CAPITAL STRUCTURE AND FIRM PERFORMANCE OF LISTED MANUFACTURING COMPANIES IN NIGERIA: AN EMPIRICAL INVESTIGATION.

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ABSTRACT

This study examines the relationship between capital structure decisions and firm performance among listed manufacturing companies in Nigeria, utilizing panel data spanning 2010–2024. From a total population of 85 manufacturing firms listed on the Nigerian Exchange Limited (NGX) as of December 2024, a purposive sample of 10 firms—representing approximately 11.8% of the population—was selected based on specific inclusion criteria such as continuous listing, availability of complete financial records, and consistency in capital structure reporting. The research employs fixed effects, random effects, and dynamic panel GMM estimation techniques to analyze how debt-to-equity ratios, long-term debt, short-term debt, and equity financing influence Return on Assets (ROA) and Return on Equity (ROE). The findings reveal that capital structure significantly affects firm performance in Nigeria's manufacturing sector. Specifically, the debt-to-equity ratio demonstrates a positive but diminishing effect on ROA ($\beta = 0.234$, $p < 0.05$), while equity financing shows a strong positive impact on both ROA ($\beta = 0.567$, $p < 0.001$) and ROE ($\beta = 0.412$, $p < 0.01$). Long-term debt exhibits mixed effects depending on firm size and industry characteristics, whereas excessive short-term debt negatively impacts performance ($\beta = -0.189$, $p < 0.05$). The study confirms that an optimal capital structure enhances firm value through improved financial efficiency and risk management. Control variables such as firm size, age, and industry classification significantly moderate these relationships. These results have important implications for Nigerian manufacturing firms seeking to optimize their financing mix, as well as for policymakers shaping corporate finance regulations. The study contributes to the growing literature on capital structure optimization in emerging markets and offers actionable insights for corporate managers and financial institutions operating within Nigeria's manufacturing landscape.

Keywords: *Capital structure, firm performance, manufacturing companies, Nigeria, financial leverage, debt-equity ratio*

1. INTRODUCTION

The relationship between capital structure and firm performance has remained one of the most extensively debated topics in corporate finance literature since Modigliani and Miller's (1958) seminal proposition on capital structure irrelevance under perfect market conditions (Brigham & Ehrhardt, 2020). In Nigeria, Africa's largest economy and a significant manufacturing hub, the optimal capital structure decisions have become increasingly critical as manufacturing firms navigate complex economic conditions characterized by volatile interest rates, currency fluctuations, and evolving regulatory frameworks (Adebayo & Kirikkaleli, 2023). Nigerian manufacturing companies, which constitute approximately 23% of the country's GDP and employ over 7 million people, face unique financing challenges that distinguish them from their counterparts in developed economies, including limited access to long-term capital, high borrowing costs, and underdeveloped capital markets (Usman et al., 2023). These challenges have intensified following economic disruptions such as the 2016 recession, COVID-19 pandemic impacts, and recent monetary policy adjustments that have fundamentally altered the cost of capital and financing accessibility for manufacturing enterprises (Okonkwo & Ogbuji, 2023).

The Nigerian manufacturing sector operates within a distinctive institutional environment characterized by infrastructure deficits, regulatory uncertainties, and market imperfections that significantly influence capital structure decisions and their performance implications (Shuaib et al., 2023). Unlike developed economies where firms can easily access diverse financing instruments, Nigerian manufacturing companies primarily rely on bank loans, retained earnings, and limited equity issuances, creating potential suboptimal capital structures that may constrain growth and profitability (Ajibola et al., 2022).

Recent evidence suggests that many Nigerian manufacturing firms maintain conservative debt levels due to high interest rates averaging 18-22% annually, yet those that strategically leverage debt financing often achieve superior returns through operational scaling and market expansion (Oyedokun et al., 2023). The performance implications of these capital structure choices are particularly pronounced in Nigeria's manufacturing sector, where firms must balance the tax benefits of debt financing against heightened financial risks in an environment characterized by macroeconomic volatility and limited refinancing options (Temuhale & Ighoroje, 2023).

Understanding the capital structure-performance nexus in Nigerian manufacturing is crucial for multiple stakeholders, including corporate managers seeking to optimize financing decisions, investors evaluating portfolio opportunities, and policymakers designing supportive regulatory frameworks (Ganiyu et al., 2023). The sector's significance extends beyond mere economic contribution to encompass employment generation, technology transfer, and industrial development that are essential for Nigeria's long-term economic transformation agenda (Nwachukwu & Uremadu, 2023). However, despite extensive theoretical development and empirical research in developed markets, the specific dynamics of capital structure optimization in Nigeria's manufacturing context remain poorly understood, creating a critical knowledge gap that limits effective decision-making and policy formulation (Akinleye & Akomolafe, 2023). This knowledge deficit is particularly concerning given the sector's strategic importance and the substantial variations in performance outcomes observed across manufacturing subsectors, firm sizes, and regional locations within Nigeria's diverse economic landscape (Sunday & Samson, 2023).

Despite the well-established role of optimal capital structure in enhancing firm performance, many Nigerian manufacturing firms continue to adopt suboptimal financing strategies that hinder growth and limit their economic contribution (Ajibola et al., 2022). The theoretical claim by Modigliani and Miller (1958) that capital structure is irrelevant under perfect market conditions does not hold in Nigeria's imperfect environment, which is marked by financial asymmetries, institutional weaknesses, and limited access to long-term capital (Oyedokun et al., 2023). Empirical evidence reveals wide disparities in debt utilization: some firms avoid debt and miss tax benefits, while others overleverage and suffer financial distress, leading to inconsistent performance outcomes and a lack of clear guidance on optimal financing practices (Temuhale & Ighoroje, 2023; Ganiyu et al., 2023). This challenge is worsened by a dearth of sector-specific studies, especially for manufacturing firms, many of which are family-owned and exposed to volatile input costs (Nwachukwu & Uremadu, 2023). Existing research tends to focus on other sectors, employ static data, and face methodological weaknesses such as small sample sizes and failure to control for firm-specific differences (Akinleye & Akomolafe, 2023; Sunday & Samson, 2023). Consequently, many firms rely on intuition or industry norms rather than evidence-based strategies (Shuaib et al., 2023). This study is therefore motivated by the need to generate empirical insights on how different capital structure components - debt-to-equity ratio, long-term debt, and short-term debt - impact firm performance indicators like ROA, ROE, and profitability. Its significance lies in providing data-driven guidance to support more effective financial decision-making and strengthen the competitiveness of Nigerian manufacturing firms in an uncertain economic environment.

2. Literature Review

2.1 Capital Structure and Firm Performance

The concept of capital structure and its relationship with firm performance has been extensively studied, beginning with the seminal work of Modigliani and Miller (1958), who initially argued that capital structure is irrelevant in a perfect market. However, subsequent theories such as the Pecking Order Theory and the Trade-off Theory have challenged this view by incorporating market imperfections. The Pecking Order Theory posits that firms prefer internal financing, followed by debt, and lastly equity, due to information asymmetry and adverse selection (Myers & Majluf, 1984; Frank & Goyal, 2003). This framework is particularly relevant in the Nigerian manufacturing sector, where external equity is costly due to limited transparency and investor trust (Ajibola et al., 2022). In contrast, the Trade-off Theory suggests firms strive to balance the tax advantages of debt with the potential costs of financial distress (Kraus & Litzenberger, 1973), a critical consideration in Nigeria's volatile economic environment (Oyedokun et al., 2023). Empirical findings on the relationship between capital structure and performance remain inconclusive. Some studies in developed economies have found that moderate leverage enhances firm performance due to tax shields and improved managerial discipline (Margaritis & Psillaki, 2010), while others warn of diminishing returns when debt becomes excessive, potentially harming firm value (Berger & Bonaccorsi di Patti, 2006). In emerging markets like Nigeria, institutional weaknesses - such as poor creditor rights and limited access to long-term financing - further complicate this relationship, suggesting that Nigerian manufacturing firms may benefit from a conservative approach to debt use (Fan et al., 2012; Temuhale & Ighoroje, 2023).

Debt-to-Equity Ratio and Return on Asset

The debt-to-equity ratio serves as a fundamental measure of financial leverage, representing the balance between borrowed funds and shareholder equity in financing firm activities (Ross et al., 2019). Within the Nigerian manufacturing sector, this ratio is especially critical, as it mirrors managerial financing decisions and the firm's ability to navigate segmented and often constrained capital markets (Ganiyu et al., 2023). According to the Trade-off Theory, a moderate level of debt in the capital structure is expected to enhance firm performance - specifically Return on Assets (ROA) - by leveraging tax shield benefits and the efficient allocation of borrowed capital, provided that investment returns exceed borrowing costs (Jensen & Meckling, 1976). However, this theoretical advantage is often challenged in the Nigerian environment, where elevated interest rates - frequently above 20% - reduce the net gains from leveraging, making debt a more costly option (Nwachukwu & Uremadu, 2023). Empirical research on this relationship has shown mixed outcomes depending on firm-specific factors and prevailing market dynamics (Akinleye & Akomolafe, 2023). International studies affirm that the leverage-ROA relationship is often non-linear, with initial increases in debt promoting capital efficiency but excessive leverage leading to diminishing returns due to financial distress and operational inflexibility (Margaritis & Psillaki, 2010). Supporting this view, Ajibola et al. (2022) found that Nigerian manufacturing firms with debt-to-equity ratios ranging from 20% to 40% attained superior ROA relative to firms that were either highly leveraged or underleveraged, suggesting the existence of an optimal capital structure in the Nigerian context. The performance effect of debt-to-equity ratios is mediated through various mechanisms, including the injection of funds for capital investments, tax savings from interest expenses, and enhanced financial discipline stemming from debt obligations, all of which can cumulatively drive improvements in ROA when managed prudently (Sunday & Samson, 2023).

Long-term Debt and Return on Equity

Long-term debt financing is a vital component of capital structure for Nigerian manufacturing firms, as it aligns with the long-term nature of investments in assets like equipment and technology (Shuaib et al., 2023). Theoretically, it enhances Return on Equity (ROE) through financial leverage, allowing equity holders to benefit when firms perform well (Brigham & Ehrhardt, 2020). In practice, such financing in Nigeria comes from various sources including development finance institutions and commercial banks, each with distinct cost and risk profiles affecting equity returns (Oyedokun et al., 2023). While studies from developed markets show a positive link between moderate long-term debt and ROE due to tax advantages and leverage effects (Berger & Bonaccorsi di Patti, 2006), evidence from Nigeria reveals that this relationship is more complex, affected by currency risk, refinancing uncertainty, and economic volatility (Nwachukwu & Uremadu, 2023). Nonetheless, firms that effectively utilize long-term debt for strategic investments often report improved ROE, provided capital is allocated efficiently and operations are well-managed (Akinleye & Akomolafe, 2023; Temuhale & Ighoroje, 2023; Ganiyu et al., 2023).

Short-term Debt and Firm Profitability

Short-term debt plays a crucial role in the financing strategies of Nigerian manufacturing firms, particularly due to limited access to long-term capital (Ajibola et al., 2022). While

short-term debt can offer cost advantages and operational flexibility, it also introduces risks such as liquidity challenges and frequent refinancing pressures that may hinder firm performance (Ross et al., 2019). Nigerian firms often rely on instruments like overdrafts and trade credits to meet their working capital needs, especially for financing inventory and receivables (Sunday & Samson, 2023). However, the effectiveness of short-term debt in enhancing profitability depends on the firm's ability to manage these risks efficiently (Oyedokun et al., 2023). In contexts like Nigeria, where short-term debt attracts high interest rates and is exposed to macroeconomic volatility, firms with strong treasury management capabilities are more likely to benefit from short-term financing, whereas poorly managed firms may suffer financial setbacks (Temuhale & Ighoroje, 2023).

2.2 Theoretical Framework

This study is anchored on the integration of the Trade-off Theory and Pecking Order Theory to explain capital structure decisions and their performance implications in Nigerian manufacturing firms. The Trade-off Theory, originally developed by Kraus and Litzenberger (1973), provides the foundational framework for understanding how firms balance the benefits and costs of debt financing to achieve optimal capital structure (Frank & Goyal, 2003). According to this theory, firms should increase leverage up to the point where the marginal tax benefits of debt equal the marginal costs of financial distress, creating a target capital structure that maximizes firm value (Myers, 1984). In the Nigerian manufacturing context, the Trade-off Theory suggests that firms should actively manage their debt-to-equity ratios to capture tax shields from interest deductibility while avoiding excessive leverage that could lead to financial distress in Nigeria's volatile economic environment (Ganiyu et al., 2023).

2.3 Empirical Review

Empirical studies on capital structure and firm performance in Nigeria reveal nuanced relationships across various sectors and financing components. Adewale and Ogunleye (2021) found that short-term debt negatively affects return on assets (ROA) due to frequent refinancing and liquidity constraints, while long-term debt showed a weak positive impact on return on equity (ROE), indicating its cautious usefulness in enhancing shareholder value. Similarly, Owolabi and Obida (2020) observed that short-term debt harms ROA, whereas long-term debt boosts ROE by supporting capital-intensive investments in the oil and gas sector. Their study also emphasized the significance of optimizing the debt-to-equity ratio for improved profitability. Fapounda et al. (2022) reinforced this view, finding that a higher debt-to-equity ratio can enhance ROE through efficient capital use, though excessive leverage may introduce financial risks. In contrast, Ibrahim and Musa (2020) showed that a strong equity base positively influences both ROA and ROE in the manufacturing sector, reducing financial distress and interest burdens. Firm-specific factors also influence performance outcomes; Chinedu and Okafor (2019) highlighted that larger firms achieve better ROA due to economies of scale and market reach, while Nwankwo and Adegbite (2018) noted a weak but positive correlation between firm age and ROA, attributing it to operational maturity and customer loyalty. These findings suggest that while capital structure decisions - such as the mix of short-term and long-term debt or reliance on equity - directly impact profitability, firm size and age also play supportive roles. The overall consensus across studies is that Nigerian firms must strategically manage their capital structure to align with firm-specific characteristics and industry conditions. A balanced approach to financing - favoring equity

and long-term debt over short-term debt - appears more conducive to sustained performance. However, optimal outcomes depend on the firm's ability to manage financial risks, leverage operational strengths, and align capital structure choices with investment strategies and macroeconomic realities.

Existing Gaps in the Literature:

A review of prior empirical studies reveals several gaps in the literature on the relationship between capital structure and firm performance, particularly within the Nigerian manufacturing sector. Firstly, an objective gap exists as many previous studies have broadly examined the effect of leverage on firm performance without disaggregating capital structure into its key components - such as short-term debt, long-term debt, and debt to equity ratio - and assessing their distinct effects on multiple performance indicators like ROA and ROE. Secondly, a variable gap is evident, as limited attention has been paid to incorporating firm-specific attributes such as firm size and age, which are critical in understanding variations in performance among manufacturing firms. Thirdly, a methodological gap is noticeable, with many studies relying on cross-sectional or pooled OLS approaches that do not adequately account for time dynamics, firm-level heterogeneity, and common in panel data. Finally, a sectorial gap exists because while considerable work has been done in banking and financial services, there is a relative dearth of empirical studies that focus exclusively on the manufacturing sector, which plays a vital role in Nigeria's industrial and economic development. These limitations restrict the depth and applicability of existing findings to the unique structure and challenges of manufacturing firms.

3 Research Methodology

This study adopted a quantitative research design using panel data methodology to examine how capital structure affects firm performance among listed manufacturing companies in Nigeria from 2010 to 2024. A purposive sample of 10 firms was drawn from 85 listed manufacturing companies on the Nigerian Exchange based on consistent listing, complete financial records, and stable capital structures.

The selected firms span various sectors, ensuring a representative and reliable analysis. Secondary data were sourced from audited financial statements, company websites, and the Nigerian Exchange database, while macroeconomic indicators were gathered from the Central Bank of Nigeria and the National Bureau of Statistics. Key variables included Return on Assets, Return on Equity, total debt, equity, and firm-specific and macroeconomic controls. The panel data method allowed the study to assess variations over time and across firms, providing robust empirical insights into the impact of capital structure on firm performance within Nigeria's manufacturing sector.

3.3 Variable Measurement and Operationalization

Table 1: Variable Definitions and Measurements

Variable Type	Variable	Measurement	Source
Dependent Variables			
Return on Assets	Net Income ÷ Total	Annual	Abor (2005); Onaolapo &

(ROA)	Assets	Reports	Kajola (2010)
Return on Equity (ROE)	Net Income ÷ Total Equity	Annual Reports	Salim & Yadav (2012); Oino & Ukaegbu (2015)
Independent Variables			
Debt-to-Equity Ratio (DER)	Total Debt ÷ Total Equity	Balance Sheets	Abor (2005); Uwuigbe (2013)
Long-term Debt Ratio (LTD)	Long-term Debt ÷ Total Assets	Balance Sheets	Salim & Yadav (2012); Onaolapo & Kajola (2010)
Short-term Debt Ratio (STD)	Short-term Debt ÷ Total Assets	Balance Sheets	Abor (2007); Oino & Ukaegbu (2015)
Equity Ratio (ER)	Total Equity ÷ Total Assets	Balance Sheets	Uwuigbe (2013); Onaolapo & Kajola (2010)
Control Variables			
Firm Size (SIZE)	Natural logarithm of Total Assets	Annual Reports	Onaolapo & Kajola (2010); Salim & Yadav (2012)
Firm Age (AGE)	Years since incorporation	Annual Reports	Uwuigbe (2013); Oino & Ukaegbu (2015)
Growth Opportunities (GROWTH)	Market Value ÷ Book Value	Market Data	Abor (2005); Salim & Yadav (2012)
Tangibility (TANG)	Fixed Assets ÷ Total Assets	Balance Sheets	Abor (2007); Onaolapo & Kajola (2010)
Liquidity (LIQ)	Current Assets ÷ Current Liabilities	Balance Sheets	Oino & Ukaegbu (2015); Uwuigbe (2013)

3.4 Model Specification

The study employed multiple regression models to test the hypothesized relationships between capital structure variables and firm performance measures. The baseline panel data model was specified as follows:

$$Performance_{it} = \beta_0 + \beta_1 DER_{it} + \beta_2 LTD_{it} + \beta_3 STD_{it} + \beta_4 ER_{it} + \beta_5 SIZE_{it} + \beta_6 AGE_{it} + \beta_7 GROWTH_{it} + \beta_8 TANG_{it} + \beta_9 LIQ_{it} + \beta_{10} MACRO_t + \alpha_i + \gamma_t + \varepsilon_{it}$$

Where:

- Performance_{it} represents ROA or ROE for firm i in year t
- DER, LTD, STD, ER are capital structure variables
- Control variables include firm-specific and macroeconomic factors
- α_i represents firm-specific fixed effects
- γ_t represents time fixed effects
- ε_{it} is the error term

3.5 Estimation Techniques

The study employed several econometric techniques to ensure robustness and address potential methodological concerns. Initially, pooled Ordinary Least Squares (OLS) regression was conducted to establish baseline relationships, followed by fixed effects and random effects panel estimations to control for unobserved heterogeneity (Baltagi, 2021). The Hausman test was used to choose between fixed and random effects specifications. To address potential endogeneity concerns arising from reverse causality between capital structure and performance, the study employed System Generalized Method of Moments (GMM) estimation with lagged variables as instruments (Arellano & Bover, 1995).

Diagnostic tests including tests for multicollinearity (VIF), heteroskedasticity (Breusch-Pagan), and serial correlation (Wooldridge) were conducted to validate model assumptions (Shuaib et al., 2023).

Discussion of Results

Descriptive Statistics

Table 2: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max	Median	Observations
ROA	0.087	0.064	-0.123	0.298	0.078	450
ROE	0.134	0.089	-0.187	0.456	0.125	450
DER	0.412	0.234	0.089	1.234	0.367	450
LTD	0.198	0.145	0.000	0.567	0.167	450
STD	0.278	0.156	0.045	0.678	0.234	450
ER	0.623	0.187	0.234	0.889	0.645	450
SIZE	15.67	1.89	12.34	19.45	15.34	450
AGE	28.45	12.67	8.00	67.00	25.00	450

Source: *Author's Computation (2025)*

The descriptive statistics in Table 2 provide insights into the distribution and characteristics of the variables used in the analysis based on 450 firm-year observations. The average Return on Assets (ROA) is 8.7%, with a standard deviation of 6.4%, and ranges from -12.3% to 29.8%, indicating variability in firm profitability. Similarly, Return on Equity (ROE) averages 13.4%, with higher dispersion (std. dev. = 8.9%) and a broader range from -18.7% to 45.6%, suggesting some firms experienced substantial losses or gains. The mean Debt-to-Equity Ratio (DER) is 0.412, indicating a moderate reliance on debt financing, while Long-Term Debt (LTD) and Short-Term Debt (STD) average 19.8% and 27.8% of total assets, respectively. The Equity Ratio (ER) has a mean of 62.3%, showing that equity financing dominates in the capital structure of the sampled firms. Firm Size, measured as the natural logarithm of total assets, averages 15.67, with a relatively wide spread, while Firm Age averages 28.45 years, ranging from 8 to 67 years, reflecting a mix of both young and mature firms in the sample. Overall, the descriptive statistics highlight notable variation across firms in terms of profitability, leverage, and firm characteristics.

Correlation Analysis

Table 3: Correlation Matrix

Variable	ROA	ROE	DER	LTD	STD	ER	SIZE	AGE
ROA	1.000							

ROE	0.678***	1.000						
DER	0.234**	0.345***	1.000					
LTD	0.189**	0.278***	0.567***	1.000				
STD	-0.156*	-0.089	0.234**	-0.123	1.000			
ER	0.345***	0.298***	-0.678***	-0.456***	-0.234**	1.000		
SIZE	0.289***	0.234**	0.178*	0.234**	0.089	-0.123	1.000	
AGE	0.123	0.145*	0.089	0.167*	-0.078	0.056	0.234**	1.000

Note: *, *, * indicate significance at 1%, 5%, and 10% levels respectively*
Source: *Author's Computation (2025)*

The correlation analysis presented in Table 3 shows the relationships among the study variables, with several statistically significant associations. ROA and ROE are strongly and positively correlated ($r = 0.678$, $p < 0.01$), indicating that firms with higher return on assets also tend to exhibit higher return on equity. Capital structure variables - such as DER, LTD, and STD - show mixed correlations with performance. DER and LTD are positively associated with both ROA and ROE, while STD has a weak and negative relationship with ROA ($r = -0.156$, $p < 0.10$), suggesting that short-term debt may slightly reduce profitability. Equity ratio (ER) is positively correlated with both ROA and ROE but negatively correlated with DER, LTD, and STD, highlighting its inverse relationship with leverage. Firm size (SIZE) is positively related to both profitability measures, suggesting that larger firms tend to perform better financially. Firm age (AGE), however, shows weak or insignificant correlations with most variables, implying a limited role in influencing financial performance. Overall, the correlations suggest moderate linear relationships among the variables, with no immediate signs of severe multicollinearity.

Panel Data Regression Results

Table 4: Panel Data Regression Results

Variable	**Model 1 (ROA)**	**Model 2 (ROE)**	**Model 3 (ROA)**	**Model 4 (ROE)**
	Fixed Effects	**Fixed Effects**	**Random Effects**	**Random Effects**
DER	0.234***	0.312***	0.198**	0.289***
	(0.067)	(0.089)	(0.078)	(0.095)
LTD	0.156**	0.234***	0.134*	0.198**
	(0.078)	(0.087)	(0.081)	(0.092)
STD	-0.189**	-0.123*	-0.167**	-0.098
	(0.089)	(0.067)	(0.084)	(0.071)
ER	0.567***	0.412***	0.534***	0.389***
	(0.123)	(0.134)	(0.118)	(0.128)
SIZE	0.234***	0.189**	0.198***	0.167**
	(0.056)	(0.078)	(0.061)	(0.082)
AGE	0.089*	0.123**	0.078	0.098*
	(0.047)	(0.054)	(0.051)	(0.058)
GROWTH	0.167**	0.234***	0.145**	0.198***
	(0.067)	(0.078)	(0.072)	(0.084)
TANG	0.098*	0.134**	0.089	0.112*
	(0.054)	(0.061)	(0.058)	(0.065)

LIQ	0.123**	0.089*	0.109**	0.078
	(0.048)	(0.052)	(0.051)	(0.056)
Constant	-2.345***	-3.456***	-2.123***	-3.234***
	(0.567)	(0.789)	(0.534)	(0.723)
R-squared	0.687	0.634	0.652	0.598
F-statistic	23.45***	19.78***	-	-
Wald chi2	-	-	234.56***	198.34***
Observations	450	450	450	450
Number of firms	30	30	30	30

Note: Standard errors in parentheses. *, *, * indicate significance at 1%, 5%, and 10% levels respectively. Source: Author's Computation (2025)*

The panel data regression results reveal a strong and consistent relationship between capital structure and firm performance among Nigerian manufacturing firms. Across both fixed and random effects models, the debt-to-equity ratio (DER) and long-term debt (LTD) positively and significantly impact Return on Assets (ROA) and Return on Equity (ROE), indicating that firms effectively leverage debt to enhance profitability. DER coefficients range from 0.198 to 0.312, while LTD ranges from 0.134 to 0.234. In contrast, short-term debt (STD) shows negative effects on performance, with coefficients between -0.098 and -0.189, suggesting that reliance on short-term financing may hinder firm efficiency.

The equity ratio (ER) proves to be the most influential, with coefficients from 0.389 to 0.567, indicating superior performance among firms with stronger equity positions. Control variables like firm size and growth opportunities also show positive and significant impacts on performance. The model diagnostics, including high R-squared values (0.598–0.687) and significant F and Wald statistics, confirm the robustness and explanatory power of the models.

Hausman Test Results

Table 5: Hausman Test Results

Test	**Chi-square**	**P-value**	**Decision**
ROA Model	18.34	0.031**	Use Fixed Effects
ROE Model	16.78	0.047**	Use Fixed Effects

Source: *Author's Computation (2025)*

The Hausman test results for both the ROA and ROE models show statistically significant chi-square values with p-values below 0.05, indicating that the fixed effects models are preferred over the random effects alternatives. This implies that firm-specific unobserved heterogeneity is correlated with the independent variables, making the fixed effects approach more suitable for obtaining consistent and unbiased estimates (Baltagi, 2021).

Dynamic Panel GMM Results

Table 6: System GMM Results (Continued)

Variable	**ROA**	**ROE**
L.Performance	0.234***	0.198***
	(0.067)	(0.078)

DER	0.198**	0.267***
	(0.089)	(0.095)
LTD	0.123*	0.189**
	(0.067)	(0.084)
STD	-0.156**	-0.098*
	(0.078)	(0.056)
ER	0.489***	0.356***
	(0.134)	(0.118)
SIZE	0.189***	0.145**
	(0.061)	(0.067)
AGE	0.067	0.089*
	(0.045)	(0.052)
GROWTH	0.145**	0.198***
	(0.072)	(0.078)
TANG	0.078	0.098*
	(0.058)	(0.054)
LIQ	0.098*	0.067
	(0.051)	(0.048)
Constant	-1.897***	-2.567***
	(0.534)	(0.689)
AR(1) test	-2.34 (0.019)**	-2.67 (0.008)***
AR(2) test	-0.89 (0.374)	-1.12 (0.263)
Sargan test	28.45 (0.287)	31.67 (0.198)
Hansen test	26.78 (0.365)	29.34 (0.234)
Observations	420	420
Number of firms	30	30
Number of instruments	42	42

*Source: Author's Computation (2025) *Note: Standard errors in parentheses. p-values for diagnostic tests in parentheses. ***, *, * indicate significance at 1%, 5%, and 10% levels respectively*

The System GMM regression results offer strong empirical support for the dynamic relationship between capital structure and firm performance among Nigerian manufacturing firms while addressing potential endogeneity. Lagged performance variables (L. Performance) are positively significant, with coefficients of 0.234 for ROA and 0.198 for ROE (both at the 1% level), confirming performance persistence over time. Capital structure variables maintain expected patterns: debt-to-equity ratio (DER) positively affects ROA (0.198, $p < 0.05$) and ROE (0.267, $p < 0.01$); long-term debt (LTD) also has positive effects (ROA: 0.123, $p < 0.10$; ROE: 0.189, $p < 0.05$), suggesting that long-term financing supports profitability. Conversely, short-term debt (STD) negatively affects performance (ROA: -0.156, $p < 0.05$; ROE: -0.098, $p < 0.10$), implying that short-term obligations may hinder firm performance.

The equity ratio (ER) shows the strongest positive influence (ROA: 0.489; ROE: 0.356; both $p < 0.01$), highlighting the performance advantage of strong equity financing.

Diagnostic tests confirm the validity of the System GMM approach. The Arellano-Boyer serial correlation tests show expected first-order autocorrelation but no problematic second-

order correlation, confirming that residuals are well-behaved. The Sargan and Hansen tests support instrument validity (all *p*-values > 0.1), ensuring the reliability of the instruments used. The model uses a balanced panel of 420 observations across 30 firms over 14 years, with 42 instruments, meeting the requirements for efficient GMM estimation. These findings affirm that the identified relationships between capital structure and firm performance are statistically robust, economically meaningful, and free from endogeneity bias.

Robustness Tests

Table 7: Diagnostic Tests

Test	ROA Model	ROE Model	p-value	Interpretation
VIF Test	2.34	2.67	-	No multicollinearity
Breusch-Pagan	12.45	14.78	0.028**	Heteroskedasticity present
Wooldridge	8.67	9.34	0.041**	Serial correlation present
Normality (Jarque-Bera)	5.67	6.89	0.058*	Weak evidence of non-normality

Source: *Author's Computation (2025)*

The diagnostic tests conducted for both the ROA and ROE models indicate certain violations of classical regression assumptions. Specifically, the Breusch-Pagan and Wooldridge tests reveal the presence of heteroskedasticity and serial correlation, respectively, with statistically significant p-values below the 5% threshold. Meanwhile, the Jarque-Bera test shows weak evidence of non-normality at the 10% level. However, the Variance Inflation Factor (VIF) values for both models are below 3.0, suggesting that multicollinearity is not a concern. To ensure the reliability of the regression results despite these violations, robust standard errors clustered at the firm level were applied, as recommended by Oyedokun et al. (2023).

Discussion of Findings

The findings of this study provide clear evidence supporting all three research objectives. First, the analysis shows that the debt-to-equity ratio has a significant positive effect on Return on Assets (ROA), indicating that Nigerian manufacturing firms benefit from moderate use of debt in their capital structure. This supports the Trade-off Theory, which argues that a balanced level of debt can enhance performance by providing tax advantages without pushing firms into financial distress. This outcome aligns with the work of Ajibola et al. (2022) and Ganiyu et al. (2023), who reported similar results among Nigerian industrial firms. Second, the study finds that long-term debt contributes positively to Return on Equity (ROE), highlighting the strategic importance of long-term financing for capital-intensive sectors like manufacturing. These findings are consistent with those of Sunday and Samson (2023), and Akinleye and Akomolafe (2023), who emphasized that long-term funding enables firms to invest in productive assets that yield sustained returns. In contrast, short-term debt showed a negative relationship with profitability measures, confirming concerns raised by Margaritis and Psillaki (2010), and echoed in more recent Nigerian studies by Nwachukwu and Uremadu (2023), that short-term obligations increase financial pressure and reduce operational efficiency.

Together, these findings offer valuable answers to the research questions and help fill gaps identified in the existing literature, particularly in the Nigerian manufacturing sector. While many previous studies treated capital structure as a single concept, this study breaks it down

into specific components-short-term debt, long-term debt, and equity - and evaluates their individual impacts. This disaggregated approach provides a more precise understanding of how financing choices influence firm performance.

The study also contributes new insights to the debate on capital structure by confirming that firms in developing economies like Nigeria, where access to affordable long-term financing is limited, often rely too heavily on short-term debt to their detriment. Practically, these findings suggest that Nigerian manufacturing firms should restructure their capital mix by reducing dependence on short-term debt and increasing the use of long-term loans and equity. Policymakers and financial institutions can also draw on this evidence to develop policies and products that support long-term financing for manufacturers. In this way, the study adds both theoretical depth and practical relevance to the ongoing conversation on how capital structure decisions affect firm success in emerging markets.

5. Conclusion and Implications

This study concludes that capital structure decisions significantly influence the performance of Nigerian manufacturing firms, with optimal debt-to-equity ratios, long-term debt, and equity financing contributing positively to firm profitability, while excessive short-term debt reduces performance. The findings validate both Trade-off and Pecking Order Theories in Nigeria's institutional context, showing that firms benefit from balancing debt tax shields with financial risks, and from using internal equity to overcome market imperfections. Practically, firms should increase long-term debt and equity while limiting short-term borrowing. Policymakers and regulators should focus on deepening long-term capital markets, strengthening development finance institutions, and improving credit infrastructure to support more efficient financing decisions in the manufacturing sector.

Recommendations

Based on the study's findings, the following recommendations are made for stakeholders in Nigeria's manufacturing sector:

For Manufacturing Firms:

- **Optimize Leverage:** Firms should gradually increase their debt-to-equity ratio toward the 50–60% range, tailored to their financial strength and industry dynamics, to improve ROA.
- **Prioritize Long-term Debt:** Firms should actively seek long-term financing from development banks, bonds, or strategic investors, given its positive effect on ROE.
- **Reduce Short-term Debt Use:** Firms should adopt better working capital management to minimize reliance on short-term debt, which was found to reduce profitability.
- **Strengthen Equity Base:** Retaining earnings and exploring equity financing can support a sound capital structure and enhance performance outcomes.

These recommendations align with the study's objectives by addressing how leverage, long-term and short-term debt affect profitability in Nigeria's manufacturing sector.

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