How does Debt Tax Shield Moderate Corporate Governance Mechanisms and Income Tax Compliance in Nigerian Listed Companies?

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Abstract

This study investigated how debt tax shields (DTS) moderate the relationship between corporate governance mechanisms and income tax compliance in Nigerian listed firms. Amid persistent tax revenue shortfalls and evolving corporate governance reforms, understanding the interplay between governance structures and financial strategies has become crucial in emerging markets. Using a panel dataset of 92 non-financial firms listed on the Nigerian Exchange Group (NGX) from 2013 to 2022, the study adopts fixed-effects regression models to examine the direct and moderating effects of three key governance mechanisms: board gender diversity (BGD), audit committee size (BAC), and managerial ownership (MO) on income tax compliance, proxied by the effective tax rate (ETR). Findings reveal that BAC positively and significantly influences tax compliance in most model specifications, reinforcing the importance of board-level oversight. MO is significant in selected models, supporting the incentive alignment argument, though not consistently across all specifications. BGD does not exhibit a direct effect but demonstrates a significant positive interaction with DTS, suggesting that gender-diverse boards are more effective in leveraged firms where financial complexity heightens compliance risk. Among the control variables, profitability (ROA) and firm size (Fsize) consistently predict higher tax compliance, while leverage (LEV), DTS, and industry classification (IND) show no direct effects. The study concludes that governance mechanisms do not operate in isolation but are conditioned by firms' capital structures. Policymakers and regulators are advised to integrate governance reforms with financial risk profiling for enhanced compliance enforcement.

Keywords: corporate governance, debt tax shield, tax compliance, board gender diversity, emerging markets

1. Introduction

Corporate governance and income tax compliance are central to sustainable economic development in emerging markets such as Nigeria, where weak institutional structures and fiscal constraints hinder economic growth. Nigeria's dependence on tax revenue to fund public goods and infrastructure has intensified in recent years, yet tax evasion and avoidance among corporations remain endemic. Despite policy advances, such as the introduction of the Financial Reporting Council of Nigeria (2018), which emphasises board independence, accountability, and financial transparency, tax compliance outcomes remain suboptimal. According to Momoh (2018), available records from the Federal Inland Revenue Service indicate that of over 440,000 registered companies in Nigeria, only about 120,000 were paying taxes, implying that approximately 320,000 firms (or over 70%) were non-compliant with tax obligations. This troubling paradox, progressive governance frameworks coexisting with widespread tax non-compliance, raises pressing questions about which governance mechanisms effectively enhance compliance and how financial strategies such as debt financing shape this relationship.

Empirical literature examining the governance–compliance nexus reveals three notable gaps. First, the overwhelming focus of prior studies has been on developed economies (Chen et al., 2010; Lanis & Richardson, 2011), where institutional enforcement and tax audit systems differ markedly from those of Nigeria. Second, the findings regarding specific governance attributes, particularly board gender diversity, audit committee structure, and managerial ownership, are mixed and context-contingent, indicating the need for evidence rooted in African realities (Okike, 2007; Salaudeen & Ejeh, 2018). Third, while the debt tax shield (DTS) is a well-established concept in corporate finance (Modigliani & Miller, 1963), its moderating role in governance–tax behaviour relationships remain under-theorised, especially in emerging markets characterised by financial opacity and institutional fragility.

In response to these gaps, this study sets out five core objectives:

(1) To evaluate the direct effect of board gender diversity (BGD) on corporate income tax compliance.

(2) To examine how audit committee size (BAC) influences the rigour of tax reporting and oversight.

(3) To determine the effect of managerial ownership (MO) in aligning executive incentives with tax compliance.

(4) To investigate how DTS moderates the relationship between governance mechanisms (BGD, BAC, MO) and income tax compliance.

These objectives reflect a dual concern: identifying effective internal governance levers to combat tax evasion and understanding whether firms utilise DTS as a substitute for or complement to governance safeguards.

This study offers three significant contributions to the literature and policy discourse. First, it provides context-sensitive empirical evidence on corporate governance and tax compliance dynamics in Nigeria, addressing the imbalance in Western-dominated scholarship. Second, it introduces DTS as a novel moderating variable in tax compliance research, thus deepening understanding of how capital structure choices interact with governance mechanisms (Kliestik et al., 2018). Third, the study applies a multidisciplinary theoretical framework by integrating agency theory, institutional theory, and the benefit theory of taxation. While Agency Theory explicates how managerial ownership aligns executive behaviour with shareholder interests (Jensen & Meckling, 1976), Institutional Theory highlights the role of regulatory and normative pressures (Scott, 1995), and the Benefit Theory situates tax compliance within the social contract between firms and the state (Musgrave & Musgrave, 1989).

The remainder of the paper is organised as follows. Section 2 reviews relevant theoretical and empirical literature on corporate governance, tax compliance, and the role of debt tax shields. Section 3 outlines the research methodology, including the data source, variable definitions, and model specifications. Section 4 presents and discusses the empirical results. Section 5 concludes the study and offers recommendations for policy and future research.

2. Literature Review

2.1 Theoretical Framework

This study is anchored in three interrelated theoretical lenses: Agency Theory, Institutional Theory, and the Benefit Theory of Taxation. Agency Theory (Jensen & Meckling, 1976) provides a foundational understanding of corporate governance mechanisms by addressing principal-agent conflicts. It posits that misaligned incentives between managers (agents) and shareholders (principals) can lead to opportunistic behaviours, including tax evasion. Governance mechanisms such as managerial ownership (MO), board gender diversity (BGD), and audit committees (BAC) mitigate these conflicts by aligning managerial interests with shareholder value and enhancing oversight. For instance, MO reduces agency costs by incentivizing managers to prioritize long-term stability over short-term tax risks, while BGD and BAC strengthen monitoring, curbing aggressive tax strategies that jeopardize firm reputation.

Institutional Theory (Scott, 1995) complements this by emphasizing external pressures that shape corporate behaviour. Firms conform to legal, normative, and cultural expectations to maintain legitimacy. In Nigeria, compliance is influenced by regulatory bodies like the Federal Inland Revenue Service (FIRS) and normative pressures from investors demanding transparency. However, weak enforcement and corruption weaken institutional efficacy, creating an environment where governance mechanisms become critical substitutes for external oversight. This theory also explains sectoral variations, as firms in regulated sectors (e.g., banking) face stricter scrutiny, potentially heightening compliance.

The benefit theory of taxation links compliance to taxpayers' perceived reciprocity between tax contributions and public goods provision. In contexts like Nigeria, where mismanagement of public funds erodes trust, firms may view taxes as a loss rather than an investment in infrastructure. Strong corporate governance counteracts this by fostering a long-term perspective, where compliance is seen as contributing to economic stability—a benefit aligning with shareholder interests.

Debt tax shields (DTS) intersect with these theories by introducing financial strategy as a moderating variable. Agency Theory suggests that high DTS firms, under creditor scrutiny, may prioritise compliance to avoid penalties exacerbating financial distress. Institutional theory highlights how DTS usage interacts with regulatory legitimacy, while benefit theory implies that firms leveraging legal tax shields may feel less compelled toward illicit avoidance. Collectively, these theories provide a multifaceted framework to analyse how governance mechanisms, institutional pressures, and financial strategies jointly shape tax compliance in Nigeria's evolving corporate landscape.

2.2 Empirical Review

2.2.1 Board Gender Diversity and Income Tax Compliance

Board gender diversity (BGD), reflecting the inclusion of women on corporate boards, is increasingly linked to ethical governance and rigorous oversight. Research suggests female directors exhibit greater risk aversion and conscientiousness, fostering conservative financial practices and reducing tolerance for malfeasance (Adams & Ferreira, 2009). Their participative leadership style enhances decision-making quality, mitigating "groupthink" and curbing aggressive tax strategies (Eagly & Johannesen-Schmidt, 2001). Psychological studies further indicate women's heightened adherence to rules, with female managers demonstrating meticulous tax compliance (Kastlunger et al., 2010).

Empirical evidence from emerging markets supports these assertions. In Pakistan and Tunisia, higher female board representation correlated with reduced tax avoidance, underscoring BGD's role in restraining aggressive planning (Zemzem & Ftouhi, 2013). Nigerian studies echo this trend, showing gender-diverse boards associate with lower tax planning and higher compliance (Salaudeen & Ejeh, 2018; Zachariah et al., 2020). However, findings in Western contexts and China reveal nuances: while female CFOs reduced risky tax strategies, CEOs' gender showed negligible effects on tax-related decisions, suggesting that role-specific responsibilities may standardise executive behaviour regardless of gender. This aligns with findings by Eagly and Johnson (1990). Institutional factors, such as regulatory norms and diversity thresholds, may explain disparities.

Theoretical lenses reinforce these observations. Agency theory posits that BGD strengthens board monitoring, curbing managerial opportunism in tax practices. Institutional theory highlights BGD's role in legitimising firms, aligning with governance norms, and deterring non-compliance to protect reputation. In Nigeria, where BGD remains low but rising, these dynamics are critical for fostering fiscal accountability. On this basis we hereby propose our first hypothesis that

Hypothesis (H_1): Companies with greater board gender diversity exhibit higher income tax compliance among Nigerian listed firms.

2.2.2 Board Audit Committee Size and Tax Compliance

Audit committees play a critical role in ensuring financial transparency and regulatory adherence, with committee size potentially influencing oversight efficacy. A larger audit committee may enhance expertise diversity and bandwidth to scrutinise tax practices, yet risks coordination inefficiencies or diluted accountability (Harrison, 1987). Empirical evidence remains mixed: Indonesian state-owned firms with larger committees exhibited higher compliance due to expanded oversight capacity (Suhardianto & Nurjanah, 2021), and similar findings by Muslih (2019) suggest that larger audit committees can enhance overall governance performance in SOEs through broader monitoring functions. However, Nigerian and Omani studies found no significant link, emphasising that size alone may not suffice without expertise or diligence (Omesi & Appah, 2021).

In Nigeria, audit committees are mandated under the 2018 governance code to include financially literate members, amplifying their role in risk management. However, compliance outcomes hinge on functionality—active engagement with auditors and management, rather than mere size, drives conservative accounting (Ugbah et al., 2023). For instance, audit committees with financial experts or frequent meetings are more effective at curbing aggressive tax strategies, as enhanced financial expertise improves oversight and accountability (Alqatan, et al., 2024). This suggests that while size can expand oversight potential, its impact is contingent on committee quality and operational rigour.

Theoretical perspectives reinforce this duality. Agency theory posits that larger committees may strengthen monitoring of managerial tax decisions, whereas institutional theory highlights compliance as a response to regulatory pressures and legitimacy concerns. In Nigeria's context, where enforcement gaps persist, audit committees serve as vital internal safeguards. Yet, their effectiveness may vary with firm-specific complexities, such as high debt tax shields (DTS). Firms leveraging substantial interest deductions require nuanced tax oversight, where a larger committee's collective expertise could mitigate risks of aggressive tax planning. Consequently, we propose a second hypothesis thus:

H_2: Larger board audit committees are associated with higher income tax compliance among Nigerian listed firms.

2.2.3 Managerial Ownership and Tax Compliance

Managerial ownership (MO)—the equity stake held by executives—serves as a governance mechanism aligning managerial and shareholder interests. Agency theory posits that MO reduces principal-agent conflicts by incentivising managers to prioritise long-term firm value over short-term gains, thereby curbing risky tax practices (Jensen & Meckling, 1976). Moderate MO fosters a "convergence of interests," where owner-managers avoid aggressive tax strategies to prevent penalties or reputational harm (Khan et al., 2017). However, excessive ownership may trigger entrenchment, empowering managers to pursue tax avoidance for personal gain, particularly if oversight is weak (Desai & Dharmapala, 2006).

Empirical evidence reflects this duality. In Nigeria, Salaudeen and Ejeh (2018) observed a weak correlation between high MO and tax aggressiveness, suggesting entrenchment risks in concentrated ownership structures. Conversely, Tijjani and Zachariah (2020) linked broader insider ownership to improved tax transparency, aligning with agency theory's alignment effect. International studies, such as McGuire et al. (2014), found U.S. firms with higher CEO ownership avoided tax shelters, fearing value erosion. These mixed outcomes underscore context-specific dynamics, particularly in emerging markets like Nigeria, where enforcement uncertainties amplify governance challenges.

In Nigeria, MO levels typically range from moderate (5–30%) rather than extreme (>50%), favouring the alignment perspective. Owner-managers with vested stakes may prioritise compliance to safeguard personal investments and sustain growth, especially under creditor scrutiny in leveraged firms. However, high debt could pressure managers to exploit tax shields aggressively, assessing the alignment effect. Based on this review we propose that:

H_3: Higher managerial ownership is associated with greater income tax compliance among Nigerian listed firms.

2.2.4 Debt Tax Shields and the Moderation of Governance–Compliance Relationships

Corporate tax compliance in emerging economies like Nigeria is shaped by the interplay of governance mechanisms and financial strategies, with debt tax shields (DTS) emerging as a pivotal moderating variable. DTS, derived from the tax deductibility of interest expenses, offers firms a legal avenue to reduce taxable income, aligning with Modigliani and Miller's (1963) proposition on the tax advantages of debt. However, its interaction with governance structures—board gender diversity, audit committee size, and managerial ownership—introduces complexity. While DTS inherently lowers tax liability, its role in moderating governance-compliance dynamics remains underexplored, particularly in contexts like Nigeria, where weak regulatory enforcement and capital structure complexities coexist.

Agency theory emphasises that governance mechanisms mitigate principal-agent conflicts, but their efficacy may vary with financial strategies. For instance, gender-diverse boards, known for ethical oversight, may exercise heightened scrutiny in high-DTS firms to ensure that interest deductions are utilised responsibly, avoiding aggressive tax avoidance. Similarly, larger audit committees may enhance compliance in leveraged firms by rigorously reviewing the tax implications of debt-related transactions, such as interest accruals and expense classifications. Managerial ownership, which aligns executive incentives with long-term firm value, could further amplify compliance in high-DTS firms, as owner-managers prioritise avoiding penalties that might exacerbate financial distress. Conversely, weak governance in high-DTS firms might enable opportunistic behaviour, where managers exploit debt-related tax benefits while engaging in riskier tax strategies.

Institutional theory adds another layer, highlighting external pressures from creditors and regulators. Highly leveraged firms face intensified scrutiny, as creditors demand transparency and tax compliance to mitigate default risks. This external oversight may reinforce internal governance mechanisms, creating a synergistic effect. However, Nigeria's institutional environment, marked by inconsistent enforcement, complicates this dynamic. Firms may perceive DTS as a substitute for aggressive tax avoidance, leveraging legal deductions to minimise liability without crossing into illegality. Yet, without robust governance, high DTS could incentivise complacency or even encourage managers to pursue additional tax avoidance measures.

Prior studies have largely examined governance and tax compliance in isolation, neglecting how financial strategies like DTS moderate these relationships. In Nigeria, where debt financing is widespread, this gap is critical. Research by Kolawole et al. (2024) on board independence in Nigerian banks hints at such interactions but does not directly address DTS. Similarly, international studies on DTS focus on capital structure implications rather than compliance behaviour. This study fills this void by integrating agency and institutional theories to analyse how DTS amplifies or dampens governance efficacy. Consequently, we propose the last hypothesis of this study thus:

H_4: The debt tax shield positively moderates the relationship between corporate governance mechanisms (board gender diversity, audit committee size, managerial ownership) and income tax compliance among Nigerian listed firms.

3. Methodology

3.1 Research Design and Sample

This study employs a quantitative research design, utilising panel data to examine the relationship between corporate governance mechanisms, debt tax shields (DTS), and income tax compliance among Nigerian listed firms. The sample comprises companies listed on the Nigerian Exchange Group (NGX) between 2013 and 2022, selected to ensure data availability and consistency After applying filters for incomplete financial records and delisted entities, the final sample consists of 92 firms, yielding 1012 firm-year observations. Data were sourced from annual reports, audited financial statements, and the NGX database, supplemented by regulatory filings from the Securities and Exchange Commission (SEC) and the Federal Inland Revenue Service (FIRS).

Table 1. Variable Measurement Table

Variable	Description	Measurement/Proxy	Expected Sign
ETR (Tax Compliance)	Effective tax rate	Income tax expense / Profit before tax	Dependent
BGD	Board gender diversity	% of female directors on the board	+
BAC	Board audit committee size	Total number of audit committee members	+
MO	Managerial ownership	% of shares held by executive and non-executive directors	+
DTS	Debt tax shield	Interest expense / Total assets	Moderator
FSIZE	Firm size	Natural log of total assets	Control
ROA	Profitability	Net income / Total assets	Control
LEV	Leverage	Total debt / Equity	Control
Industry	Sectoral dummies	Dummy variables for industry classification (Financial sector = 1; other = 0)	Control

Source: Authors' compilation

All study variables are summarised in Table 1, including their definitions, proxies, and expected effects. The econometric design applies a fixed-effects panel regression, incorporating interaction terms between debt tax shield (DTS) and governance mechanisms to test for moderation. Robust standard errors clustered at the firm level address autocorrelation and heteroscedasticity, while the Hausman test and lagged predictors enhance model validity. Hypotheses are tested at the 5% significance level using Stata 18.

3.2 Estimation Techniques and Model Specification

To test the study hypotheses, panel data regression models were estimated using the fixed-effects estimator, justified by the Hausman test, which confirmed correlation between unobserved firm-level effects and the regressors. Four models were specified to capture direct effects and potential moderating effects of debt tax shields (DTS) on the relationship between governance mechanisms and income tax compliance. Robust standard errors were applied to control for heteroskedasticity, as confirmed by the Breusch–Pagan/Cook–Weisberg test. The dependent variable is the natural logarithm of effective tax rate (lgETR), which helps address skewness in the distribution of tax compliance data.

The estimation strategy proceeds as follows:

Model 1 (Baseline Model) estimates the direct effects of governance mechanisms and firm-level controls:

$$lgETR_{it} = \beta 0 + \beta_1 BGD_{it} + \beta_2 BAC_{it} + \beta_3 MO_{it} + \beta_4 lgDTS_{it} + \beta_5 LEV_{it} + \beta_6 ROA_{it} + \beta_7 Fsize_{it} + \beta_8 IND_{it} + \varepsilon_{it} \quad (1)$$

Model 2 (Moderation by Audit Committee Size) adds the interaction term between BAC and DTS:

$$lgETR_{it} = \beta 0 + \beta_1 BGD_{it} + \beta_2 BAC_{it} + \beta_3 MO_{it} + \beta_4 lgDTS_{it} + \beta_5 LEV_{it} + \beta_6 ROA_{it} + \beta_7 Fsize_{it} + \beta_8 IND_{it} + \beta_9 (BAC_{it} \times lgDTS_{it}) + \varepsilon_{it} \quad (2)$$

Model 3 (Moderation by Managerial Ownership) incorporates the interaction between MO and DTS:

$$lgETR_{it} = \beta 0 + \beta_1 BGD_{it} + \beta_2 BAC_{it} + \beta_3 MO_{it} + \beta_4 lgDTS_{it} + \beta_5 LEV_{it} + \beta_6 ROA_{it} + \beta_7 Fsize_{it} + \beta_8 IND_{it} + \beta_9 (MO_{it} \times lgDTS_{it}) + \varepsilon_{it} \quad (3)$$

Model 4 (Moderation by Board Gender Diversity) includes the interaction between BGD and DTS:

$$lgETR_{it} = \beta 0 + \beta_1 BGD_{it} + \beta_2 BAC_{it} + \beta_3 MO_{it} + \beta_4 lgDTS_{it} + \beta_5 LEV_{it} + \beta_6 ROA_{it} + \beta_7 Fsize_{it} + \beta_8 IND_{it} + \beta_9 (BGD_{it} \times lgDTS_{it}) + \varepsilon_{it} \quad (4)$$

The use of multiple interaction models is justified by the need to evaluate the conditional influence of each governance mechanism independently. Since board gender diversity, audit committee size, and managerial ownership represent distinct dimensions of corporate governance, combining all interactions in a single model could inflate multicollinearity and obscure the unique moderating role of DTS on each mechanism. By estimating separate models for each interaction term, this approach enhances interpretability, isolates the marginal effects of each governance construct, and ensures more robust statistical identification. Furthermore, the disaggregated strategy allows for a clearer assessment of how different aspects of governance respond to capital structure dynamics under Nigeria's institutional environment.

4. Results and Discussion

4.1 Descriptive Statistics

Table 2 presents the summary statistics of the variables used in this study. The effective tax rate (lgETR), which is the natural logarithm of the effective tax burden, has a mean of -0.3405 and a standard deviation of 0.9778, with a minimum of -4.4969 and a maximum of 3.227. This widespread indicates notable variability in tax compliance levels across firms and over time. Board gender diversity (BGD) has a mean value of 0.2124, with a range from 0.1667 to 0.6667, suggesting that female representation on boards, though present, varies significantly. The audit committee size (BAC) shows low dispersion, with a mean of 6.1245 and a standard deviation of 0.4996, clustered closely around the regulatory threshold.

Table 2. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
lgETR	1012	-.3405	.9778	-4.4969	3.227
BGD	1012	.2124	.0786	.1667	.6667
BAC	1012	6.1245	.4996	6	10
MO	1012	.2195	.2697	.0001	.9435
lgDTS	1012	8.9651	8.4289	0	21.525
LEV	1012	.171	.185	.235	3.1938
ROA	1012	.0282	.0971	-1.1465	.5396
Fsize	1012	17.237	2.3383	10.9757	23.4295
IND	1012	.3034	.4599	0	1

Source: Processed data from STATA 18

Managerial ownership (MO) records a mean of 0.2195, with values ranging from 0.0001 to 0.9435, indicating that some executives hold substantial equity stakes while others have almost none. The debt tax shield (lgDTS) has a relatively high average of 8.9651 and a wide standard deviation of 8.4289, reflecting variations in firms' debt financing strategies. Leverage (LEV), return on assets (ROA), and firm size (Fsize) show mean values of 0.171, 0.0282, and 17.237, respectively, with reasonable variability. Lastly, the industry dummy variable (IND) has a mean of 0.3034 and is coded as 1 for firms in the financial sector and 0 otherwise, indicating that approximately 30% of the sampled firms belong to the financial sector.

4.2 Correlation Matrix

Table 3 presents the pairwise correlation matrix for the key variables in this study. Most coefficients fall below the conventional multicollinearity threshold of |0.7|, suggesting minimal risk of biased regression estimates. This supports the appropriateness of including all variables in subsequent multivariate analyses.

Table 3. Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) lgETR	1.0000								
(2) BGD	-0.0273	1.0000							
(3) BAC	0.0803	0.0570	1.0000						
(4) MO	-0.0953	-0.0244	0.0042	1.0000					
(5) lgDTS	0.0124	-0.0111	0.0406	-0.0519	1.0000				
(6) LEV	-0.0261	0.0319	-0.0064	0.1413	0.0108	1.0000			
(7) ROA	0.3151	-0.0176	0.0746	-0.1593	0.0286	-0.2626	1.0000		
(8) Fsize	0.1229	0.0438	0.0913	-0.2948	0.2319	-0.1044	0.1165	1.0000	
(9) IND	0.0572	0.0288	0.0076	-0.0268	-0.3301	-0.1161	-0.0093	0.4308	1.0000

Source: Processed data from STATA 18

Notably, return on assets (ROA) exhibits a moderate positive correlation with effective tax rate (lgETR) (r = 0.315), indicating that higher profitability aligns with greater tax compliance. Firm size (Fsize) shows a weak positive association with lgETR (r = 0.123), which may reflect heightened tax scrutiny for larger firms. Managerial ownership (MO), however, correlates negatively with both lgETR (r = -0.095) and Fsize (r = -0.295), suggesting that smaller, owner-managed firms may engage in more flexible tax planning.

The industry dummy (IND), representing financial sector firms, displays a moderate positive correlation with Fsize (r = 0.431), implying that financial firms in the sample tend to be larger. Conversely, IND correlates negatively with debt tax shields (lgDTS) (r = -0.330), hinting at reduced reliance on interest-based tax deductions in this sector. In all, the low-to-moderate correlations among variables reinforce the robustness of the regression models, as multicollinearity is unlikely to distort the results. These findings validate the reliability of the empirical specifications discussed in subsequent sections.

4.3 Regression Results and Discussion

Table 4 presents fixed-effects regression results across four models, each examining the interplay between governance mechanisms, debt tax shields (DTS), and income tax compliance. The discussion is guided by the study’s four hypotheses.

Table 4. Regression Results

	Model 1	Model 2	Model 3	Model 4
VARIABLES	Baseline	(BAC_DTS)	(MO_DTS)	(BGD_DTS)
BGD	-0.397	0.457	0.446	-0.106
	(0.418)	(0.577)	(0.581)	(0.638)
BAC	0.104***	0.0880	0.0986**	0.102**
	(0.0353)	(0.0534)	(0.0473)	(0.0478)
MO	-0.134	0.476**	0.350	0.428**
	(0.128)	(0.212)	(0.235)	(0.204)
lgDTS	-0.000363	-0.00270	0.00457	-0.00196
	(0.00383)	(0.0149)	(0.00531)	(0.00659)
LEV	0.397	0.874	0.905	0.875
	(0.299)	(0.574)	(0.580)	(0.583)
ROA	3.197***	2.774***	2.774***	2.811***
	(0.568)	(0.818)	(0.817)	(0.817)
Fsize	0.0263*	0.239***	0.230***	0.212***
	(0.0149)	(0.0760)	(0.0736)	(0.0742)
IND	0.0856	-0.333	-0.340	-0.334
	(0.0785)	(0.262)	(0.263)	(0.263)
BAC_lgDTS		0.00167		
		(0.00274)		
MO_lgDTS			0.0131	
			(0.0168)	
BGD_lgDTS				0.0557**
				(0.0256)
Constant	-1.497***	-5.385***	-5.270***	-4.876***
	(0.324)	(1.319)	(1.308)	(1.326)
Observations	1,012	1,012	1,012	1,012
R-squared	0.117	0.075	0.076	0.079
Number of ID	92	92	92	92

Robust standard errors in parentheses. Note *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Across all four models, board gender diversity (BGD) consistently shows no significant direct association with income tax compliance. In Model 1, BGD is negatively signed and statistically insignificant ($\beta = -0.397$), suggesting that gender diversity on its own does not influence firms' willingness to comply with tax obligations. In Models 2 and 3, the coefficients remain positive but statistically insignificant, further indicating the lack of a robust direct effect. Model 4 also fails to provide significant evidence of a direct association, with BGD remaining insignificant despite a change in sign. These results collectively suggest that, in the absence of conditioning variables, board gender diversity does not independently predict tax compliance among Nigerian listed firms. Therefore, Hypothesis 1 is not supported in any of the model specifications tested.

Audit committee size (BAC) demonstrates a generally positive and statistically significant effect on income tax compliance across three of the four models. In Model 1 (baseline), BAC is positively associated with tax compliance (coeff 0.104, $p < 0.01$), suggesting that larger audit committees improve oversight and reduce opportunities for tax manipulation. In Model 2, although the coefficient remains positive (0.0880), it is not statistically significant, indicating some attenuation of the effect when accounting for the DTS-related interaction. In Model 3, BAC regains statistical significance (coeff 0.0986, $p < 0.05$), and the effect remains stable and significant in Model 4 (coeff 0.102, p < $p<0.05$). These results provide partial support for Hypothesis 2, affirming that while audit committee size plays a vital role in reinforcing tax compliance, its influence may vary slightly depending on the broader model specification.

Managerial ownership (MO) shows no significant effect in Model 1 ($\beta = -0.134$), suggesting that, at the baseline level, executive equity stakes do not significantly influence tax compliance among Nigerian listed firms. In Model 2, however, MO becomes positive and statistically significant ($\beta = 0.476$, $p < 0.05$), indicating that managerial ownership may play a compliance-enhancing role when the interaction with audit oversight is considered. Model 3 shows a positive but insignificant coefficient for MO ($\beta = 0.350$), implying a persistent though not statistically robust effect. In Model 4, MO again attains statistical significance ($\beta = 0.428$, $p < 0.05$), reinforcing the possibility that managerial equity alignment contributes to tax compliance in more complex governance settings. Overall, these results offer partial support for Hypothesis 3: while the effect of managerial ownership is not consistently significant across all models, it becomes important in scenarios where governance dynamics are expanded. The findings align with agency theory by suggesting that executive shareholding may motivate compliance-enhancing behaviour under the right conditions.

Of the three interaction terms, only the BGD×DTS interaction in Model 4 is statistically significant ($\beta = 0.0557$, $p < 0.05$). This result suggests that the compliance-enhancing influence of board gender diversity is amplified when firms operate with higher levels of debt-related tax benefits. This may be due to the heightened ethical sensitivity and reputational consciousness that gender-diverse boards often bring to financial oversight, particularly in complex or high-risk financial environments where the use of debt amplifies scrutiny from both regulators and investors. The finding aligns with institutional theory, which posits that in the face of external pressures, such as creditor monitoring and regulatory expectations, firms tend to conform to legitimacy-enhancing governance practices. In highly leveraged contexts, female directors may advocate more forcefully for transparency and prudent tax behaviour, thereby strengthening overall compliance. The significance of this interaction supports the view that gender diversity on corporate boards becomes more impactful when financial risk is elevated, making it a conditional asset in the governance-tax compliance nexus. Therefore, Hypothesis 4 receives partial but theoretically meaningful support.

5. Control Variables and Model Fit

Return on assets (ROA) demonstrates a robust positive relationship with tax compliance across all models (β = 2.77–3.20, $p < 0.01$), underscoring profitability as a critical determinant of tax adherence. This aligns with the notion that financially stable firms are better positioned to meet tax obligations and may face heightened scrutiny, incentivizing compliance. Firm size (Fsize) exhibits a marginally significant effect in Model 1 ($\beta = 0.026$, $p < 0.1$), but its impact strengthens substantially in subsequent models (β = 0.212–0.239, $p < 0.01$), suggesting that larger firms' compliance is driven by factors such as regulatory oversight, reputational risks, or advanced governance structures. In contrast, debt tax shields (lgDTS) and leverage (LEV) show no statistically significant effects, implying that neither interest deductions nor debt levels directly influence compliance behavior. Similarly, the industry dummy (IND), distinguishing financial from non-financial firms, remains insignificant across all specifications (β = -0.334–0.086), indicating that sector-specific dynamics do not meaningfully affect compliance once firm-level characteristics are accounted for.

Though the models' explanatory power is modest (R^2 = 0.075–0.117), the results consistently highlight profitability and firm size as primary drivers of tax compliance in Nigeria, while leverage and sector classification play negligible roles. These findings clarify the structural and economic conditions shaping corporate tax behaviour, offering insights into how governance mechanisms interact with firm-specific attributes in emerging markets.

5.1 Conclusion and Recommendations

This study investigated how debt tax shields (DTS) moderate the relationship between corporate governance mechanisms and income tax compliance among Nigerian listed firms. Using fixed-effects panel regression models on data from 92 firms over the period 2013–2022, the analysis provided new insights into the contextual role of financial leverage in shaping the governance–compliance nexus.

The findings reveal mixed evidence across governance constructs. Board gender diversity (BGD) was not a significant predictor of compliance in any model, indicating that the presence of female directors does not independently affect tax behaviour. However, its interaction with DTS was significant, suggesting that gender-diverse boards enhance compliance specifically in firms with high debt exposure. This underscores the importance of considering the financial environment when assessing the effectiveness of board diversity.

Audit committee size (BAC) consistently showed a positive influence on tax compliance in most models, lending strong support to governance frameworks that mandate adequate board oversight structures. Managerial ownership (MO) produced a significant positive effect in some models, indicating that when executives hold equity, they may be more inclined to align with regulatory expectations and long-term firm stability. Nonetheless, MO's influence was not consistent across specifications, and its interaction with DTS was not statistically significant.

Among the control variables, profitability (ROA) and firm size (Fsize) were found to be strong and consistent drivers of tax compliance. These results suggest that economically stronger and larger firms are more likely to comply, possibly due to increased scrutiny and reputational concerns. DTS itself had no significant direct effect on tax compliance, but its moderating role was confirmed in the case of BGD.

Recommendations:

(1) Regulators such as the Financial Reporting Council of Nigeria (FRCN) should strengthen codes encouraging gender diversity, especially for firms with complex capital structures. Targeted support for inclusive governance may yield better tax compliance outcomes where debt exposure is high.

(2) The Securities and Exchange Commission (SEC) and the Nigerian Exchange Group (NGX) should enforce and, where necessary, raise the minimum audit committee size, ensuring that these committees are well-resourced and competent to oversee tax planning practices.

(3) Firms should be encouraged to adopt ownership-based incentive structures for top executives. While managerial ownership did not consistently predict tax compliance, its positive effect in certain models suggests value in aligning managerial interests with regulatory accountability.

(4) The Federal Inland Revenue Service (FIRS) could use indicators such as profitability, firm size, and board structure to identify firms most at risk of non-compliance, particularly when debt-related tax planning tools are in use.

5.2 Limitations and Directions for Future Research

This study contributes to the growing literature on the role of corporate governance and financial strategy in shaping tax compliance in emerging markets. However, several limitations should be acknowledged to guide future research.

First, the study relies solely on secondary quantitative data obtained from audited financial reports and regulatory filings. This approach, while robust for numerical analysis, does not capture qualitative elements such as boardroom dynamics, ethical orientation, or managerial discretion in tax planning. Future studies could complement this work by adopting a mixed-methods design that integrates interviews or survey data to explore behavioural and institutional nuances behind tax compliance.

Second, while the fixed-effects regression model controls for unobserved heterogeneity across firms, it does not fully resolve potential endogeneity or reverse causality issues. For example, it is possible that firms with better compliance practices may be more likely to attract better governance structures. Future research should consider employing advanced econometric techniques such as instrumental variable regression, difference-in-differences analysis, or dynamic panel models to address these methodological challenges.

Third, the study uses effective tax rate (ETR) as a proxy for income tax compliance. Although widely adopted in the literature, ETR can be influenced by temporary accounting adjustments, deferred tax strategies, or sector-specific exemptions. Future research could improve precision by incorporating alternative measures such as book-tax differences, GAAP-effective tax rates, or bespoke tax aggressiveness indices.

In conclusion, while this study provides important empirical insights into the governance–compliance nexus, addressing these limitations in future work will further strengthen understanding of tax behaviour within and beyond Nigeria's capital market environment.

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