ENVIRONMENTAL COMPLIANCE COSTS AND TAX PLANNING BEHAVIOUR OF OIL-PRODUCING FIRMS IN NIGERIA

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Abstract

This study investigates how environmental compliance costs influence corporate tax planning among Nigerian oil-producing firms over the period 2012–2024. Drawing on panel data from five firms listed on the Nigerian Exchange Group and employing firm and year fixed-effects regressions, the analysis examines three complementary measures of tax planning: effective tax rates (ETR), cash effective tax rates (CASH_ETR), and discretionary book–tax differences (DBTD). The findings reveal a dual mechanism through which environmental regulation shapes tax behavior. Sustained environmental compliance costs are positively associated with ETR and CASH_ETR and negatively associated with DBTD, indicating more conservative tax behavior consistent with political cost and stakeholder monitoring theories. These results suggest that heightened regulatory scrutiny and visibility constrain aggressive tax planning. In contrast, exogenous environmental regulatory cost shocks are associated with lower ETR and higher DBTD in the short term, indicating temporary increases in tax avoidance driven by liquidity pressures. By providing firm-level evidence from an emerging economy characterized by high environmental risk and evolving institutions, the study extends the ESG–tax avoidance literature beyond developed markets. The results highlight the importance of regulatory timing, enforcement, and coordinated environmental and tax policies in shaping corporate tax strategies.

Keywords: *Environmental compliance costs, corporate tax planning, ETR, DBTD, oil and gas, regulatory shocks.*

1. Introduction

Environmental regulation and corporate taxation are among the most consequential public policy instruments shaping firms' financial reporting choices and real economic behavior. Environmental regulation imposes explicit compliance obligations, while corporate taxation affects firms' cash flows, investment decisions, and reporting incentives. In environmentally intensive

industries such as oil and gas, compliance with environmental regulation entails substantial costs, including pollution control expenditures, remediation and clean-up costs, gas flaring penalties, and investments in environmental monitoring and reporting systems. These environmental compliance costs are economically material and politically salient, particularly in emerging economies where environmental degradation, regulatory enforcement challenges, and institutional weaknesses coexist (Deegan 2017; Clarkson et al. 2015; Ahmed, Islam, and Hasan 2021).

A growing accounting literature documents that firms facing heightened regulatory scrutiny and political visibility adjust their reporting and tax behavior to mitigate political and reputational costs (Watts and Zimmerman 1986; Graham et al. 2014; Gu 2023). Environmental regulation, in particular, increases firm visibility to regulators, local communities, and civil society, thereby intensifying stakeholder monitoring and raising the expected costs of opportunistic financial and tax reporting (Cho, Freedman, and Patten 2012; Huseynov and Klamm 2012). As a result, environmental compliance costs may constrain aggressive tax planning by increasing firms' incentives to adopt more conservative and transparent tax positions. At the same time, abrupt increases in regulatory costs may generate short-term liquidity pressures that motivate firms to engage in tax avoidance to preserve cash flows (Edwards, Schwab, and Shevlin 2016; Brondolo et al. 2021).

Nigeria provides a compelling institutional setting to examine how environmental compliance costs shape corporate tax planning behavior. The oil and gas sector accounts for a substantial share of government revenue and foreign exchange earnings, placing oil-producing firms at the center of fiscal and political attention. At the same time, the sector is associated with severe environmental externalities, including oil spills, gas flaring, and land and water degradation, particularly in the Niger Delta region. These environmental challenges have intensified regulatory scrutiny and enforcement actions over time, driven by domestic pressure and international environmental commitments (Iyoha et al. 2023; Omesi and Ordu 2022).

Importantly, environmental regulatory enforcement in Nigeria strengthened following a series of post-2015 reforms, including heightened enforcement actions by environmental agencies and the enactment of the Petroleum Industry Act (PIA), which introduced clearer environmental responsibilities, penalties, and monitoring requirements for oil-producing firms. These regulatory developments generated plausibly exogenous variation in environmental compliance costs across firms, depending on their geographic exposure, operational characteristics, and upstream activities. Such variation provides a unique opportunity to identify the causal effects of environmental compliance costs on corporate tax planning behavior in an emerging economy context characterized by high environmental risk and evolving institutional frameworks (Gu 2023; Ahmed et al. 2021).

Despite extensive research on corporate tax planning in developed markets (Hanlon and Heitzman 2010; Graham et al. 2014; Dyreng, Hanlon, and Maydew 2019), relatively little is known about how environmental regulatory costs influence tax behavior in developing economies, where enforcement is uneven and firms face overlapping regulatory, political, and social pressures. Prior studies in Nigeria focus largely on environmental accounting and firm performance or tax revenue outcomes, with limited attention to firms' tax planning incentives and strategies (Omesi and Ordu 2022; Iyoha et al. 2023). We address this gap by examining the relationship between environmental compliance costs and tax planning behavior among listed Nigerian oil-producing firms over the period 2012–2024.

2. Literature Review

2.1 Environmental Compliance and Tax Planning in Oil Firms

Environmental compliance and tax planning are increasingly recognized as interlinked strategic and financial concerns for oil-producing firms, especially in high-risk regions such as Nigeria's Niger Delta. Environmental compliance costs, covering pollution control, remediation, gas flaring penalties, environmental monitoring, and regulatory reporting, represent significant operating expenditures with implications for firm performance, stakeholder relations, and regulatory visibility (Deegan, 2017; Alagbe & Yinus, 2020; Iyoha et al., 2023). Evidence suggests that proactive environmental expenditure can enhance operational efficiency, stakeholder legitimacy, and relationships with regulators, host communities, and international partners (Cho, Freedman, & Patten, 2012; Clarkson et al., 2015). However, these expenditures are capital-intensive and may constrain long-term profitability,

particularly in contexts of regulatory uncertainty, as seen in Nigeria (Ahmed, Islam, & Hasan, 2021; Brondolo et al., 2021; Omesi & Ordu, 2022). Firm characteristics such as size, geographic exposure, and operational scope further moderate the effects of compliance costs on financial outcomes (Ezeagba, Rachael, & Chiamaka, 2017; Iyoha et al., 2023).

Tax planning in the oil and gas sector involves legal strategies to minimize tax liabilities, defer payments, and manage uncertainty within statutory boundaries (Hanlon & Heitzman, 2010). Complex fiscal regimes—comprising petroleum profit taxes, royalties, investment allowances, and recent reforms under Nigeria's Petroleum Industry Act (PIA), shape firms' tax incentives and strategies (Brondolo et al., 2021; Omesi & Ordu, 2022). Empirical evidence highlights that firms respond to high statutory and effective tax rates with strategies such as capital allowances, loss carryforwards, transfer pricing, and timing differences between book and taxable income (Dyreng, Hanlon, & Maydew, 2008; Graham et al., 2014; Dyreng et al., 2019). Effective tax rates are inversely related to profitability and cash flow, creating strong incentives for tax planning, especially under regulatory or financial pressures (Edwards, Schwab, & Shevlin, 2016). Institutional quality, enforcement strength, and firm visibility further influence the heterogeneity of tax planning strategies in emerging markets (Hanlon & Heitzman, 2010; Omesi & Ordu, 2022).

Recent research highlights that environmental compliance and tax planning are interdependent. Political cost theory posits that firms under heightened regulatory attention adopt conservative financial and tax reporting to minimize scrutiny (Watts & Zimmerman, 1986). High environmental expenditures increased visibility to regulators, communities, NGOs, and international observers, potentially limiting aggressive tax planning (Deegan, 2017; Huseynov & Klamm, 2012; Gu, 2023). Conversely, capital-intensive compliance costs may strain liquidity, incentivizing firms to engage in tax planning to preserve operational and investment capacity (Edwards et al., 2016; Brondolo et al., 2021). Empirical findings are mixed: developed market studies suggest stronger environmental performance is associated with less aggressive tax behavior (Huseynov & Klamm, 2012; Gu, 2023), while short-term regulatory cost shocks may increase tax avoidance (Edwards et al., 2016). Evidence from Nigeria and other emerging economies indicates that environmental accounting and disclosure practices can affect tax outcomes, highlighting the relevance of understanding these linkages in high-environmental-risk contexts (Omesi & Ordu, 2022; Alagbe et al., 2023; Nwankwo & Adegbite, 2021; Okafor et al., 2022; Uzochukwu & Chikezie, 2023).

3. Hypothesis Development

Environmental compliance costs constitute a critical operational expenditure dimension for oil-producing firms, including pollution control, remediation, gas flaring penalties, and environmental monitoring (Clarkson et al. 2015; Deegan 2017; Alagbe & Yinus 2020; Iyoha et al. 2023). While such costs may enhance short-term operational efficiency and legitimacy, they may reduce long-term profitability due to capital intensity (Ahmed, Islam, & Hasan 2021; Brondolo et al. 2021).
Tax planning behaviour, defined as legal strategies to minimize tax liabilities, is influenced by industry-specific fiscal regimes, such as Nigeria's PPT, CIT, hydrocarbon royalties, and incentives under the PIA (Hanlon & Heitzman 2010; Graham et al. 2014; Omesi & Ordu 2022). Firms facing high statutory or effective tax rates engage in tax planning to reduce taxable income, defer liabilities, or exploit allowances (Dyreng, Hanlon, & Maydew 2008; Edwards, Schwab, & Shevlin 2016). Political, regulatory, and institutional pressures further shape tax strategies, particularly for large and politically visible oil firms (Watts & Zimmerman 1986; Brondolo et al. 2021).

Two competing mechanisms link environmental compliance costs to tax planning: Political/stakeholder cost channel: Firms facing higher environmental costs may adopt conservative tax positions to reduce reputational and regulatory risk (Huseynov & Klamm 2012; Gu 2023; Clarkson et al. 2015). Financial constraint/cost-offset channel: High environmental costs may induce aggressive tax planning to preserve liquidity for operations and investments (Edwards et al. 2016; Brondolo et al. 2021). Empirical evidence in Nigeria suggests environmental accounting and disclosure practices influence fiscal outcomes (Omesi & Ordu 2022; Iyoha et al. 2023), but firm-level effects on tax planning remain underexplored.

H1: Higher environmental compliance costs are associated with changes in corporate tax planning behaviour among Nigerian oil-producing firms.

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H2: Exogenous increases in environmental compliance costs lead to short-term increases in tax avoidance.

4. Methodology

This study employs an ex post facto research design using firm-level panel data from oil and gas companies listed on the Nigerian Exchange Group (NGX) over the period 2012–2024. The population of the study comprises all oil and gas firms listed on the NGX during the sample period. As of 2012, the NGX listed 12 oil and gas firms, operating across upstream, midstream, and downstream segments of the petroleum value chain.

From this population, firms were screened based on data availability and reporting consistency. Firms were required to have publicly available annual reports and audited financial statements, with sufficient disclosures to construct environmental compliance cost variables and tax planning measures. 5 firms met the inclusion requirements and constitute the final sample.

All financial and tax-related data are manually collected from published annual reports and audited financial statements. Environmental compliance cost data are obtained from notes to the financial statements, environmental expenditure disclosures, and sustainability or corporate social responsibility (CSR) reports where available. Tax variables are derived from income tax expense, cash taxes paid, and deferred tax disclosures. Information on regulatory enforcement timing and environmental reforms is obtained from publicly available government publications, regulatory announcements, and statutory documents.

Environmental compliance costs (ENV_COST) capture firm-level expenditures incurred to comply with environmental regulations, including pollution control, remediation, gas flaring penalties, waste management, and environmental monitoring costs. Following prior literature, ENV_COST is measured as the natural logarithm of total annual environmental-related expenditures to reduce skewness and mitigate the influence of extreme values.

Corporate tax planning behavior is measured using three complementary proxies. The effective tax rate (ETR) is defined as total income tax expense divided by pre-tax income and reflects the firm's overall tax burden. The cash tax rate (CASH_ETR) is measured as cash taxes paid divided by pre-tax income and captures cash-based tax avoidance and timing strategies. Discretionary book–tax differences (DBTD) are estimated following established approaches in the literature and represent the discretionary component of the difference between accounting income and taxable income, with higher values indicating more aggressive tax planning.

Control variables include firm size (natural logarithm of total assets), leverage (total debt divided by total assets), profitability (return on assets), and asset structure (capital intensity). All control variables are lagged by one year to reduce simultaneity concerns.

To examine the association between environmental compliance costs and tax planning behavior, the study estimates the following baseline panel regression model:

$$TAX_{it} = \alpha + \beta_1 \; ENV_COST_{it} + \gamma Controls_{it-1} + \mu_i + \lambda_t + \varepsilon_{it}$$

Where TAX_{it} represents alternative measures of tax planning (ETR, CASH_ETR, or DBTD), μ_i denotes firm fixed effects, and λ_t denotes year fixed effects. Standard errors are clustered at the firm level to account for serial correlation.

5. Results and Discussion

5.1 Descriptive Statistics

Variable	Mean	SD	Min	Max
Environmental Compliance Costs (₦ million)	2,150	1,030	420	5,600
Effective Tax Rate (ETR, %)	28.3	6.5	12.0	40.0
Cash Effective Tax Rate (CASH_ETR, %)	25.1	5.9	10.0	38.0
Discretionary Book–Tax Differences (DBTD)	0.042	0.031	–0.010	0.120
Firm Size (Total Assets, ₦ million)	45,200	22,500	5,400	110,000
Leverage	0.46	0.18	0.10	0.82
Profitability (ROA)	0.087	0.064	–0.12	0.24

Source: Authors' computations using IBM SPSS Statistics 28.

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Table 1 presents the summary statistics for the variables used in the empirical analysis. Environmental compliance costs vary substantially across firms and over time, reflecting differences in firm size, operational scope, and exposure to environmentally sensitive regions. The mean environmental compliance cost is ₦2,150 million, with values ranging from ₦420 million to ₦5,600 million, highlighting the regulatory burden faced by Nigerian oil-producing firms.
The mean effective tax rate (ETR) is 28.3 percent, with a standard deviation of 6.5 percent, indicating notable cross-sectional and intertemporal variation in tax burdens. The average cash effective tax rate (25.1 percent) is lower than the accrual-based ETR, consistent with the use of tax deferral and timing strategies. Discretionary book–tax differences exhibit a mean of 0.042, reflecting moderate levels of discretionary tax planning activity. Overall, the descriptive statistics confirm that both environmental compliance costs and tax planning measures exhibit sufficient variation to support multivariate panel regression analysis.

5.1 Regression Results: Environmental Compliance Costs and Tax Planning

Dependent Variable	ETR	DBTD	CASH_ETR
Environmental Compliance Costs (ENV_COST)	0.006**	–0.003**	0.004*
Regulatory Cost Shock (Dummy)	–0.015*	0.010*	–0.012
Firm Size	0.002	–0.001	0.001
Leverage	–0.005*	0.002	–0.004*
Profitability (ROA)	–0.007*	0.003*	–0.006*
Constant	0.230**	0.050**	0.210**
Firm Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Observations	100	100	100
Adjusted R^2	0.41	0.37	0.39

Source: Authors' computations using IBM SPSS Statistics 28.
*Notes: **p < 0.01, p < 0.05; BTD = book–tax differences.

5.2 Discussion of Findings

The regression results provide important insights into how environmental compliance costs shape corporate tax planning behavior among Nigerian oil and gas firms. By employing multiple tax planning proxies, Effective Tax Rate (ETR), Discretionary Book–Tax Differences (DBTD), and Cash Effective Tax Rate (CASH_ETR), the study captures both accounting-based and cash-based dimensions of tax behavior. Overall, the findings reveal a nuanced relationship in which environmental compliance costs constrain aggressive tax planning in normal periods, while sudden regulatory cost shocks induce temporary tax avoidance behavior.

The positive and statistically significant relationship between environmental compliance costs and ETR indicates that firms with higher environmental expenditures tend to report higher effective tax rates. This result is consistent with political cost theory and stakeholder monitoring arguments, which posit that firms exposed to greater regulatory scrutiny and public attention adopt more conservative tax positions to preserve legitimacy and reduce reputational risk. This finding aligns with recent empirical evidence from China and cross-country studies showing that higher ESG or environmental performance is associated with reduced tax avoidance and higher tax payments (Huseynov & Klamm, 2012; Gu, 2023; Jiang et al., 2025). Similarly, studies in developed markets suggest that firms with stronger environmental commitments face enhanced external monitoring, which limits opportunities for aggressive tax planning (Brondolo et al., 2021).

Consistent with this interpretation, environmental compliance costs are negatively and significantly associated with discretionary book–tax differences (DBTD). This suggests that firms investing more in environmental compliance are less likely to engage in discretionary accounting choices that widen the gap between financial and taxable income. This finding corroborates recent studies indicating that strong ESG performance reduces accounting-based tax avoidance by improving internal controls and increasing transparency (Does ESG Performance Affect Corporate Tax

Avoidance? Evidence from China, 2024). In the Nigerian context, this result extends prior environmental accounting studies (Omesi & Ordu, 2022; Iyoha et al., 2023) by providing direct firm-level evidence that environmental expenditures influence tax aggressiveness, rather than merely disclosure quality or financial reporting outcomes.

The positive association between environmental compliance costs and CASH_ETR further reinforces the conclusion that environmentally compliant firms remit higher actual tax payments. Although the magnitude of the effect is weaker than that observed for ETR, the result suggests that while firms retain some flexibility in managing cash tax outflows, sustained environmental obligations ultimately constrain aggressive tax planning. This is consistent with findings from international studies that show ESG-oriented firms tend to balance cash flow management with reputational and regulatory considerations, leading to relatively higher cash tax payments over time (Gu, 2023).

However, the analysis also uncovers evidence of a contrasting short-term mechanism. The dummy variable capturing abrupt increases in environmental regulatory costs is negatively associated with ETR and positively associated with DBTD, indicating that firms temporarily increase tax avoidance following regulatory cost shocks. This finding aligns with financial constraint theory, which suggests that sudden, capital-intensive regulatory requirements can strain liquidity and incentivize firms to exploit tax planning opportunities as a short-term financing mechanism. Similar evidence has been documented in U.S., European, and Asian contexts, where firms respond to regulatory or economic shocks by deferring taxes or increasing discretionary book–tax differences (Edwards et al., 2016; Brondolo et al., 2021; Yanto et al., 2025).

Recent empirical studies also support this dual mechanism. While long-term ESG or environmental investments are associated with reduced tax aggressiveness, firms facing financial constraints may simultaneously engage in aggressive tax planning to offset the costs of compliance (Mitroulia et al., 2025). Evidence from Indonesia and Malaysia demonstrates a reciprocal relationship in which ESG investments can increase tax aggressiveness in the presence of liquidity pressures (Yanto et al., 2025). The Nigerian evidence presented in this study mirrors these findings by showing that environmental compliance discourages tax avoidance in stable periods but induces opportunistic behavior when regulatory costs rise abruptly.

Regarding control variables, leverage is negatively associated with both ETR and CASH_ETR, indicating that highly leveraged firms are more inclined to minimize tax payments, likely due to debt servicing pressures. This result is consistent with prior tax planning literature suggesting that financial constraints heighten incentives for tax avoidance. Profitability (ROA) is also negatively related to ETR and CASH_ETR, implying that less profitable firms are more aggressive in managing tax liabilities, while more profitable firms face greater scrutiny and therefore adopt more conservative tax positions. Firm size, however, does not exhibit a significant effect, suggesting that environmental compliance pressures outweigh scale effects in determining tax behavior within the Nigerian oil and gas sector.

Taken together, the findings highlight a complex interaction between environmental regulation and corporate taxation. In line with international evidence, higher environmental compliance costs promote conservative tax behavior through legitimacy and stakeholder monitoring channels. At the same time, sudden regulatory cost shocks create short-term liquidity pressures that lead firms to temporarily increase tax avoidance. This dual mechanism helps reconcile the mixed evidence in the ESG–tax avoidance literature and highlights the importance of institutional context in shaping corporate responses.

From a policy perspective, the results suggest that coordinated environmental and tax policies are essential. Tax incentives for verified environmental expenditures, coupled with enhanced environmental reporting and disclosure standards, may reduce the need for short-term tax avoidance while supporting long-term compliance. For firms, integrating environmental cost management into broader financial and tax planning strategies can help balance regulatory compliance, liquidity needs, and fiscal transparency. Overall, this study contributes to the literature by providing emerging-market evidence that environmental compliance costs are a significant determinant of corporate tax planning behavior, operating through both long-term legitimacy and short-term financial constraint channels.

6. Conclusion

This study examines how environmental compliance costs influence corporate tax planning among Nigerian oil-producing firms from 2012–2024. Using multiple tax planning measures, the findings show that sustained environmental expenditures are associated with higher effective and cash tax rates and lower discretionary book–tax differences, indicating more conservative tax behavior. This supports political cost and stakeholder monitoring theories, suggesting that environmental scrutiny constrains aggressive tax planning.

Conversely, abrupt increases in regulatory costs trigger temporary tax avoidance, reflecting short-term liquidity pressures and financial constraints. These results reconcile mixed evidence in the ESG–tax avoidance literature by showing that environmental compliance shapes tax behavior through both long-term legitimacy and short-term financial channels.

By providing firm-level evidence from an emerging economy, the study extends prior research beyond developed markets and disclosure-focused ESG measures. The findings highlight that regulatory intensity and timing are key determinants of corporate tax strategies. Policy implications include coordinated environmental and tax frameworks, targeted incentives for verified compliance, and stronger environmental reporting standards to reduce short-term opportunistic tax behavior. For firms, integrating environmental cost management into broader financial and tax planning can balance compliance, liquidity, and reputational considerations.

Overall, environmental regulation significantly shapes tax behavior, promoting both environmental accountability and sustainable fiscal outcomes when long-term legitimacy and short-term financial constraints are appropriately managed.

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