



Effect of firm attributes on tax aggressiveness of quoted oil and gas firms in Nigeria

¹Prof. Barnabas Embugus Barde

bardebarnabas@gmail.com

²Dr Hassan Musa

³EKUMA-OKO Grace Amarachi

^{1,2&3}Department of Accounting, Nasarawa State University, Keffi

Abstract

Grounded in the principles of Agency Theory, this study explores the impact of firm attributes on the tax aggressiveness of listed oil and gas companies in Nigeria. It focuses on how profitability and financial leverage influence the level of tax aggressiveness, which is measured using the effective tax rate (ETR). The study population comprises eight oil and gas firms listed on the Nigerian Exchange Group, of which seven were purposively selected based on the availability of complete financial data for the ten-year period between 2015 and 2024. An ex post facto research design was employed, relying on secondary data obtained from the firms' audited annual reports and financial statements. Data analysis involved descriptive statistics, correlation analysis, and panel regression techniques, with the Hausman specification test determining the most appropriate model. The empirical results indicate that profitability has a negative and statistically significant relationship with ETR, suggesting that highly profitable firms tend to engage in greater tax planning activities to lower their tax obligations. Likewise, financial leverage exhibits a negative and significant effect on ETR, implying that firms with higher debt ratios benefit from interest tax shields that reduce their overall tax liabilities. The study concludes that effective management of profitability and capital structure enhances tax efficiency and supports the Agency Theory proposition that managerial actions should align with shareholders' wealth maximization. It is recommended that oil and gas firms strengthen ethical and transparent tax strategies that optimize tax benefits while maintaining compliance with regulatory standards to promote financial sustainability and good corporate governance.

Keywords: Firm attributes, Tax Aggressiveness, Oil and Gas Firms in Nigeria

1.0 Introduction

Corporate taxation remains a key interface between firms and the state, especially in resource-dependent economies where company taxes underpin public revenue and fiscal stability. In this context, tax aggressiveness has gained sustained scholarly attention because it captures the extent to which firms deliberately reduce tax liabilities through tax planning choices and reporting discretion that may remain within legal boundaries but intensify tax risk and regulatory scrutiny (Wilde & Wilson, 2018). Tax-aggressive behaviour is commonly reflected in persistently low



effective tax rates and related tax outcomes, which raise concerns for revenue mobilisation, transparency, and corporate accountability in emerging markets (Kovermann & Velte, 2019).

In Nigeria, quoted oil and gas firms operate within a uniquely complex fiscal environment shaped by sector-specific tax rules, heightened regulatory monitoring, and exposure to volatile crude oil prices and exchange-rate instability. These conditions intensify pressures on cash flows and earnings quality, increasing incentives for firms to pursue aggressive tax positions to protect after-tax returns and preserve liquidity for investment and operational continuity. The oil and gas sector's strategic role in government revenue and foreign exchange further elevates the policy relevance of understanding firm-level drivers of tax aggressiveness among listed operators.

Tax aggressiveness is shaped not only by institutional conditions but also by firm attributes that determine both the motivation and the capacity to minimise corporate tax burdens. Two attributes that remain central in recent empirical research are profitability and financial leverage. Profitability affects the scale of taxable capacity and can heighten incentives to engage in tax-reducing behaviour because higher profits increase expected tax exposure and amplify the economic benefits of tax savings (Wilde & Wilson, 2018). Financial leverage, in contrast, is closely connected to tax outcomes because interest-bearing debt generates tax shields through deductible finance costs, and leverage may therefore influence the level and form of tax aggressiveness adopted by firms (Oxford Research Encyclopedia of Economics and Finance, 2021). These relationships are consistent with the trade-off logic that firms balance tax benefits of debt against expected distress and enforcement costs, implying that leverage decisions can be linked to strategic tax outcomes (Oxford Research Encyclopedia of Economics and Finance, 2021).

Agency-based explanations further suggest that managers may have incentives to pursue aggressive tax outcomes to improve reported performance or free cash flows, although such actions can increase tax-risk exposure and potential reputational costs when governance monitoring is weak (Al-Faryan et al., 2024). Consequently, profitability and leverage are expected to interact with managerial incentives and firm constraints in shaping tax aggressiveness, particularly in sectors with complex transactions and substantial financing needs such as oil and gas.

Empirical evidence remains context-sensitive. While recent studies in Nigeria and other emerging markets frequently model tax aggressiveness as a function of firm attributes such as profitability and leverage, findings vary across sectors, sample periods, and measurement choices for tax aggressiveness (Zubairu, 2022; Obiekea, 2025). These inconsistencies underscore the need for sector-specific evidence that controls for firm heterogeneity and time dynamics, especially in Nigeria's oil and gas industry where fiscal regimes and macroeconomic volatility can materially affect tax behaviour.

To address these gaps, this study adopts a panel regression framework to examine the effects of firm attributes on tax aggressiveness of quoted oil and gas firms in Nigeria. Specifically, profitability and financial leverage are employed as the main explanatory variables, while tax



aggressiveness is operationalised using effective tax rate-based measures derived from audited financial statements. The study tests the following null hypotheses: (i) profitability has no significant effect on the tax aggressiveness of quoted oil and gas firms in Nigeria; and (ii) financial leverage has no significant effect on the tax aggressiveness of quoted oil and gas firms in Nigeria. The remainder of the paper is structured into five sections: Section 2 reviews related literature, Section 3 presents the methodology, Section 4 discusses the results, and Section 5 concludes with policy and managerial implications.

2.1 Conceptual Framework

2.1.1 Tax Aggressiveness

Tax aggressiveness has emerged in contemporary accounting and finance literature as a central construct for understanding corporate tax behaviour. It broadly refers to the extent to which firms engage in deliberate tax-minimisation strategies that reduce explicit tax payments relative to statutory expectations, while remaining within the boundaries of tax law. Armstrong, et al. (2015) conceptualise tax aggressiveness as a spectrum of discretionary tax practices ranging from routine tax planning to highly aggressive positions that increase tax risk and regulatory scrutiny. This perspective underscores that tax aggressiveness is not an illegal act per se but a strategic outcome of managerial judgement in tax-related decisions.

Similarly, Gallemore and Labro (2015) describe tax aggressiveness as an observable manifestation of firms' internal tax planning capabilities, shaped by information asymmetry, organisational complexity, and managerial incentives. They emphasise that aggressive tax behaviour often reflects a firm's ability to exploit tax rules through timing differences, deductions, and structural arrangements. From this viewpoint, tax aggressiveness functions as a measurable outcome of strategic financial decision-making rather than a simple indicator of compliance or non-compliance.

Recent literature further highlights that tax aggressiveness has important implications for corporate governance, transparency, and firm risk. Minnick and Noga (2018) argue that while aggressive tax strategies can enhance short-term cash flows, they may expose firms to long-term risks such as penalties, reputational damage, and increased monitoring by tax authorities. Consequently, tax aggressiveness is increasingly viewed as a trade-off between tax savings and potential non-tax costs, making it a relevant construct for examining firm behaviour in regulated and capital-intensive industries.

Empirically, tax aggressiveness is operationalised using quantifiable indicators that capture deviations between accounting income and tax outcomes. Kim, Li, and Zhang (2020) note that effective tax rates and related measures provide reliable proxies for assessing the degree of aggressiveness in corporate tax behaviour, particularly when firm-level tax return data are unavailable. These measures enable cross-firm and intertemporal comparisons and have been widely adopted in studies of corporate taxation in emerging and developed economies alike.



2.1.2 Firm attributes

Firm attributes represent internal characteristics that influence managerial incentives, risk preferences, and strategic choices, including tax behaviour. Among these attributes, profitability and financial leverage are consistently identified as key determinants of tax aggressiveness in recent literature. Profitability reflects a firm's ability to generate earnings from its asset base and directly influences the size of its taxable income. Martinez and Silva (2017) conceptualise profitability as a primary driver of tax planning incentives, arguing that firms with higher profits have stronger motivation to engage in aggressive tax strategies to protect after-tax returns.

Dang, et al. (2018) further explain that profitability not only increases tax exposure but also enhances a firm's capacity to invest in sophisticated tax planning mechanisms, such as specialised advisory services and complex organisational structures. As a result, profitable firms may exhibit lower effective tax rates and higher levels of tax aggressiveness compared to less profitable counterparts. In this sense, profitability serves both as an incentive and an enabling factor for aggressive tax behaviour.

Financial leverage, on the other hand, captures the extent to which a firm relies on debt financing relative to equity. Lanis and Richardson (2018) conceptualise leverage as a fundamental determinant of tax outcomes because interest expenses on debt are generally tax-deductible, creating a natural tax shield. This inherent tax advantage implies that leverage can directly reduce taxable income and influence the marginal benefits of additional tax aggressiveness.

However, the relationship between leverage and tax aggressiveness is not unidirectional. Kubick and Lockhart (2017) argue that while debt financing reduces tax liabilities through interest deductions, highly leveraged firms may face increased scrutiny from creditors and regulators, potentially constraining aggressive tax behaviour. This suggests that leverage may either substitute for or complement other tax planning strategies depending on firm-specific conditions and institutional context.

In capital-intensive industries such as oil and gas, profitability and leverage assume heightened importance in shaping tax behaviour. Firms in this sector typically require substantial fixed investments and external financing, while also generating large and volatile profits. Taylor and Richardson (2015) observe that such conditions intensify incentives for aggressive tax planning, as firms seek to stabilise cash flows and manage tax exposure in the face of earnings volatility and high statutory tax burdens.

Within the Nigerian context, the oil and gas sector is characterised by layered taxation, significant capital requirements, and heightened regulatory oversight. These features suggest that firm attributes such as profitability and financial leverage are likely to play a decisive role in determining tax aggressiveness. Yet, despite the sector's fiscal importance, empirical evidence focusing specifically on how these attributes influence tax aggressiveness among quoted oil and gas firms in Nigeria remains limited.



Drawing from the foregoing discussion, this study conceptualises tax aggressiveness as the extent to which firms deliberately engage in tax-minimisation strategies that reduce effective tax burdens. Profitability and financial leverage are conceptualised as core firm attributes that shape both the incentive and the capacity for aggressive tax planning. Accordingly, this study examines the effect of profitability and financial leverage on tax aggressiveness of quoted oil and gas firms in Nigeria, contributing sector-specific evidence to the growing literature on corporate tax behaviour in emerging economies.

2.2 Empirical Review

Mariana (2021) investigated the relationship between capital intensity and profitability on tax aggressiveness with the objective of identifying how internal financial structures influence a firm's tax avoidance behavior. Conducted in Indonesia within the manufacturing sector, the study analyzed secondary data from listed firms using a quantitative research design. The population comprised manufacturing firms, and a purposive sampling technique was employed to select the sample. The profitability variable was proxied using Return on Assets (ROA), while tax aggressiveness was measured by the effective tax rate (ETR). Regression analysis was used to test the hypotheses. The findings indicated that profitability significantly affected tax aggressiveness, suggesting that more profitable firms were more likely to engage in aggressive tax strategies to reduce their tax burdens. The study, however, was limited by its small sample size and its focus on a single sector, which reduces generalizability. Additionally, the study's reliance on ROA as the sole profitability proxy may not fully capture multidimensional profitability factors such as profit margins or return on equity. Despite these limitations, the research contributed valuable empirical evidence to the understanding of how internal financial characteristics shape corporate tax behavior.

In the same vein, Sumiati (2021) examined the effects of profitability, leverage, firm size, capital intensity, and inventory intensity on tax aggressiveness using data from Indonesian listed companies across multiple sectors. The study aimed to determine the partial and simultaneous effects of these firm characteristics on corporate tax avoidance behavior. The research adopted a quantitative correlational design, using purposive sampling to select 20 companies from the population. Data were analyzed using multiple linear regression. Results revealed that profitability, leverage, size, and capital intensity individually had no significant effect on tax aggressiveness, while inventory intensity significantly influenced tax aggressiveness. When the variables were analyzed jointly, they collectively explained a substantial portion of the variance in tax aggressiveness. The study provided important insights by incorporating inventory intensity, a rarely studied variable, into the model. However, its findings contradicted prior research that emphasized the significance of profitability and leverage, suggesting potential contextual influences specific to the Indonesian market. The use of secondary financial data and a relatively small sample limited the robustness of the results, while cross-sectoral data could have diluted sector-specific effects.

Likewise, Tampubolon (2021) conducted a study titled "The Effect of Liquidity, Leverage and Profitability on the Tax Aggressiveness of Manufacturing Companies" with the objective of exploring how key financial indicators relate to aggressive tax practices in Indonesian



manufacturing firms. The research utilized financial data from 20 manufacturing companies listed on the Indonesia Stock Exchange, covering a three-year period. Employing multiple linear regression as the statistical technique, the study found that leverage had a minimal effect on tax aggressiveness, while profitability significantly affected it. The results implied that profitable firms might employ tax planning strategies to minimize their tax obligations. The population was limited to manufacturing firms, and a purposive sampling approach was adopted. The findings reinforced the notion that profitability drives tax planning behavior but challenged the common assumption of leverage being a strong determinant. However, the study's short observation period and focus on a single sector potentially limited its external validity. The regression technique was appropriate, yet the study could have benefited from panel data methods to better capture firm-level variations over time.

Additionally, Suhendar (2022) explored the relationship between profitability, leverage, and inventory intensity on tax aggressiveness, introducing majority ownership as a moderating variable. The study was set in Indonesia and examined firms listed on the Indonesia Stock Exchange. The objective was to determine how profitability and ownership structure jointly shape a firm's tax avoidance tendencies. Using secondary data, the study employed multiple regression analysis with moderation effects. The population included Indonesian listed firms, and the sample was drawn through purposive sampling. The findings revealed that profitability exerted a positive influence on tax aggressiveness, while leverage and earnings management had no significant impact. The inclusion of majority ownership as a moderating factor provided a novel contribution to the field, indicating that ownership concentration might influence firms' willingness to engage in aggressive tax behavior. However, the study's reliance on a single-country sample and limited control variables constrains the generalizability of the conclusions.

In the same manner, Susanto (2022) examined factors affecting tax aggressiveness, with particular emphasis on the role of profitability as a determinant of tax avoidance practices. The study was conducted in Indonesia, focusing on publicly listed companies across various sectors. The research adopted a quantitative approach using multiple linear regression to test the relationship between profitability and tax aggressiveness. Profitability was proxied by Return on Assets (ROA), and tax aggressiveness was measured using the effective tax rate. The study found that profitability had a positive and significant effect on tax aggressiveness, indicating that highly profitable firms tend to adopt tax planning strategies to reduce their effective tax rates. The sample was selected using purposive sampling from a population of Indonesian listed firms, though the sample size was relatively small. The findings reinforced the hypothesis that profitability encourages more aggressive tax strategies. Nevertheless, the study's limitation lies in its exclusive reliance on financial data, which may overlook qualitative governance or institutional factors that also influence tax behavior. The analysis technique, though standard, could be expanded with panel regression to strengthen causal inference.

Moreover, Abidin (2023) examined the influence of financial leverage, capital intensity, and inventory intensity on tax aggressiveness in Indonesia's coal mining sector. The study aimed to



determine how these firm-specific financial attributes shape corporate behavior toward tax avoidance. Conducted in the Indonesian extractive industry, the research used secondary data obtained from the financial statements of coal mining firms listed on the Indonesia Stock Exchange between 2018 and 2021. The population consisted of all listed coal mining firms, from which a purposive sample was selected. The quantitative study employed multiple linear regression to analyze the relationship between the variables. Results revealed that financial leverage had a significant positive effect on tax aggressiveness, implying that higher debt ratios may provide firms with greater tax shields through interest deductions. Conversely, capital intensity and inventory intensity were found to have no significant impact on tax aggressiveness. The findings highlight the dominant role of leverage in explaining tax strategies in the mining industry, which is characterized by heavy capital investment and cyclical revenues. However, the study's focus on a single sector and its modest sample size limited the external validity of its conclusions. Additionally, the study did not consider profitability, which is often critical in explaining firms' tax behaviors, making the model potentially underspecified.

Likewise, Sumiati (2021) analyzed the effect of profitability, leverage, size, capital intensity, and inventory intensity on tax aggressiveness, aiming to assess both individual and collective impacts of firm characteristics on tax avoidance behavior. The study focused on firms listed on the Indonesia Stock Exchange and adopted a purposive sampling technique to select 20 companies from different sectors over a three-year period. Using multiple regression analysis, the study found that profitability, leverage, firm size, and capital intensity had no significant effect on tax aggressiveness, while inventory intensity had a significant positive effect. This suggests that firms with higher levels of inventory may have more flexibility in managing taxable income, perhaps due to inventory valuation methods. The study contributed to expanding the understanding of how non-financial variables, such as operational intensity, can influence tax decisions. Nonetheless, the small sample size and short observation period limited its robustness, and the exclusion of control variables like liquidity or governance indicators may have resulted in omitted variable bias. Moreover, the inclusion of multiple sectors could have introduced heterogeneity that diluted the strength of sector-specific relationships.

In addition, Pranata (2021) explored the effects of corporate social responsibility (CSR), firm size, and leverage on tax aggressiveness in Indonesian listed firms. The study was motivated by the limited empirical evidence connecting CSR engagement with tax planning behavior. The research used data from manufacturing and service sector firms on the Indonesia Stock Exchange between 2016 and 2020. A purposive sampling technique was employed to select 40 firms, and multiple linear regression was used as the statistical technique. The results revealed that leverage had a positive and significant effect on tax aggressiveness, while CSR and firm size had insignificant effects. This implies that firms with higher debt levels tend to exploit interest expense deductions to minimize tax obligations. The study further emphasized that CSR disclosure alone may not constrain firms from engaging in tax avoidance, especially when financial incentives are strong. However, the model could have benefited from including profitability or capital intensity as control variables to account for operational characteristics influencing tax decisions. The



generalization of the findings was also limited by the focus on Indonesian firms, whose tax systems and governance mechanisms differ from other emerging economies.

Furthermore, Khasanah (2022) investigated the effect of liquidity, leverage, company size, and fixed asset intensity on tax aggressiveness, focusing on manufacturing firms in Indonesia. The study aimed to determine which firm characteristics most strongly predict tax planning behavior and how these variables could inform investment decisions. Using a purposive sampling technique, data were collected from 25 manufacturing firms listed on the Indonesia Stock Exchange between 2017 and 2020. The analysis employed multiple linear regression to test the hypotheses. The results showed that liquidity and leverage had positive but statistically insignificant effects on tax aggressiveness, while company size and fixed asset intensity exhibited significant effects. This suggests that larger firms and those with higher fixed asset ratios may be more tax aggressive, possibly due to more sophisticated tax planning capabilities and higher depreciation allowances. However, the study's reliance on a relatively small sample and short time frame limited the ability to capture cyclical tax behavior. Additionally, the research could have improved its methodological rigor by using panel regression techniques to control for firm-specific heterogeneity.

Lastly, Mustika (2020) examined the impact of liquidity, leverage, and earnings management on corporate tax aggressiveness in Indonesia's property and real estate sector. The study aimed to understand how financial and accounting policies shape corporate tax planning. Data were obtained from 30 property and real estate companies listed on the Indonesia Stock Exchange from 2015 to 2019. The research applied purposive sampling and used multiple regression analysis. Findings indicated that liquidity and earnings management had no significant effect on tax aggressiveness, while leverage had a positive and significant impact. This implies that firms with higher debt ratios tend to utilize interest expense deductions to reduce taxable income. The study contributed sector-specific insights into tax aggressiveness within capital-intensive industries. Nevertheless, its focus on a single sector and the exclusion of variables such as profitability limit the broader applicability of the results. Furthermore, reliance on a simple linear model without addressing potential endogeneity between leverage and tax aggressiveness may have affected the robustness of its conclusions.

2.3 Theoretical framework

Agency Theory (1976)

The Agency Theory, proposed by Jensen and Meckling (1976), provides a fundamental framework for understanding how conflicts of interest between shareholders (principals) and managers (agents) affect corporate decision-making, particularly in financial and tax-related contexts. The theory posits that while shareholders aim to maximize firm value, managers may pursue personal interests that diverge from this objective, resulting in agency costs such as monitoring expenses, incentive misalignment, and inefficiencies in decision-making. To mitigate these costs, firms often



rely on effective governance structures and performance-based incentives that align managerial decisions with shareholder interests.

In the context of corporate tax behavior, Agency Theory explains that managerial discretion over financial reporting and tax planning can significantly influence a firm's level of tax aggressiveness. Managers may adopt aggressive tax strategies to present improved after-tax earnings and thereby enhance their compensation or reputation (Hanlon & Heitzman, 2010). However, excessive tax aggressiveness can expose firms to regulatory sanctions, reputational damage, and future financial risks (Lanis & Richardson, 2012). This duality underscores the agency dilemma in tax decision-making the balance between legitimate tax minimization and the pursuit of private managerial benefits.

Recent empirical evidence reinforces the relevance of Agency Theory in explaining tax behavior in emerging economies. For instance, Amidu et al. (2020) found that managerial incentives and leverage structure significantly affect the level of corporate tax aggressiveness in Sub-Saharan African firms. Similarly, Fagbemi and Olaoye (2021) demonstrated that firms with stronger governance mechanisms, including independent boards and shareholder oversight, exhibited lower tax aggressiveness in Nigeria. Profitability and leverage, key firm attributes examined in this study, also interact with agency relationships: highly profitable firms may face greater temptation for earnings management and tax minimization (Richardson & Lanis, 2007), while leveraged firms might exploit interest deductions to reduce taxable income, potentially aligning with shareholder value or reflecting opportunistic managerial conduct (Taylor & Richardson, 2013).

Applying Agency Theory to the present study, profitability and financial leverage represent critical channels through which managerial decisions influence tax aggressiveness among quoted oil and gas firms in Nigeria. Profitability captures managerial efficiency in generating returns for shareholders, while leverage reflects financing strategies that alter tax obligations through interest expenses. When managers act in alignment with shareholders' interests, they utilize tax planning strategically to minimize tax liabilities and enhance firm value. Conversely, when managerial discretion is misused, firms may engage in overly aggressive tax avoidance, leading to reputational and regulatory risks that erode long-term shareholder wealth.

Thus, Agency Theory underpins this study by explaining how firm attributes serve as conduits through which managerial behavior shapes corporate tax aggressiveness, emphasizing the importance of governance mechanisms in ensuring that tax decisions serve the broader goal of shareholder wealth maximization.

3.0 Methodology

This study adopts an ex post facto research design because it depends on already existing secondary financial data obtained from published annual reports of quoted oil and gas firms in Nigeria. The ex post facto design is suitable because it allows the examination of past firm-level behavior to determine the relationship between firm-specific attributes such as profitability and



financial leverage and tax aggressiveness without manipulating any variables (Nwidobie, 2020). This design enables the identification of causal relationships using historical data, which is particularly appropriate for financial and accounting studies involving corporate attributes and performance indicators (Olayiwola & Okoro, 2021).

The population of the study consists of all oil and gas firms quoted on the Nigerian Exchange Group (NEG) as of 2024. According to the 2024 Fact Book of the Exchange, there were eight listed oil and gas firms on the main board. A purposive sampling technique was adopted to select seven firms that met the inclusion criteria. The criteria included continuous listing on the Exchange for at least ten years, profitability in at least six of the years between 2015 and 2024, and complete and accessible financial statements for the study period. Based on these criteria, the firms selected were Conoil Plc, Eterna Plc, MRS Oil Nigeria Plc, Oando Plc, TotalEnergies Marketing Nigeria Plc, Seplat Energy Plc, and Japaul Gold Ventures Plc.

The study used secondary data derived from the Nigerian Exchange Group (NEG) Fact Book, the firms' published annual reports, and audited financial statements available on their official websites. The study covered a ten-year period (2015–2024), generating a balanced panel dataset of seventy firm-year observations. The dependent variable is tax aggressiveness, measured by the effective tax rate (ETR), which reflects the proportion of tax expenses to pre-tax income. The independent variables are profitability, measured by return on assets (ROA), and financial leverage, measured by the ratio of total debt to total assets.

The analysis began with descriptive statistics to provide an overview of the dataset and assess the distribution and variability of the variables. A correlation matrix was then used to identify potential multicollinearity and explore the direction of relationships among the variables. Diagnostic tests were carried out to ensure the reliability and validity of the regression model. These included tests for normality, multicollinearity using the Variance Inflation Factor (VIF), heteroskedasticity using the Breusch-Pagan test, and autocorrelation using the Durbin-Watson statistic. The Hausman specification test was employed to determine the most appropriate model between the Fixed Effects Model (FEM) and Random Effects Model (REM), ensuring model consistency and efficiency (Audu, Ganiyu, & Yusuf, 2022).

Given the panel nature of the dataset, which incorporates both cross-sectional and time-series dimensions, the study employed panel regression analysis. Two models: the Fixed Effects Model and Random Effects Model were estimated to examine the effect of profitability and financial leverage on tax aggressiveness. The Hausman test guided the selection of the appropriate estimator. A rejection of the null hypothesis implies that firm-specific effects are correlated with the regressors, favoring the Fixed Effects Model, while failure to reject supports the Random Effects Model (Amidu, Kwakye, & Haruna, 2020).



The regression model for the study is specified as follows:

$$TAG_{it} = a + \beta_1 PRO_{it} + \beta_2 FLV_{it} + \mu$$

Where:

TAG = Tax aggressiveness, measured by the effective tax rate (ETR)

a = Constant term

β_1, β_2 = Coefficients

PRO = Profitability, measured as return on assets

FLV = Financial Leverage

μ = Error term

it = Crosssectional and time series component

All statistical analyses were conducted using STATA version 17 due to its advanced features for panel data estimation and diagnostic analysis. A 5% level of significance ($p < 0.05$) was adopted to test all hypotheses, ensuring that only statistically meaningful relationships were reported.

Table 1 Measurement of Variables

Variable	Symbol	Measurement	Source	Expected Sign
Tax Aggressiveness	TAGG	Effective Tax Rate (ETR) = Total Tax Expense ÷ Profit Before Tax	Olayiwola and Okoro (2021); Fagbemi and Olaoye (2021)	Dependent Variable
Profitability	PROF	Return on Assets (ROA) = Net Income ÷ Total Assets	Amidu, Kwakye, and Haruna (2020); Oyeleke, Erin, and Emeni (2019)	±
Financial Leverage	LEV	Total Debt ÷ Total Assets	Nwidobie (2020); Audu, Ganiyu, and Yusuf (2022)	+

Source: Researcher's Computation (2026).

2.5 RESULTS and DISCUSSIONS

Table 2 Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	70	0.086	0.027	0.031	0.146
Leverage	70	0.547	0.098	0.3	0.796
ETR	70	0.265	0.019	0.226	0.335

Source: Researcher's Computation (2026).

Table 2 presents the summary statistics for the variables used in this study, which include tax aggressiveness (ETR) as the dependent variable, and firm attributes represented by profitability (ROA) and financial leverage (LEV) as independent variables. The dataset comprises 70 firm-year



observations derived from seven quoted oil and gas firms in Nigeria over a ten-year period spanning 2015 to 2024.

The mean value of ROA is 0.086, with a standard deviation of 0.027, a minimum of 0.031, and a maximum of 0.146. This indicates that, on average, Nigerian quoted oil and gas firms generated approximately 8.6% returns on their total assets during the study period. The moderate dispersion of profitability values suggests a fair level of stability in firms’ operational efficiency and earnings capacity. However, the lower bound of 3.1% implies that some firms experienced weak performance, possibly due to fluctuating global oil prices, high production costs, or inefficiencies in asset utilization.

The mean financial leverage is 0.547, with a standard deviation of 0.098, a minimum of 0.300, and a maximum of 0.796. This implies that, on average, 54.7% of the firms’ assets were financed by debt during the period. The relatively high leverage ratio is consistent with the capital-intensive nature of the oil and gas industry, where substantial financing is required for exploration, infrastructure, and asset maintenance. The moderate variation across firms suggests differing debt policies and risk management strategies, with some firms maintaining higher debt exposures to exploit tax benefits from interest deductions.

The mean effective tax rate (ETR), a proxy for tax aggressiveness, is 0.265, with a standard deviation of 0.019, a minimum of 0.226, and a maximum of 0.335. This shows that, on average, the firms paid about 26.5% of their pre-tax income as corporate taxes. The relatively narrow dispersion of ETR values implies a consistent tax compliance pattern among the sampled firms. However, the slight variation between the minimum and maximum ETR indicates that some firms engaged in mild tax planning strategies to reduce tax liability within permissible limits. The mean value being below Nigeria’s statutory corporate tax rate of 30% suggests the presence of moderate tax aggressiveness in the sector, likely resulting from the utilization of allowable tax incentives and deductions associated with debt financing and capital expenditure.

Table 3 Correlation Matrix

Variable	ROA	Leverage	ETR
ROA	1		
Leverage	0.075	1	
ETR	-0.454	-0.515	1

Source: Researcher’s Computation (2025).

Table 3 presents the correlation coefficients among the variables of the study, namely tax aggressiveness (ETR), profitability (ROA), and financial leverage (LEV). Correlation analysis provides a preliminary understanding of the direction and strength of linear relationships among the variables before conducting panel regression estimation. The results help identify whether multicollinearity may pose a concern and how the variables are interrelated in the context of quoted Nigerian oil and gas firms.



The correlation coefficient between profitability (ROA) and financial leverage (LEV) is 0.075, indicating a weak positive association. This suggests that firms with slightly higher debt levels tend to exhibit marginally higher profitability, though the relationship is not strong. This weak correlation aligns with the findings of Amidu, Kwakye, and Haruna (2020), who observed that profitability and leverage often move together in capital-intensive industries, where access to debt financing can enhance operational capacity and profitability. However, the low magnitude of this coefficient implies that variations in profitability are influenced more by factors such as oil price volatility, production efficiency, and cost management rather than the degree of leverage alone.

The correlation between profitability (ROA) and tax aggressiveness (ETR) is -0.454, indicating a moderate negative relationship. This suggests that as profitability increases, effective tax rates tend to decline, implying that more profitable firms engage in greater tax planning or exhibit higher levels of tax aggressiveness. This result is consistent with the argument of Oyeleke, Erin, and Emeni (2019), who found that profitable Nigerian firms tend to exploit available tax incentives and allowances to minimize their tax burden. The negative sign supports the notion that managers in highly profitable firms have both the motivation and the resources to pursue tax-saving strategies that enhance after-tax earnings.

Similarly, the correlation between financial leverage (LEV) and tax aggressiveness (ETR) is -0.515, indicating a moderate negative association. This implies that firms with higher debt ratios tend to have lower effective tax rates, reflecting the tax-shield benefits of interest expense deductions. The finding corroborates the results of Nwidobie (2020) and Fagbemi and Olaoye (2021), who documented that higher financial leverage enhances tax aggressiveness as firms utilize debt strategically to reduce taxable income. In the context of Nigerian oil and gas firms, where large-scale capital investments are often financed through debt, this relationship highlights how financial structure influences tax behavior.

Table 4 Multicollinearity Test (Variance Inflation Factor – VIF)

Variable	VIF
Const	40.142
ROA	1.006
Leverage	1.006

Source: Researcher's Computation (2026).

Table 4 presents the results of the multicollinearity test conducted using the Variance Inflation Factor (VIF) to examine the degree of correlation among the independent variables, namely profitability (ROA) and financial leverage (LEV). The purpose of this diagnostic test is to ensure that the independent variables are not highly correlated with one another, as high multicollinearity may distort regression estimates and weaken the reliability of the model's coefficients.

The VIF value for profitability (ROA) is 1.006, while that for financial leverage (LEV) is also 1.006. These values are significantly below the conventional threshold of 10 recommended by



Hair, Black, Babin, and Anderson (2019), indicating the absence of multicollinearity in the model. The low VIF values suggest that profitability and leverage are sufficiently independent, and that each variable provides unique explanatory power in predicting tax aggressiveness. The constant term records a high VIF value of 40.142, which is expected and not a cause for concern, as the constant is not used in assessing multicollinearity among explanatory variables (Gujarati & Porter, 2009).

Table 5 Normality Test (Shapiro–Wilk Test)

Variable	W Statistic	p-value
ROA	0.989	0.791
Leverage	0.991	0.889
ETR	0.966	0.055

Source: Researcher's Computation (2026).

Table 5 presents the results of the Shapiro-Wilk normality test conducted to examine whether the variables in the model are normally distributed. The null hypothesis of the Shapiro–Wilk test assumes that the data follow a normal distribution. A p-value less than 0.05 indicates a statistically significant deviation from normality (Razali & Wah, 2011). Assessing the normality of the data is essential, as it determines whether the assumptions underlying regression analysis are satisfied.

As shown in Table 5, the p-values for the variables are ROA ($p = 0.791$), financial leverage ($p = 0.889$), and tax aggressiveness ($p = 0.055$). All the p-values exceed the 0.05 significance level, indicating that none of the variables significantly deviate from normality. This implies that the distributions of profitability, financial leverage, and tax aggressiveness are approximately normal across the sampled firms and periods. The result suggests that the dataset is well-behaved, and the assumption of normality required for linear regression and inferential statistics is adequately satisfied.

The relatively high W statistics, ranging between 0.966 and 0.991, further confirm the near-normal distribution of the study variables. This finding is consistent with the expectations of corporate financial data, which often approximate normality when measured over multiple firms and years. According to Gujarati and Porter (2009), the Central Limit Theorem ensures that even moderate sample sizes, such as the 70 firm-year observations used in this study, are sufficient to produce approximately normal distributions for regression residuals.



Table 6 Panel Regression Results (Fixed and Random Effects Models)

Variable	Fixed Effects (1)	Random Effects (2)
ROA (Profitability)	-0.309** (0.071)	-0.296** (0.065)
LEV (Financial Leverage)	-0.088** (0.018)	-0.094** (0.018)
_cons	0.339 (0.013)	0.342 (0.011)
Observations	70	70
R ² / Pseudo R ²	0.447	0.432
F-statistic / Wald χ^2	9.56***	15.37***

Source: Researcher’s Computation using Stata 13.0 (2026).

Standard errors are in parentheses.

***p < .01, **p < .05, p < .10

Table 4 Multicollinearity Test (Variance Inflation Factor – VIF)

Variable	VIF
Constant	40.142
ROA (Profitability)	1.006
LEV (Financial Leverage)	1.006

Source: Researcher’s Computation (2026).

Table 4 presents the results of the multicollinearity test based on the Variance Inflation Factor (VIF), which examines the degree of correlation among the independent variables—profitability (ROA) and financial leverage (LEV). The test helps to ensure that no strong linear relationship exists between the explanatory variables that could distort the reliability of the regression estimates.

As shown in Table 4, the VIF values for profitability (1.006) and financial leverage (1.006) are far below the conventional threshold of 10, indicating the absence of multicollinearity problems. The constant term shows a higher VIF value of 40.142, which is normal since the intercept does not affect the interpretation of multicollinearity among explanatory variables. The low VIF values imply that each independent variable provides distinct and independent explanatory power in predicting tax aggressiveness.

These results suggest that the variables used in the model are not linearly dependent on each other, thereby satisfying one of the fundamental assumptions of the classical linear regression model. Consequently, the panel regression results can be interpreted with confidence, as the estimated coefficients are not inflated due to multicollinearity bias.



Table 8 Hausman Test

Test Statistic	Chi ² (2)	Prob > Chi ²
Hausman	7.32	0.027

Source: Researcher’s Computation using Stata 13.0 (2026).

The Hausman (1978) specification test was conducted to determine the appropriate panel regression model between the fixed effects and random effects estimations. The null hypothesis of the Hausman test states that the random effects model is the more efficient and consistent estimator, assuming that individual effects are uncorrelated with the explanatory variables. Conversely, the alternative hypothesis suggests that the fixed effects model is preferable when unobserved firm-specific effects are correlated with the regressors, thereby producing more reliable coefficient estimates.

As presented in Table 8, the chi-square statistic ($\chi^2 = 7.32, p = 0.027$) is statistically significant at the 5% level. This result indicates that the null hypothesis of the random effects model being consistent is rejected. Consequently, the fixed effects model is considered more appropriate for analyzing the relationship between profitability, financial leverage, and tax aggressiveness among quoted oil and gas firms in Nigeria.

The preference for the fixed effects model implies that firm-specific characteristics—such as managerial style, corporate governance structure, and strategic financing policies—exert unique influences on the firms’ tax behavior and are correlated with their profitability and leverage levels. This justifies the use of the fixed effects estimator to obtain unbiased and consistent parameter estimates for the study’s regression analysis.

Table 9 Autocorrelation Test

Test Statistic	F(1, 6)	Prob > F
Wooldridge	2.174	0.187

Source: Researcher’s Computation using Stata 13.0 (2026).

The Wooldridge test for autocorrelation in panel data was conducted to detect the presence of first-order serial correlation in the residuals of the panel regression model. The null hypothesis of the test assumes that there is no first-order autocorrelation among the error terms, while the alternative hypothesis suggests the presence of serial correlation. Autocorrelation, if present, can bias standard errors and lead to inefficient estimates in panel data regression.

As shown in Table 9, the test produced an F-statistic of 2.174 with an associated probability value ($p = 0.187$). Since the probability value exceeds the 0.05 significance level, the null hypothesis of



no first-order autocorrelation cannot be rejected. This implies that the residuals of the regression model are free from serial correlation, meaning that errors are independently distributed across time and firms.

The absence of autocorrelation confirms that the model satisfies one of the essential assumptions of the classical linear regression model. This enhances the reliability of the regression estimates and ensures that the standard errors of the coefficients are unbiased and efficient. Therefore, the results of the panel regression analysis can be considered statistically sound for explaining the relationship between profitability, financial leverage, and tax aggressiveness among quoted oil and gas firms in Nigeria.

From Table 6, in conformity with the a priori expectation, profitability (ROA) under the fixed effects model has a coefficient of -0.309 ($p = 0.015$), indicating a negative and statistically significant effect on tax aggressiveness (ETR) at the 5% significance level. This result implies that hypothesis 1 (H01: Profitability has no significant effect on the tax aggressiveness of quoted oil and gas firms in Nigeria) is rejected. The negative coefficient suggests that for every one-unit increase in profitability, the effective tax rate decreases by approximately 30.9%. This finding indicates that more profitable firms tend to engage in higher levels of tax aggressiveness, thereby reducing their tax burden. This may be because profitable firms possess stronger financial flexibility and managerial incentives to adopt strategic tax planning initiatives that minimize taxable income. The result aligns with the findings of Oyeleke, Erin, and Emeni (2019) and Amidu, Kwakye, and Haruna (2020), who reported that profitable Nigerian firms actively exploit tax incentives and reliefs to lower effective tax rates. The outcome supports the Agency Theory (Jensen & Meckling, 1976), which posits that managers in profitable firms may engage in tax reduction strategies to enhance after-tax income, thereby aligning with shareholders' wealth maximization objectives.

Furthermore, financial leverage (LEV) under the fixed effects model has a coefficient of -0.088 ($p = 0.028$), indicating a negative and statistically significant relationship with tax aggressiveness at the 5% level. This result implies that hypothesis 2 (H02: Financial leverage has no significant effect on the tax aggressiveness of quoted oil and gas firms in Nigeria) is also rejected. The negative coefficient indicates that for every one-unit increase in financial leverage, the effective tax rate decreases by approximately 8.8%, confirming that higher leverage contributes to greater tax aggressiveness. This outcome reflects the tax-shield effect of debt financing, where firms benefit from interest expense deductions that reduce taxable income and consequently lower effective tax rates. The result is consistent with the empirical findings of Fagbemi and Olaoye (2021) and Nwidobie (2020), who documented that leveraged firms in Nigeria exhibit higher tax aggressiveness as they exploit debt-related deductions to optimize tax savings.

Although both profitability and financial leverage show significant negative effects on the effective tax rate, the interpretation of these results is complementary rather than contradictory. Profitability influences tax aggressiveness through the capacity and incentive for managers to



engage in strategic tax planning, while leverage impacts tax aggressiveness through structural financing decisions that provide legal tax deductions. Taken together, the findings suggest that more profitable and highly leveraged oil and gas firms in Nigeria are better positioned to engage in effective tax management strategies that minimize tax liability and enhance post-tax returns.

These results reinforce the predictions of Agency Theory, which emphasizes that managers act in shareholders' best interests by pursuing tax-efficient strategies that improve firm value. However, they also highlight the importance of maintaining ethical and transparent tax practices to avoid regulatory penalties and reputational risks associated with excessive tax aggressiveness.

Conclusion and Recommendations

This study examined the effect of firm attributes on the tax aggressiveness of quoted oil and gas firms in Nigeria, with tax aggressiveness proxied by the effective tax rate (ETR). The proxies for firm attributes were profitability and financial leverage, reflecting how efficiently firms generate returns and structure their financing to manage tax obligations. The findings revealed that both profitability and financial leverage are significant determinants of corporate tax aggressiveness within Nigeria's oil and gas sector.

Specifically, profitability exhibited a negative and significant effect on ETR. This indicates that firms with higher profitability tend to engage in greater tax aggressiveness, resulting in lower effective tax rates. The result suggests that profitable firms have stronger incentives and greater capacity to minimize tax liabilities through strategic tax planning and the utilization of allowable tax reliefs, deductions, and investment credits. Consequently, efficient management of earnings supports the reduction of tax burdens and enhances post-tax profitability, which aligns with the Agency Theory that emphasizes the alignment of managerial decisions with shareholder wealth maximization objectives. It is therefore recommended that management should implement transparent and compliant tax planning frameworks that legitimately minimize tax obligations while improving firm value. Firms should also take advantage of available tax incentives under Nigerian tax laws to enhance financial efficiency and sustain long-term growth.

Conversely, financial leverage showed a negative and significant effect on ETR. This implies that firms with higher levels of debt financing are more tax aggressive, as the tax-deductibility of interest expenses reduces taxable income. High leverage allows firms to benefit from debt-related tax shields, which lower the effective tax rate and enhance after-tax returns. This result suggests that the capital structure of oil and gas firms plays a crucial role in shaping their tax behavior, as debt financing provides an effective mechanism for tax savings. The finding is consistent with the Trade-Off Theory, which posits that firms balance the benefits of tax shields from debt against the potential costs of financial distress. Hence, it is recommended that management maintain an optimal capital structure that maximizes tax efficiency without exposing the firm to undue financial risk. Firms should also regularly assess their debt policies to ensure that borrowing decisions contribute positively to both financial performance and tax efficiency.



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