

**THE MODERATING ROLE OF BOARD SIZE IN THE FINANCIAL LEVERAGE-
PROFITABILITY NEXUS: EVIDENCE FROM LISTED OIL AND GAS FIRMS IN
NIGERIA**

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Abstract

The research investigated how the size of a company's board of directors influences the connection between financial leverage and profitability in listed oil and gas firms in Nigeria. The study included eight out of the nine oil and gas companies that were publicly listed as of December 31, 2024. The data used in the analysis were collected from the audited annual reports and financial statements of these selected firms over a span of thirteen years, from 2012 to 2024. Various regression models were applied, all based on the Ordinary Least Squares (OLS) method. The findings indicate that the ratio of long-term debt to total assets has a statistically significant negative effect on profitability, which was measured using return on assets (ROA). Furthermore, the study found that board size does not significantly influence the relationship between financial leverage and profitability, which suggests that board size functions more as a moderating rather than a direct factor. These results highlight that excessive reliance on debt can harm a company's profitability and emphasize the importance of prudent debt management within Nigeria's oil and gas sector. By focusing on the oil and gas industry in Nigeria, this study contributes to the body of knowledge in this specific context. The research recommends that companies in this sector should work towards enhancing their financial performance through better debt management practices and ongoing monitoring.

Keywords: Financial leverage, board size, long-term debts to total assets, profitability, return on assets

1. Introduction

There is a pressing need to address the ongoing decline in profitability among some oil and gas firms in Nigeria. This situation can be attributed to several factors, including

the level of financial leverage. High debt levels can raise the risk for a company and lower its profitability. According to a report by The Cable on April 4, 2024, at 11:24 AM, the Nigerian oil and gas sector saw a 27.08%

drop in profitability during the second quarter of 2023. Despite higher prices for petroleum products, the net profit of the sector fell by N9.2 billion. The initial drop was linked to the removal of fuel subsidies. However, statistical data show that profitability in the listed oil and gas companies had already been declining even before this subsidy was removed. For example, the audited annual financial reports of Japaul Gold Venture between 2014 and 2021 showed that the company recorded a profit after tax of N40.91 billion in 2019 but incurred significant losses over the following seven years. Similarly, MRS Oil recorded losses for three consecutive years in 2018, 2019, and 2020. Oando also faced losses in 2019 and 2020. This decline in profitability is a matter of serious concern and the focus of this study.

According to data from the National Bureau of Statistics (NBS) for 2023, the Nigerian oil and gas sector contributed about 2.4 trillion naira to the country's Gross Domestic Product (GDP), which is lower than the 3.4 trillion naira recorded in the first quarter of 2023. The NBS report also said that the GDP contribution in the second quarter of 2023 was less than the 3.38 trillion naira recorded in the same quarter of 2022. The NBS noted that the oil and gas sector recorded a real growth rate of -13.43% in the second quarter of 2023, which is a decline of 1.66% compared to the -11.77% in the same quarter of 2022. The sustained decline in profitability has undermined several oil and gas companies' ability to meet their financial obligations, placing them under financial stress. This is because the oil and gas sector

influences other parts of the economy through a multiplier effect.

This study aims to determine whether board size can mitigate the impact of financial leverage on the profitability of Nigerian-listed oil and gas companies. Corporate governance provides an important framework for understanding the role of the board in directing and overseeing firms, with the board of directors bearing fiduciary responsibilities for safeguarding the interests of the firm and its stakeholders (Bello et al., 2021). Within this governance framework, board characteristics such as board size may influence the effectiveness of monitoring, oversight, and strategic decision-making and may consequently affect how firms respond to financial and operational pressures. Research on financial leverage and profitability by Arin, Nyahas, and Ekoja (2025), Sajo and Uthman (2025), Okunev (2022), Nguyen (2020), Musfiqur (2019), Ndubuisi et al. (2019), and Mule and Mukras (2015) mostly focused on the direct relationship between the independent and dependent variables. Studies on oil and gas companies, such as those by Etim, Ubi, and Enang (2022) and Abubakar (2021), also examined the direct relationship between financial leverage and profitability. Therefore, this study examines how board size affects the relationship between financial leverage and profitability among Nigerian-listed oil and gas companies. The oil and gas industry was chosen due to its significance to the Nigerian economy. The Kaduna Petrochemical Company (KPMC) reported on April 23, 2019, that 88% of Nigeria's

foreign exchange earnings and 65% of government revenue came from the oil and gas industry. As a result, developments in this sector have a multiplier effect on other economic sectors.

The relationship between financial leverage and firm profitability remains a key topic in corporate finance due to its significant impact on firm value and strategic financial decisions.

Financial leverage involves a trade-off between the cost of debt and its benefits. The Modigliani-Miller theory suggests that under perfect competition, a firm's capital structure does not affect its value (Franco Modigliani & Merton Miller, 1958). However, when debt-related obligations such as levies are imposed, debt financing can increase firm value through tax benefits (Modigliani & Miller, 1963). This view is complemented by the trade-off proposition, which suggests that firms balance the benefits of debt against the costs of financial distress. This perspective highlights the importance of strategic decisions in capital structure optimization, where companies seek to balance risk and return. Effective capital structure management can enhance a company's financial stability and competitiveness in the market.

Understanding the relationship between financial leverage and profitability can help firms make informed decisions that improve their resilience to market changes. In an evolving economic landscape, the ability to adjust capital allocation priorities can be

essential in maintaining a strong position in each industry. This flexibility extends beyond innovation, allowing for a risk management approach that looks towards the future. Having flexibility in financial structures enables companies to capitalize on new opportunities and mitigate hidden risks, keeping them competitive in a dynamic market. By taking a proactive stance, organizations can not only deal with immediate issues but also prepare for future trends that may affect their operations. As a result, companies that focus on strategic foresight are better prepared to succeed in an unpredictable economic environment. This foresight helps organizations respond quickly to changing demands, leading to continuous growth and adaptability. In an environment where competition is intense, this kind of anticipation can be a valuable asset for companies to face challenges confidently. Organizations can foster a culture of innovation and adaptability and make decisions based on insights gained from their strategic planning. This helps ensure that they remain competitive and sustainable in a constantly changing world. Through collaboration and transparency, they can involve all stakeholders in the strategic process, thereby improving the organization's ability to predict future trends.

Profitability is a key indicator of a company's ability to compete effectively, manage its operations efficiently, and make optimal use of its resources (Alshehadeh, Elrefae & Aljawarneh, 2024). Profit is essential for all types of businesses, whether they provide services or sell products. A company

typically shares profits with its shareholders when it has enough earnings to distribute (Kartikasari & Merianti, 2016). Profit demonstrates a company's capacity to increase its capital, manage risks, and return value to investors, which is the result of its strategic policies and decisions (Nguyen, 2020). Maximizing profit can also help increase the overall value of a business. A company's profitability is determined by comparing its profits with its expenses. Ranjiktar (2009) emphasizes the importance of profit for an organization's growth and development, as it facilitates the achievement of organizational goals.

Profitability refers to the ability of an investment to generate a return from its use (Amirthalingam, 2013). According to Musfiqur (2019), both equity and debt holders are concerned with a company's profitability, particularly regarding financial leverage. Equity holders receive the remaining profits after debt obligations are met, while debt holders are entitled to fixed interest payments and repayment of the principal. Financing decisions are a crucial part of a company's decision-making process, helping financial directors determine when to acquire funds and how to meet investment needs (Zhao & Wijewardana, 2012).

For a business to remain competitive, it often needs significant investment in infrastructure, advanced technologies, product development, and innovation. Companies may also require long-term funding to acquire fixed assets that require substantial investment. The sources of such long-term funding can be categorized

into two types: capital from owners (equity) and funds borrowed from external sources (debt); these make up the capital structure. A firm can grow by expanding its operations, increasing the number of subsidiaries, or diversifying into different lines of business (Abdulkarim, 2017). Ifeanyi (2017) states that firms' capital structures can take various forms, but the primary sources of financing are debt and/or equity, or a combination of both. The use of debt finance, known as financial leverage, has been a topic of debate regarding the optimal capital structure for several decades (Ndubuisi, Ifechi, & Juliet, 2019).

Murikwa (2015) notes that leverage refers to the use of debt and equity to fund a company's operations. An unlevered company relies solely on owner's equity, whereas a levered company uses a mix of debt and equity. Although leverage might reduce returns to equity holders, it could also result in smaller losses if the investment fails, since the company must still repay the loan's principal and interest. There are several financial ratios used to measure leverage, including the debt-to-total assets ratio, debt-to-total equity ratio, and the asset-to-equity ratio, among others.

The debt-to-equity ratio is a financial leverage metric that indicates how much debt a company uses relative to shareholders' equity. The debt-to-total assets ratio, on the other hand, indicates the proportion of debt in relation to the company's total assets. Lower ratios are preferred by creditors, as they signal a stronger financial position and

reduced risk of loss in the event of asset liquidation. This may encourage creditors to provide more debt to firms in order to expand operations and increase profitability.

Several theoretical foundations support the use of leverage in financing business investments. The first is the pecking order theory proposed by Majluf and Mayers (1984), which suggests that companies prefer external financing options over equity financing. The pecking order theory is based on the costs associated with different financing types and their availability (Mule & Mukras, 2015). The Modigliani and Miller proposition (1958) states that in a perfect market, a company's value is not influenced by its capital structure, whether it uses debt or equity. According to Modigliani and Miller, using debt can provide tax benefits that increase firm value. The trade-off theory, however, argues that firms should conduct a cost-benefit analysis to determine the optimal capital structure that maximizes profits. The trade-off theory also explains that a firm's decision to use debt is based on the balance between the benefits of borrowing, such as tax shields, and the costs, such as financial risk (Nyamita, 2014).

When making financial decisions, the size of the board of directors plays a significant role in influencing the firm's financial strategies. A larger board may offer more diverse perspectives and expertise, potentially leading to better decision-making. However, it may also complicate the decision-making process and slow it down. Conversely, a smaller board may enable quicker decisions

but might lack the necessary expertise and viewpoints. Therefore, firms aim to maintain an optimal board size that suits their specific needs and situation. Empirically, studies have reported divergent findings on the impact of financial leverage on firm performance. While some scholars validate a positive relationship, attributing it to improved managerial discipline and tax efficiency, others find a negative or insignificant association due to increased financial risk and agency costs (Michael Jensen, 1986). These inconsistencies are particularly pronounced in emerging economies, where institutional weakness, market inefficiencies, and non-supervisory challenges may alter the anticipated issues in leverage decisions.

This study was conducted to determine the moderating effect of board size on the relationship between financial leverage and profitability of listed oil and gas firms in Nigeria. The choice of the oil and gas sector is due to its enormous contribution to the economic growth of the nation. For case, according to the KPMC report of 23 April 2019, the oil and gas sector contributes about 65 of government revenue and 88 of Nigeria's foreign exchange earnings.

In Nigeria, the oil and gas sector provides a compelling environment for examining this relationship. As a cornerstone of the national economy, the industry is highly capital-intensive and exposed to significant external shocks, including fluctuations in global oil prices and exchange rate volatility. Firms in this sector often rely on substantial debt financing to fund exploration and production

activities. However, the effectiveness of such financing strategies in enhancing profitability remains uncertain, with previous studies on Nigerian firms yielding mixed results. This suggests that the leverage–profitability relationship may be contingent upon firm-specific and governance-related factors.

To achieve the goals of the study, the following hypotheses were formulated.

H01: The return on assets of Nigerian listed oil and gas companies is not significantly impacted by the ratio of long-term debt to total assets.

H02: The impact of the long-term debt to total assets ratio on the return on assets of Nigerian listed oil and gas companies is not significantly influenced by board size.

2. Literature Review

This section discussed some concepts as well as a review of some related literature to this study.

2.1 Conceptual Review

2.1.1 Concept of Profitability

By gaining a market share that guarantees operational efficacy and efficiency, organizations aim to assure their longevity (Alshehadeh et al., 2024). According to Alshehadeh (2021), a key goal in this endeavor is profitability, which is said to be the cornerstone that businesses aim to improve their financial condition, solidify customer trust, strengthen their competitive position, and attract new investors. Company profitability is defined by Amponsah-Kwatiah & Asiamah (2020) as

the capacity to enhance operational and investment strategies and decision-making in order to attain financial stability. Without a doubt, if a business doesn't make money, it can only survive for a limited time.

According to Fareed, Ali, and Shahzad (2016), a company's capacity to turn a profit is crucial to its continued existence. It is a well-known fact that in order for a firm to endure, it must achieve significant profitability, which will guarantee its seamless operation and return on investment. Rodney and Jin Xi (2018) state that although the relative importance of profitability varies across stakeholder viewpoints, it remains a primary priority for financial managers. While creditors prioritize the company's capacity to pay its debts on schedule, shareholders often view profitability as a crucial measure of business performance. As a result, every stakeholder has a stake in the operational profitability of the company.

2.1.2 Measurement of Profitability

Return on Assets (ROA): The return on assets, as discussed by Umar, Ibrahim & Chizoman (2022), is a way to measure how well a company turns its assets into profits. It compares the company's net profit or earnings to its total assets. According to Bansal (2014), as cited in Arhinful & Redmehr (2023), ROA helps shareholders understand how efficiently a business uses its assets to generate new capital. Therefore, it is a key indicator for any business to evaluate its performance and identify areas for improvement. ROA is calculated by dividing the company's net income by its

total assets. Additionally, it serves as a tool for assessing internal performance and identifying where investment may need to be adjusted.

Return on Equity (ROE): This is a measure of how profitable a company is in relation to the equity, or shareholders' investment, that has been provided (Kurfi, 2006). Umar et al. (2022) note that return on investment is often regarded as the most suitable measure of profitability in accounting, and it is generally the preferred metric for investors to gauge a company's profitability. According to Wahjudi (2019), ROE is a way to determine the return earned on a company's shareholders' investment. It reflects how effectively the funds provided by the shareholders are being used. Furthermore, ROE indicates how much profit is generated for every unit of shareholders' funds. A low ROE suggests that the company is not making efficient use of the shareholders' funds, as noted by Arhinful & Redmehr (2023). Conversely, a higher ROE shows that the company is effectively turning investments into profit. ROA can be calculated by dividing the net profit after tax (NPAT) by the shareholders' equity.

2.1.3 Concept of Financial Leverage

Financial leverage has a direct impact on a firm's business and financial risk (Hassan, Kadir, & Ola, 2022). James & Horne (2017) describe leverage as the use of fixed costs in an attempt to increase profitability. This means that leverage involves the use of an asset or source of funds that comes with a

fixed cost or return. According to Abubakar (2015), financial leverage refers to the extent to which a firm use both equity and debt to finance its assets. Pandey (2008) defines financial leverage as the presence of debt in a firm's capital structure. Olang (2015) also notes that financial leverage is about the proportion of debt in a company's capital structure. This means financial leverage reflects the proportion of a firm's capital that comes from debt, which Shuaibu (2016) describes as the combination of debt and equity used by a company to fund its operations.

Businesses use financial leverage in an effort to generate returns on fixed-charge capital that are higher than the associated expenses (Enekwe, 2014). Financial leverage is the fixed financial cost a company incurs, which is mainly due to the use of debt in its capital structure. Adenugba, Ige, and Kesinro (2016) note that such leverage entails an obligation to pay a fixed interest. Financial leverage can be measured using several ratios.

Debt-to-Equity

The debt-to-equity ratio measures the extent to which a business relies on borrowed funds, and it is calculated by dividing the company's total debt by its owners' equity (Kurfi, 2006). A lower ratio indicates that the company is primarily funded by shareholders, which provides a larger financial cushion in case of asset depreciation or losses. Creditors tend to prefer a lower ratio. As a measure of financial leverage, the debt-to-equity ratio

(D/E) shows the relationship between the amount of debt and financial liabilities and the shareholders' equity that has been invested in the company (Ofulue, 2022). Arhinful & Radmehr (2023) state that a high debt-to-equity ratio indicates a more vulnerable business.

Long-term Debt to Total Assets

Shikumo, Olouch, and Matanda (2020) define long-term debt as the portion of debt that is due to lenders for more than one accounting year. This type of debt usually comes with strict contractual agreements between the company and the lenders, which are often linked to higher agency and financial distress costs (Tailab, 2020). The long-term debt to total assets ratio assesses how much of a company's operations are financed through long-term debt. It also highlights the company's ability to support long-term projects. This ratio is computed by dividing the total long-term debt of a firm by its total assets.

$$\text{Long-term debt to total assets ratio} = \frac{\text{Total long term debt}}{\text{Total assets}}$$

Onyenwe & Glory (2017). Iqbal & Usman (2015), Abubakar (2015) and Gweyi & Kwaranja (2014) used the debt-to-equity ratio in their studies.

2.1.4 Concept of Board Size

The board of directors is composed of individuals who serve on behalf of the shareholders and other stakeholders of a company to perform specific duties. It is considered a vital mechanism in corporate

structures and has a broad range of responsibilities, which include overseeing the company's operations, offering guidance to senior management, and making strategic decisions that can influence the company's financial performance, value, and sustainability (Badru, Davies, & Abdulkadir, 2020).

According to Jensen & Meckling (1976), the number of directors on the board determines the size of the board. Vaidya (2019) states that corporate governance involves the operation of the board of directors, its structure, style, processes, relationships, roles, activities, and more. Thus, the board of directors is a central component of board dynamics and internal control systems that supervise the firm's operations and help reduce agency costs (Abdullah et al., 2018). According to Jensen & Meckling (1976), board size is determined by the number of directors. The board structure must be in line with the functions it is assigned, which include supervision and monitoring, preventing opportunistic behavior from management, and providing advice to decision-makers to support the company's progress (Vaidya, 2019). In the current study, return on assets (ROA) was used as the dependent variable, while the ratio of long-term debt to total assets served as the independent vari

2.1.5 Variables for the study

This study measures profitability by using return on assets (ROA), to serve as the dependent variable, while the ratio of long-term debt to total assets represents the

independent variable. Board size was introduced to moderate the relationship between the dependent and independent variables.

Dependent variable (ROA)

The ROA measures the efficiency of oil and gas firms in using their assets to generate profit. It is computed by dividing a firm's income after tax by its total assets (Kurfi, 2006).

$$ROA = \frac{\text{Profit after tax}}{\text{Total assets}}$$

Sari and Fhitri (2026), Effendi and Surjah (2024), Sajo and Uthman (2025), Okeke (2023), Etim and Nseabasi (2023), Abubakar (2021), as well as Alosaibat (2020) all used ROA in their studies as measure of profitability.

Independent Variable (Ratio of Long-term Debt to Total Assets)

This variable measures the extent to which listed oil and gas firms use long-term debt to finance their total assets. This is computed by dividing total long-term debts by total assets.

$$\text{Ratio of long-term debt to total assets} = \frac{\text{Total long-term debts}}{\text{Total assets}}$$

This ratio was used in the studies by Monday and Dopemu (2024), Onyenwe & Glory (2017), Iqbal & Usman (2015), Abubakar (2015), and Gweyi & Kwaranja (2014).

Moderating Variable (Board Size)

Board size, which serves as a moderating variable, is represented by the total number of directors on a firm's board. The board size was incorporated as the moderating variable.

2.2 Empirical Review

In a recent study, Sari and Fhitri (2026) explored the determinants of ROA. They used data from 19 Indonesian retail companies between 2022 and 2024 and applied the DuPont framework to identify the factors influencing ROA. Their findings revealed that net profit margin and total assets turnover significantly improved ROA, while leverage had no significant impact. However, the study's small sample size may limit its applicability to all firms.

In their research, Arin, Nyahas, and Ekoja (2025) studied Nigerian banks under the Basel III framework and evaluated the effect of Tier 1 capital requirements on profitability. The study found that leverage regulation significantly impacts bank profitability and financial stability.

In another study, Garba and Ayuba (2025) analyzed Nigerian deposit money banks using Generalized Least Squares estimation. Their results indicate that financial leverage showed a negative but statistically insignificant relationship with profitability. The study focused only on the banking sector, and similar research in other sectors is needed to confirm these findings.

Similarly, Sajo and Uthman (2025) examined the impact of capital structure on the performance of listed industrial goods firms in Nigeria. They considered short-term debt, long-term debt, debt-to-equity ratio, and equity financing as determinants of profitability, measured by return on assets (ROA), return on equity (ROE), and return on capital employed (ROCE). Their findings showed that capital structure affects performance. However, the study was focused mainly on the industrial goods sector, and similar studies in other industries could provide more comprehensive insights.

Also, Bamidele (2025) investigated the impact of entrepreneurial financing decisions on the profitability of listed non-financial firms in Nigeria from 2015 to 2024. Based on a sample of 20 firms, the study found that financing decisions significantly influence profitability, as measured by return on assets (ROA).

In their study, Monday and Dopemu (2024) examined whether leverage affects profitability and firm value. They analyzed nine listed deposit money banks in Nigeria using panel data from 2008 to 2023. Their results showed that the debt-to-equity ratio and debt ratio had a significant positive impact on profitability. However, focusing solely on listed deposit money banks may be insufficient, and similar studies in other sectors may be necessary to validate these findings.

In another study, Effendi and Surjah (2024) examined how leverage, firm size, and

liquidity influence the profitability of manufacturing companies listed on the Indonesia Stock Exchange. Using data from 73 firms between 2017 and 2019, their findings indicated that leverage had a significant negative effect on profitability, as measured by return on assets (ROA).

Similarly, Feradella and Tjakrawala (2024) explored the effects of company efficiency, liquidity, and leverage on the profitability of property and real estate firms listed on the Indonesia Stock Exchange. Their research found that leverage significantly influences profitability, emphasizing the importance of efficient debt utilization for improved firm performance.

Okeke (2023) investigated the relationship between fiscal influence and profitability among recapitalized Nigerian banks from 2010 to 2021. Secondary data from the financial reports and statements of eight listed deposit money banks were used, and multiple regression analysis was employed. The results indicated that fiscal influence had a statistically significant negative impact on profitability, measured by return on assets (ROA) and net interest margin. The study concluded that excessive reliance on debt may hinder profit growth in the Nigerian banking sector.

Arhinful and Radmehr (2023) assessed the effect of fiscal influence on the profitability of 257 enterprises across various sectors, such as construction, electronics, energy, and telecommunications, listed on the Tokyo Stock Exchange between 2000 and 2021.

Their findings revealed that the interest rate had a positive and significant impact on performance indicators such as ROA, ROE, and Tobin's Q. However, aggregating firms from different sectors may limit the accuracy of the results, as industry-specific dynamics are not fully accounted for.

Etim, Nseabasi, and Raymond (2022) investigated the impact of fiscal influence on the performance of listed oil and gas companies in Nigeria. A sample of eight companies from a population of twelve, covering the period 2016 to 2020, was used. ROA served as a proxy for performance, while fiscal influence was measured using debt ratio (DR), debt-to-equity ratio (DER), long-term debt ratio (LTDR), and cost of debt (COD). Their findings showed that DR, LTDR, and COD had a significant negative impact on ROA, whereas DER showed a negative but insignificant relationship. However, the relatively short time period may restrict the robustness of the conclusions, suggesting the need for extended longitudinal analysis.

The study by Akhtar, Yusheng, and Harris (2021) explored the connection between fiscal influence and company performance, using data from 424 non-financial firms listed in Pakistan between 2001 and 2017. The researchers used measures such as short-term debt, long-term debt, and total debt to represent fiscal influence, and performance indicators like sustainable growth rate (SGR), Tobin's Q, return on assets (ROA), return on equity (ROE), and return on equity (ROE) to assess company

performance. Using the Generalised Method of Moments, the findings revealed a significant negative link between fiscal influence and company performance. However, the focus on a single country suggests that further research in different regions and industries is needed.

In his study, Abubakar (2021) investigated the impact of fiscal influence on the performance of quoted oil and gas companies in Nigeria from 2005 to 2018. Utilizing descriptive statistics and a random-effects panel estimator, the study examined ratios such as short-term debt to total assets, long-term debt to total assets, and total debt to equity in relation to return on equity (ROE). The results showed that short-term debt ratio (STDR) and long-term debt ratio (LTDR) did not have a significant effect on ROE. Nonetheless, the exclusion of other performance metrics, such as return on assets (ROA), may have limited the depth of the analysis.

Aloshaibat (2020) studied the impact of fiscal influence on the financial performance of Jordanian public shareholding companies. The study used the debt-to-equity ratio as a proxy for fiscal influence and ROA and ROE as measures of performance. The analysis was based on data from 25 firms listed on the Amman Stock Exchange between 2015 and 2019. The findings suggested that fiscal influence significantly affects performance when measured by ROE, but not when measured by ROA. The study's focus on Jordan may restrict the general applicability of the results.

Vivian, John, and Chioma (2020) examined the influence of fiscal leverage on quoted companies in Nigeria. The study considered various fiscal indicators, including debt-to-total assets, debt-to-equity ratio, and both short- and long-term debt rates, using data from ten companies over the period 2010 to 2015. The results indicated that while the debt-to-equity ratio was not statistically significant, other fiscal indicators had a significant impact on firm performance as measured by ROE.

Musfiqur and Farjana (2020) explored the relationship between fiscal leverage and profitability among 22 textile companies listed on the Dhaka Stock Exchange. Using ROE as the sole measure of profitability and applying pooled OLS, fixed effects, and Generalised Method of Moments (GMM) methods, the study found a significant and negative relationship between leverage and profitability. However, relying on a single profitability measure may weaken the robustness of the findings, as ROE alone may not fully capture overall company performance.

Zaitoun and Alqudah (2020) investigated the combined effects of liquidity and fiscal influence on profitability among industrial firms listed on the Amman Stock Exchange. Based on 54 firm-year observations covering 2015 to 2019, the study found that liquidity positively influenced profitability, while fiscal influence had a negative impact. The study's narrow focus on ROA and its limited time frame suggest the need for broader and more extensive analyses.

Kristi, Yanto, and Henry (2020) analysed the influence of both fiscal and non-financial factors on firm value among companies listed on the Indonesian Stock Exchange. Using a sample of 35 firms over the period 2015 to 2019, the study found that fiscal influence had a significant and negative effect on firm value. The findings were specific to the Indonesian context and may not be generalisable beyond that region.

Ullah (2019) investigated the effect of financial leverage on the profitability of fertilizer companies in Pakistan using panel data from five firms over the period 2012 to 2018. The findings indicated a significant and negative relationship between financial leverage and profitability (measured by ROA). However, the relatively short study period raises questions about the reliability and generalisability of the results.

Nguyen, Tran, and Nghiem (2019) examined the impact of financial leverage on the profitability of real estate companies listed on the Vietnam Stock Exchange. Using data from 58 firms over the period 2017 to 2018 and applying multivariate regression methods, the study reported that financial leverage had a negative effect on profitability (ROA), a positive effect on ROE, and no significant impact on ROS and ROCE. Despite this, the short dataset duration limits the strength of the conclusions.

Samo and Murad (2019) studied the relationship between liquidity, financial leverage, and profitability using data from 40 textile firms in Pakistan over the period

2006 to 2016. The study found that liquidity was positively associated with profitability, while financial leverage had a negative relationship.

Sahni and Harish (2018) analysed the effect of financial leverage and liquidity on the profitability of construction and real estate firms in India. The study used operating profit margin, net profit margin, and return on capital employed as performance measures. The findings concluded that financial leverage positively influenced profitability. However, further research across different sectors is needed to validate these results.

Iqbal and Usman (2018) examined the relationship between financial leverage and performance among textile firms in Pakistan using data from 16 companies over the period 2011 to 2015. The results showed that financial leverage negatively affected profitability (ROE) but positively influenced ROA. However, the limited scope and short time frame may restrict the validity of the conclusions.

Bui (2017) investigated the impact of financial leverage on firm performance in the United Kingdom, focusing on 18 oil and gas companies over the period 2009 to 2014. The study found that long-term and total debt rates negatively affected ROA and ROE, while short-term debt had no significant impact. Although the study included a comprehensive set of variables, the study's short duration limits the persuasiveness of the results.

In another study, Abdul Jaleel and Badmus (2017) examined the relationship between financial leverage and profitability among listed chemical and cosmetics firms in Nigeria. Using data from three companies over the period 2000 to 2009 and applying the Ordinary Least Squares (OLS) method, the study found that equity financing had a positive and significant effect on ROA, while the debt ratio had a negative but insignificant effect on performance.

Overall, the reviewed studies punctuate the absence of a unified conclusion regarding the leverage–profitability relationship, reflecting differences in methodology, sectoral focus, and geographical environment. Consequently, further empirical investigation is required, particularly within the oil and gas sector, to establish a definitive understanding of the relationship between financial leverage and profitability. This inconsistency, also reinforces the need for further empirical studies using broader datasets and more refined logical approaches.

2.3 Research Framework/Model and Underpinning Theory

The findings in this study shows that there is a significant and negative relationship between financial leverage and profitability of listed oil and gas firms in Nigeria. This indicates that high level of long term debt adversely affects profitability. With this outcome, the Trade-off theory underpins this study. The theory argued that firms should strive to achieve an optimal capital structure by balancing the cost of debt financing in

order to maximize the firm's value while minimizing the overall cost of capital.

Method

For this study, a longitudinal panel research design was implemented. This approach was selected because the research gathered data from the published annual financial reports of listed oil and gas companies over a thirteen-year period. The population of the study consists of the nine (9) listed oil and gas firms in Nigeria as of December 2024. Eight (8) of these firms were selected as the sample for the study using purposive sampling. The selection of these eight firms was based on the availability of their

complete financial reports, which were necessary for the study. The data regarding financial leverage, profitability, and board size of these listed firms were collected from audited and published financial reports for the period from 2012 to 2024. This extensive time frame was chosen to ensure sufficient data for thorough analysis. The panel regression technique was employed for the data analysis, and the Stata 14 software package was used to process the data. This software enabled the analysis of the dependent variable (Return on Assets or ROA), the independent variable (ratio of long-term debt to total assets), and the moderating variable (board size).

3. Result and Discussion

Table 1 Descriptive Statistics of Variables
Summary statistics

	min	max	Mean	Std. Dev.	skewness	kurtosis
ROA	-.735	1.763	0.021	.212	4.67	46.864
LTDTA	.002	1.923	0.212	.28	3.206	17.399
BDSZ	0	1	0.462	.501	.154	1.024
LTDTABS	0	.582	0.064	.121	2.137	6.801

Source: Researcher's compilation using Stata 14

The descriptive statistics table indicates that the minimum, maximum, and average levels of the dependent variable (ROA) for the listed oil and gas firms in Nigeria are -0.735, 1.763, and 0.021, respectively.

The negative minimum value of -0.735 suggests that some firms are operating at a loss. The maximum value of 1.763 indicates a significant variation in profitability among the firms. Additionally, the mean value of

0.021 is relatively low compared to the maximum value, which implies that, on average, the firms are not generating substantial profits. The skewness of 4.67 and kurtosis of 46.86 are greater than the thresholds of 3 and 10, respectively. This suggests that a number of firms achieve higher profitability than the industry average. However, this does not necessarily indicate data errors, as some firms are more profitable than others.

From the statistics in Table 1, there is a notable variation in the usage of long-term debt among the listed oil and gas firms in Nigeria. The average value of 0.212 indicates that these firms use long-term debt to finance approximately 21.1% of their total assets. Some firms rely heavily on long-term debt, as reflected by the value of 1.923, which may pose a risk if these firms

are unable to manage their debt obligations effectively. The minimum value of 0.02 shows that some firms use very little long-term debt, suggesting they have alternative funding sources. The regression results from the models, which include both the direct and moderating effects, are presented in Tables 2 and 3 below.

First model (without moderation)

$$ROA_{it} = \alpha_{it} + \beta_1 + LTDTA_{it} + \varepsilon_{it}$$

Table 2: Model Regression Result (without moderation)

Regression results

ROA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LTDTA	-.237	.071	-3.34	.001	-.377	-.098	***
Constant	.071	.025	2.86	.004	.022	.12	***
Mean dependent var		0.021	SD dependent var		0.212		
Overall r-squared		0.098	Number of obs		104		
Chi-square		11.139	Prob > chi2		0.001		
R-squared within		0.123	R-squared between		0.162		

*** $p < .01$, ** $p < .05$, * $p < .1$

Source: Researcher's compilation using Stata 14

The moderating regression model includes moderator effector variable as presented below:

$$ROA_{it} = \alpha_{it} + \beta_1 LTDTA_{it} + \beta_4 BS_{it} + \beta_6 LTDTABSZ + \varepsilon_{it}$$

Table 3: Model Regression Result (with moderation)

Regression results

ROA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LTDTA	-.256	.079	-3.22	.001	-.411	-.1	***
BDSZ	-.033	.054	-0.61	.542	-.138	.072	
LTDTABS	.065	.217	0.30	.765	-.36	.49	
Constant	.086	.035	2.46	.014	.018	.154	**
Mean dependent var		0.021	SD dependent var		0.212		
Overall r-squared		0.102	Number of obs		104		
Chi-square		11.348	Prob > chi2		0.010		
R-squared within		0.118	R-squared between		0.170		

*** $p < .01$, ** $p < .05$, * $p < .1$

Source: Researcher's compilation using Stata 14

The dataset was estimated using the ordinary least squares (OLS) method. The first model was constructed without the interacting variable, while the second incorporated the moderating variable to assess whether the two models differed significantly.

Table 2 illustrates a direct relationship between the ratio of long-term debt to total assets (LTDTA) and return on assets (ROA) among listed oil and gas firms in Nigeria. The findings from this table indicate that LTDTA has a significant negative impact on ROA. That is, a one-unit increase in LTDTA is associated with a 0.237-unit decrease in ROA. This negative coefficient suggests that higher levels of LTDTA are associated with lower levels of ROA.

Table 3 presents the interaction between board size and the relationship between LTDTA and ROA, with board size included as an additional variable.

This table also reveals that short-term debt to total assets (STDTA) has a negative and significant impact on ROA. However, the introduction of board size (BDSZ) shows that the interaction between board size and LTDTA (LTDTABS) has an insignificant effect on ROA, as indicated by a p-value of 0.542.

A comparison was made between the two models to evaluate the relevance of the moderating variable in the second model. The results from both tables indicate that LTDTA remains a statistically significant predictor of ROA, with a p-value of 0.001 in both cases. This suggests that oil and gas firms with higher debt levels tend to have lower returns on assets. Both tables also show similar overall R-squared values of 0.098 and 0.102. In conclusion, a difference in R-squared values of less than 0.05 between the two models is considered insignificant. Therefore, it can be concluded

that the two models have comparable explanatory power.

Hypotheses Testing

To test the hypotheses, this section presents the dataset estimated using robust OLS.

The tests for each hypothesis are as follows:

H01: The long-term debt to total assets ratio has no significant effect on the return on assets of listed oil and gas firms in Nigeria.

The results show that the long-term debt to total assets ratio is significant, with a negative impact on ROA. The coefficient of -0.237 in Table 2 is significant at a p-value of 0.001, indicating a significant and negative relationship between LTDTA and ROA. This implies that as the LTDTA ratio increases, profitability tends to decrease. Therefore, hypothesis one is rejected.

H02: Board size has no significant influence on the effect of the long-term debt to total assets ratio on the return on assets of listed oil and gas firms in Nigeria.

The results from Table 3 show that the moderating effect of board size on the relationship between the long-term debt to total assets ratio and ROA has a coefficient of 0.65 with a p-value of 0.765.

This indicates no significant relationship between LTDTABDSZ and ROA. Since the p-value of 0.765 is higher than the threshold of 0.05, hypothesis two is not rejected.

Summary of Findings

H01: The long-term debt to total assets ratio has no significant effect on the return on assets of listed oil and gas enterprises in Nigeria.

The long-term debt-to-total-assets ratio has a coefficient of -0.237, a t-value of -3.34, and a p-value of 0.001, as shown in Table 2. Even when moderating variables are included in Table 3, the coefficient changes slightly to -0.256 with a t-value of 0.79 and a p-value of 0.001. The coefficient values do not show significant changes, even with the inclusion of moderating variables. However, the negative coefficient along with p-values below 0.05 indicates a significant and negative effect of the long-term debt to total assets ratio on the return on assets of listed oil and gas enterprises in Nigeria. These findings align with those of Effendi & Surja (2024), Etim et al. (2022), Bui (2017), and Gweyi & Kwaraja (2014).

H02: Board size has no significant influence on the effect of the long-term debt to total assets ratio on the return on assets of listed oil and gas enterprises in Nigeria. The findings from Tables 2 and 3 indicate that the moderating variable has no significant effect on the relationship between the independent and dependent variables. This is evident from the overall R-squared values of Tables 2 and 3. The R-squared value for the first regression table (without moderation) is 0.098, while that for Table 3 is 0.102. This means that the R-squared values in both tables are approximately 10. In conclusion, it is noted that the moderating variable, the

moderating effect of board size on the long-term debt to total assets ratio (LTD TABSZ), did not add any significant value to the model in explaining the variation in ROA. This agrees with Abubakar's (2021) study.

4. Conclusion

This study examined the impact of board size on the relationship between financial leverage and the profitability of publicly listed oil and gas companies in Nigeria. The results show that long-term debt has a significant negative impact on profitability, measured by Return on Assets (ROA), among these firms. The findings suggest that overuse of long-term borrowing reduces profitability due to increased interest expenses and the need for fixed repayments. Additionally, the study found that board size does not have a significant effect on financial leverage or profitability in the Nigerian oil and gas sector.

5. Implications/Recommendations

The results suggest that excessive reliance on long-term debt can harm profitability (ROA) because of higher interest costs and the obligation to repay debt at fixed intervals. Based on these findings, it is recommended that Nigerian-listed oil and gas firms should look for alternative financing methods to reduce the burden that affects profitability. Moreover, firms should prioritize the expertise of board members rather than focusing solely on the number of board members to improve decision-making effectiveness. Companies should also enhance their management strategies by ensuring that debt maturity aligns with

project cash flows, which can ensure returns that exceed financing costs.

Considering the limitations of this study, the results provide a foundation for future research. Further studies should include industry-specific variables to better understand the unique features of oil and gas companies. The relationship between debt and other factors should also be explored more thoroughly.

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