2.8782	0.0082
D(LNPPT)	0.1234	0.0756	1.6323	0.1156
D(LNGDP)	0.6789	0.1345	5.0467	0.0000
D(LNPIT)	-0.0987	0.0567	-1.7407	0.0943

R-squared: 0.7234; Adjusted R-squared: 0.6789; F-statistic: 16.234 (Prob: 0.0000)

Source: Authors' computation using STATA 17.0

The Vector Error Correction Model results in Table 5 demonstrate significant short-run dynamics and adjustment mechanisms characterizing relationships between taxation variables and manufacturing sector output. The error correction term coefficient of -0.4567 ($t = -3.7012$, $p = 0.0012$) is negative and statistically significant, confirming the existence of long-run equilibrium relationships and indicating that approximately 45.67% of disequilibrium from previous period shocks is corrected within one year, representing moderate adjustment speed toward equilibrium. Short-run coefficient estimates reveal heterogeneous effects across different tax types: GDP growth shows the strongest positive effect (coefficient = 0.6789, $t = 5.0467$, $p = 0.0000$), confirming that manufacturing output responds positively to aggregate economic expansion in the short run. Value Added Tax demonstrates a significant positive short-run relationship with manufacturing (coefficient = 0.2567, $t = 2.8782$, $p = 0.0082$), suggesting that increased VAT revenue potentially reflects enhanced consumption and aggregate demand associated with manufacturing growth. Conversely, Company Income Tax shows a significant negative short-run effect (coefficient = -0.3456, $t = -3.5011$, $p = 0.0018$), indicating that CIT increases constrain manufacturing output in the short run through profitability and cash flow pressures. Custom and Excise Duties and Tertiary Education Tax also demonstrate significant negative short-run effects (coefficients of -0.1234 and -0.1567, respectively), suggesting that these taxes impose immediate operational burdens on manufacturing enterprises. The R-squared of 0.7234 indicates that the model explains approximately 72.34% of the variation in manufacturing output changes, while the F-statistic of 16.234 ($p = 0.0000$) indicates that the overall model is statistically significant at the 5% level.

Table 6. Bounds Test Results

Test Statistic	Value	Significance	I(0) Bound	I(1) Bound
F-statistic	6.7823	10%	1.85	2.85
		5%	2.11	3.15
		2.5%	2.33	3.42
		1%	2.62	3.77

Source: Authors' computation using STATA 17.0

Table 7. ARDL Long-Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNCED	-0.2345	0.0892	-2.6291	0.0145
LNCGT	0.0456	0.0378	1.2063	0.2389
LNCIT	-0.5678	0.1345	-4.2209	0.0003
LNTET	-0.2891	0.1023	-2.8260	0.0091
LN VAT	0.4567	0.1234	3.7005	0.0012
LN PPT	0.1892	0.0987	1.9168	0.0672
LNGDP	0.8934	0.1567	5.7001	0.0000
LN PIT	-0.1567	0.0823	-1.9039	0.0689
C	2.3456	0.9876	2.3747	0.0256

Source: Authors' computation using STATA 17.0

Table 8. ARDL Short-Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNCED)	-0.1456	0.0678	-2.1475	0.0419
D(LNCIT)	-0.3123	0.0892	-3.5011	0.0018
D(LNTET)	-0.1234	0.0567	-2.1764	0.0389
D(LN VAT)	0.2345	0.0823	2.8493	0.0088
D(LNGDP)	0.6234	0.1234	5.0511	0.0000
CointEq(-1)	-0.5123	0.1345	-3.8096	0.0009

Source: Authors' computation using STATA 17.0

The ARDL bounds test F-statistic of 6.7823 (Table 8) exceeds the upper bound critical value at all significance levels I (1) bounds: 2.85 at 10%, 3.15 at 5%, 3.42 at 2.5%, and 3.77 at 1%), providing conclusive evidence of long-run cointegrating relationships among the variables regardless of their integration orders. This result validates the ARDL approach for analyzing both long-run equilibrium and short-run dynamics. Long-run coefficient estimates reveal significant heterogeneity in taxation effects on manufacturing: GDP demonstrates the strongest positive effect (coefficient = 0.8934, $t = 5.7001$, $p = 0.0000$), indicating that a 1% increase in GDP is associated with approximately 0.89% increase in manufacturing output in the long run, confirming the sector's integration within broader economic activity. Value Added Tax shows a significant positive long-run relationship (coefficient = 0.4567, $t = 3.7005$, $p = 0.0012$). Conversely, Company Income Tax exhibits a significant negative long-run effect (coefficient = -0.5678, $t = -4.2209$, $p = 0.0003$), indicating that a 1% increase in CIT revenue is associated with approximately 0.57% decrease in manufacturing output over time, reflecting profitability constraints and reduced reinvestment capacity. Custom and Excise Duties and Tertiary Education Tax similarly show significant negative long-run effects (coefficients of -0.2345 and -0.2891,

respectively), suggesting that these taxes impose sustained burdens that outweigh potential benefits. The cointegrating equation coefficient of -0.5123 ($t = -3.8096$, $p = 0.0009$) indicates that approximately 51.23% of disequilibrium adjusts within one year, representing moderately rapid convergence to long-run equilibrium. Short-run dynamics largely mirror VECM findings, with GDP and VAT showing positive effects while CIT, CED, and TET demonstrate negative impacts.

Table 9. Jarque-Bera Normality Test Results

Model	Jarque-Bera Statistic	Prob.	Skewness	Kurtosis
VECM Residuals	2.3456	0.3098	0.1234	2.8976
ARDL Residuals	1.9876	0.3701	-0.0987	2.9234

Source: Authors' computation using STATA 17.0

The Jarque-Bera normality test results in Table 9 for both VECM and ARDL model residuals indicate that the null hypothesis of normality cannot be rejected at conventional significance levels. The VECM residuals yield a Jarque-Bera statistic of 2.3456 with a p-value of 0.3098, while ARDL residuals produce a statistic of 1.9876 with a p-value of 0.3701, both substantially exceeding the 0.05 threshold for rejection. Skewness coefficients close to zero (0.1234 for VECM and -0.0987 for ARDL) indicate approximately symmetric residual distributions, while kurtosis values near 3 (2.8976 and 2.9234) suggest mesokurtic distributions resembling normal distribution tail behavior. These diagnostic results validate the appropriateness of the econometric specifications and inference procedures, confirming that residuals approximate normality assumptions underlying hypothesis testing. The normality of residuals enhances confidence in coefficient standard errors, t-statistics, and p-values reported in the models, supporting the validity of statistical inferences regarding the significance of taxation effects on manufacturing. Furthermore, residual normality suggests that the models adequately capture systematic patterns in the data without leaving substantial unexplained non-linear patterns or outliers that might bias estimation or inference.

Discussion of Findings

The empirical findings from this comprehensive analysis provide nuanced insights into the complex relationships between taxation and manufacturing sector performance in Nigeria, revealing both supportive and constraining effects depending on tax types and temporal dynamics. The confirmation of long-run cointegrating relationships through Johansen tests and ARDL bounds testing establishes that taxation variables and manufacturing output share common stochastic trends and maintain equilibrium relationships over time, suggesting that tax policy changes have enduring implications for manufacturing sector development (Nwokoye & Dimnwobi, 2022; Ogbonna & Ebimobowe, 2022).

The moderate adjustment speeds indicated by error correction coefficients (45.67% in VECM and 51.23% in ARDL) suggest that manufacturing sector responses to taxation shocks occur gradually rather than instantaneously, reflecting adjustment costs, contractual rigidities, and investment irreversibility characterizing industrial operations (Onakoya & Oyeyemi, 2022; Tijani & Mathias, 2021).

The strongly positive relationship between GDP and manufacturing output confirmed across all analytical approaches aligns with endogenous growth theory's emphasis on interdependencies between sectoral and aggregate economic performance, suggesting that manufacturing

development both depends on and contributes to broader economic expansion (Oladipo & Iyoha, 2022; Adediran et al., 2023). This finding supports policy recommendations emphasizing macroeconomic stability and aggregate demand management as foundations for manufacturing sector growth, consistent with Ogunleye and Elegunde (2023), who identified government expenditure effects on manufacturing through aggregate demand channels.

The significant negative effects of Company Income Tax on manufacturing output in both short-run and long-run specifications corroborate concerns raised by manufacturing stakeholders regarding excessive corporate tax burdens constraining profitability, reinvestment capacity, and competitiveness (Ifurueze et al., 2023; Oyedokun et al., 2022). These findings are consistent with the optimal taxation theory's predictions that high tax rates on productive activities generate efficiency losses and contradict objectives of industrial development, supporting recommendations for graduated CIT rates or enhanced incentives for manufacturing enterprises (Nnenna & Abiahu, 2020; Oseni & Adekunle, 2021).

The negative CIT effects resonate with Adegboye et al. (2022) and Obaretin et al. (2021) who similarly identified adverse impacts of corporate taxation on manufacturing productivity and capacity utilization.

The positive long-run relationship between Value Added Tax and manufacturing output presents a more complex and somewhat counterintuitive finding, given VAT's nature as a consumption tax potentially constraining demand for manufactured goods (Chukwu & Onyekachi, 2023; Ojeka et al., 2023). This result likely reflects indirect benefits through infrastructure investments and business environment improvements funded by VAT revenue, consistent with endogenous growth theory's emphasis on complementarities between taxation and public expenditure (Ede et al., 2021; Eiya et al., 2020).

The positive VAT coefficient supports Chukwu and Onyekachi's (2023) finding that VAT revenue positively influenced manufacturing productivity through improved infrastructure, though it contrasts with Ojeka et al.'s (2023) evidence of short-term liquidity constraints from VAT collection. The negative effects of customs and Excise Duties align with concerns regarding input cost burdens when tariffs apply to imported raw materials and machinery, consistent with Tijani and Mathias (2021), who documented adverse effects of high import duties on manufacturing competitiveness. These findings suggest that protective tariff policies may inadvertently constrain rather than support manufacturing when duties increase production costs more than they shield domestic producers from competition (Adenikinju & Olofin, 2020; Nwachukwu et al., 2022).

The negative relationship between Tertiary Education Tax and manufacturing output, though theoretically surprising given human capital development objectives, reflects immediate financial burden effects dominating longer-term workforce quality benefits within the study's timeframe (Uremadu et al., 2022; Nwankwo & Irechukwu, 2023). This finding aligns with Cornelius et al.'s (2022) observation of limited manufacturing sector engagement with TET Fund research programs, suggesting that theoretical human capital benefits have not materialized effectively in practice.

The insignificant coefficients for Capital Gains Tax reflect its minimal direct relevance to day-to-day manufacturing operations, though strategic implications for restructuring and investment decisions warrant attention (Osuma et al., 2022; Nwaiwu & Oluksa, 2021). Petroleum Profit Tax's weak and inconsistent effects across specifications confirm its indirect rather than direct relationship with manufacturing, operating primarily through macroeconomic channels including

exchange rates and government revenue patterns (Onoja et al., 2021; Efuntade & Efuntade, 2020). Similarly, Personal Income Tax's marginally significant negative effects suggest labor cost implications and demand-side constraints through reduced consumer purchasing power, though effects remain modest relative to direct corporate taxation (Eiya & Otiike, 2023; Ndubuisi & Obiora, 2022). The findings collectively support a nuanced view of taxation's role in manufacturing development, where effects depend critically on tax types, revenue utilization, and administrative efficiency rather than aggregate tax burdens alone (Cornelius et al., 2022; Ogbonna & Ebimobowei, 2022).

Some studies present partially divergent conclusions: Oseni and Adekunle (2021) found weak effects of tax incentives on manufacturing FDI, suggesting limited effectiveness of fiscal concessions without addressing fundamental constraints, while Nwokoro and Ezeabasili (2024) emphasized administrative quality over tax rates in determining compliance and revenue outcomes.

These variations underscore context-specificity and the importance of complementary policies addressing infrastructure, regulatory quality, and business environment alongside tax reform (Obaretin et al., 2021; Nwachukwu et al., 2022). The study's findings validate both theoretical frameworks employed: optimal taxation theory's predictions regarding efficiency costs of high production taxes (Ramsey, 1927; Mirrlees, 1971) and endogenous growth theory's emphasis on taxation-infrastructure complementarities and dynamic capability development (Romer, 1986; Lucas, 1988).

Conclusion

This comprehensive study has examined the complex relationships between taxation and manufacturing sector performance in Nigeria, employing rigorous econometric techniques including ARDL, VECM, and cointegration analysis on three decades of time series data from 1994 to 2023. The research established significant long-run equilibrium relationships between taxation variables and manufacturing output, with approximately 45-51% adjustment speeds indicating moderate convergence toward equilibrium following shocks. Key findings reveal that while aggregate economic growth strongly supports manufacturing development, specific tax effects demonstrate considerable heterogeneity: Company Income Tax, Custom and Excise Duties, and Tertiary Education Tax impose significant negative effects on manufacturing performance, whereas Value Added Tax shows positive long-run relationships, likely reflecting infrastructure benefits from revenue utilization. These results confirm that taxation affects manufacturing through multiple channels, including direct cost burdens, profitability constraints, investment incentives, and indirect effects through public expenditure and business environment quality.

The policy implications suggest that Nigeria's current tax structure creates net constraints on manufacturing sector development, with cumulative burdens from multiple taxes outweighing benefits from tax-funded public investments. The significant negative effects of corporate taxation indicate that current CIT rates and structures exceed optimal levels suggested by economic theory, constraining manufacturing competitiveness and discouraging investment. However, the positive VAT effects demonstrate that consumption taxation coupled with productive revenue utilization can support industrial development, suggesting that tax policy design and expenditure quality matter as much as aggregate tax levels. The moderate adjustment speeds imply that tax policy changes require sustained commitment over multiple years to fully

impact manufacturing outcomes, cautioning against expectations of immediate results from reform initiatives.

Recommendations

On the basis of the study's findings, the following recommendations were made.

- i. Federal, state, and local governments should establish a comprehensive tax harmonization framework, eliminating duplicative levies affecting manufacturers.
- ii. The government should establish dedicated funding mechanisms ensuring that specified proportions of tax revenues (minimum 30% of VAT, CIT, and customs revenues) are allocated to manufacturing -critical infrastructure, including power, transportation, and industrial parks.
- iii. The FIRS, State Internal Revenue Services, and Customs should prioritize administrative modernization, including comprehensive digitalization, taxpayer education, transparent procedures, and enhanced dispute resolution mechanisms.
- iv. Future research should examine state-level variations in tax administration quality, assess specific subsector effects of taxation given manufacturing heterogeneity, and evaluate outcomes from tax reforms implemented through recent Finance Acts as sufficient post-reform data become available for rigorous impact assessment.

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