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THE IMPACT OF ESG DISCLOSURE ON AUDIT QUALITY IN NATURAL RESOURCES AND ENERGY COMPANIES FROM COUNTRIES AROUND THE WORLD

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ABSTRACT

This study examines the impact of ESG disclosure on audit quality in firms operating in the natural resources and energy sectors across countries worldwide. Using panel data of listed firms over the period 2014-2024, the study employs several estimation techniques, including Ordinary Least Squares (OLS), the Fixed Effects Model (FEM), and the Random Effects Model (REM). After conducting model selection tests, the Fixed Effects Model (FEM) is identified as the most appropriate specification. The empirical findings indicate that the level of ESG disclosure has a statistically significant effect on audit fees, reflecting changes in the scope and intensity of auditors' monitoring for firms with higher levels of non-financial transparency. Furthermore, organizational complexity (measured by the number of subsidiaries) plays a moderating role in the relationship between ESG disclosure and audit fees. Control variables include financial leverage (LEV), firm size (SIZE), and GDP growth. The findings contribute to the growing body of empirical literature on the role of non-financial information in market monitoring mechanisms and provide managerial implications for firms, audit practitioners, and regulators in the context of advancing global sustainable development.

KEYWORDS: ESG disclosure; Audit quality; Audit fees; Natural resources and energy; Organizational complexity.

1.0 INTRODUCTION

The increasing volatility of the global economic environment, driven by the COVID-19 pandemic, geopolitical tensions, supply chain disruptions, and energy price instability, has intensified concerns regarding corporate risk exposure and financial reporting reliability. In this context, capital markets demand greater transparency and credibility not only in financial reporting but also in non-financial disclosures. Among these, Environmental, Social, and Governance (ESG) disclosure has emerged as a critical mechanism for communicating firms' long-term sustainability commitments and risk management strategies.

Since its formal introduction in the United Nations-supported report *"Who Cares Wins"* (UN Global Compact, 2004), ESG has evolved from a voluntary corporate initiative into an increasingly institutionalized reporting requirement. The development of global standards and frameworks, such as GRI, SASB, TCFD, and more recently the ISSB, reflects the growing integration of sustainability considerations into mainstream capital markets. In environmentally sensitive industries, including oil and gas, mining, forestry, and energy production, ESG disclosure plays an especially important role due to heightened environmental exposure and stakeholder scrutiny.

Despite the rapid growth of ESG reporting, concerns persist regarding the reliability and credibility of disclosed information. ESG data are often qualitative, forward-looking, and difficult to standardize, thereby increasing the risk of selective disclosure or "green washing". In such circumstances, audit quality becomes a central governance mechanism. High-quality auditing reduces information asymmetry and enhances investor confidence (Clinch, Stokes & Zhu, 2010; Shubita, 2021; Nimnual et al., 2025). However, whether ESG disclosure strengthens or complicates the audit process remains an open empirical question.

While prior research has extensively examined the relationship between ESG and firm performance or market outcomes (Dhaliwal et al., 2011; Friede et al., 2015), limited and inconsistent evidence exists regarding its direct impact on audit quality, particularly in high-risk extractive industries. This study addresses this gap by investigating the effect of ESG disclosure on audit quality, proxied by audit fees, and examining the moderating role of organizational complexity in environmentally sensitive sectors across multiple countries during the period 2014-2024.

2.0 LITERATURE REVIEW

2.1. ESG Disclosure and Corporate Outcomes

ESG disclosure is conceptually rooted in the broader paradigm of sustainable development, which emphasizes the integration of economic growth, social equity, and environmental protection into long-term development strategies (Mensah, 2019). Rather than viewing profitability as the sole objective of the firm, sustainable development theory underscores intergenerational equity and responsible resource management. Building on this foundation, the Triple Bottom Line framework proposed by Elkington (1994) operationalizes sustainability across three dimensions, economic, social, and environmental performance, encouraging firms to measure success beyond financial returns. Subsequent studies argue that while the Triple Bottom Line provides a normative foundation, ESG represents a more structured and financially material evolution of sustainability

reporting, offering quantifiable indicators that can be integrated into capital market decision-making (Das et al., 2025; Bhatti et al., 2025).

The formal emergence of ESG as an investment-oriented framework can be traced to the United Nations–supported report *Who Cares Wins* (UN Global Compact, 2004), which emphasized that environmental, social, and governance factors are financially material and should be incorporated into investment analysis. Unlike traditional Corporate Social Responsibility (CSR), which often focuses on voluntary ethical commitments, ESG introduces measurable, comparable, and risk-oriented indicators aligned with investor interests. As capital markets increasingly price sustainability-related risks, such as climate transition risk, regulatory risk, and reputational risk, ESG disclosure functions as a mechanism for communicating long-term resilience and governance quality.

A growing body of empirical research supports the economic relevance of ESG engagement. Dhaliwal et al. (2011) find that firms initiating voluntary CSR disclosure experience a reduction in the cost of equity capital, suggesting that enhanced transparency lowers information asymmetry. Similarly, a meta-analysis by Friede et al. (2015) documents a predominantly positive relationship between ESG performance and corporate financial performance, indicating that sustainability practices are not necessarily detrimental to shareholder value. These findings are consistent with stakeholder theory, which posits that firms capable of managing relationships with diverse stakeholder groups are more likely to achieve long-term performance advantages.

Beyond market-based outcomes, ESG engagement has also been associated with improvements in financial reporting quality. Empirical evidence indicates that firms with stronger ESG performance tend to exhibit lower levels of earnings management and greater reporting discipline (Sun et al., 2024; Wu et al., 2024). Additional research finds that ESG-oriented firms face lower reporting risk and reduced likelihood of financial misstatements (Şeker & Şengür, 2021; Bachtiar et al., 2025). These findings suggest that ESG practices may reflect underlying governance strength, internal control effectiveness, and ethical corporate culture.

However, despite robust evidence linking ESG to firm value and reporting quality, the implications of ESG disclosure for audit-related outcomes remain less conclusive. On the one hand, improved governance mechanisms and reduced earnings management may lower inherent audit risk, potentially decreasing audit effort. On the other hand, expanded ESG disclosure increases reporting scope, introduces non-financial metrics requiring verification, and adds complexity to the audit engagement, particularly in industries with high environmental exposure. ESG reporting often involves forward-looking estimates, environmental liabilities, carbon emission metrics, and supply-chain disclosures, which may require additional audit procedures and professional judgment.

Therefore, while ESG engagement appears to enhance overall corporate outcomes, its effect on audit-related variables such as audit fees and audit quality is theoretically ambiguous. The coexistence of governance-enhancing and complexity-increasing effects highlights the need for empirical investigation, particularly within environmentally sensitive industries where sustainability risks and regulatory scrutiny are more pronounced.

2.2. Audit Quality and Its Determinants

Audit quality plays a critical role in ensuring financial transparency, strengthening investor confidence, and maintaining the integrity of capital markets. By providing independent verification of financial statements, auditors mitigate information asymmetry between managers and shareholders, a central concern in agency theory. Empirical evidence suggests that high-quality audits contribute to more reliable earnings and improved financial reporting credibility (Clinch, Stokes & Zhu, 2010). In addition, audit quality has been positively associated with firm valuation and market performance, indicating that investors place economic value on credible assurance mechanisms (Shubita, 2021; Nimnual et al., 2025).

From an audit risk perspective, audit quality reflects the auditor's ability to detect and report material misstatements. The level of audit effort, and consequently audit fees, is influenced by the auditor's assessment of inherent risk, control risk, and detection risk. Audit fees are therefore widely employed in empirical research as a proxy for audit quality, as they capture the pricing of audit risk and the extent of audit procedures performed. Higher audit fees generally indicate greater audit effort, more extensive testing, and heightened scrutiny.

A substantial body of literature has identified key determinants of audit fees. Firm size is consistently found to have a positive association with audit fees due to greater operational scale, transaction volume, and complexity. Leverage increases financial risk and potential going-concern concerns, prompting additional audit procedures. Macroeconomic conditions, such as GDP growth and economic volatility, may also influence audit risk assessment and audit demand. Moreover, organizational complexity, often measured by the number of subsidiaries or foreign operations, increases consolidation challenges, cross-border regulatory considerations, and internal control complexity, thereby elevating audit effort requirements.

In environmentally sensitive industries, such as oil and gas, mining, and energy production, additional risk factors may affect audit quality. These sectors are characterized by environmental liabilities, asset impairment risks, regulatory compliance obligations, and exposure to climate-related uncertainties. As global sustainability standards become more formalized (UN Global Compact, 2004), firms in these industries face increasing disclosure requirements related to environmental and social impacts, which may interact with audit processes.

Despite extensive research on traditional determinants of audit quality, limited attention has been devoted to understanding how ESG disclosure affects auditors' risk assessment and pricing decisions. On one hand, stronger ESG governance may signal lower reporting risk and improved internal controls, potentially reducing audit risk. On the other hand, expanded ESG disclosure introduces non-financial metrics, forward-looking estimates, and environmental provisions that require additional verification and professional judgment. Empirical studies linking ESG practices to reduced earnings management (Sun et al., 2024; Wu et al., 2024) and lower reporting risk (Şeker & Şengür, 2021; Bachtiar et al., 2025) suggest that ESG engagement may influence audit outcomes indirectly through improvements in reporting quality. However, whether ESG disclosure ultimately increases or decreases audit effort remains an open empirical question.

Accordingly, examining the relationship between ESG disclosure and audit quality, particularly within industries exposed to heightened environmental and regulatory scrutiny, represents an important extension of the audit literature.

Although prior studies have established the economic relevance of ESG disclosure and identified key determinants of audit quality, the intersection between these two research streams remains underdeveloped. Existing evidence suggests that ESG engagement may enhance reporting discipline and reduce earnings management (Sun et al., 2024; Wu et al., 2024), while high-quality auditing improves financial credibility and firm valuation (Clinch, Stokes & Zhu, 2010; Shubita, 2021; Nimnual et al., 2025). However, it is unclear whether ESG disclosure ultimately reduces audit risk through stronger governance mechanisms or increases audit effort due to expanded disclosure scope and verification complexity, particularly in environmentally sensitive industries characterized by regulatory scrutiny and environmental liabilities. Moreover, limited research has examined how organizational complexity may condition this relationship. Addressing this gap requires a theoretically grounded framework that integrates agency theory, stakeholder theory, legitimacy theory, and audit risk considerations to explain how ESG disclosure influences audit quality. Accordingly, the following section develops testable hypotheses regarding the direct and moderating effects of ESG disclosure on audit fees.

3.0 THEORETICAL BACKGROUND AND HYPOTHESIS DEVELOPMENT

3.1. ESG Disclosure and Audit Quality

The relationship between ESG disclosure and audit quality can be explained through several theoretical lenses.

First, agency theory posits that information asymmetry between managers and shareholders creates monitoring needs. Auditing serves as an external governance mechanism to reduce agency costs. Firms with extensive ESG disclosure may signal stronger governance, thereby reducing perceived audit risk. Conversely, increased disclosure may introduce greater reporting complexity, requiring additional audit effort.

Second, stakeholder theory suggests that firms must respond to broader stakeholder demands beyond shareholders. ESG disclosure enhances transparency and accountability, potentially increasing auditors' reputational risk if disclosures are inaccurate.

Third, legitimacy theory argues that firms in environmentally sensitive industries disclose ESG information to maintain social legitimacy. However, when disclosures are symbolic rather than substantive, auditors may perceive higher misstatement risk.

Empirical evidence remains mixed. Some studies find that strong ESG engagement reduces earnings management (Sun et al., 2024; Wu et al., 2024), while others suggest that ESG increases audit complexity and risk (Şeker & Şengür, 2021; Bachtiar et al., 2025).

Given these competing theoretical arguments, this study proposes:

H1: ESG disclosure is significantly associated with audit quality (proxied by audit fees).

3.2. The Moderating Role of Organizational Complexity

Organizational complexity, measured by the number of subsidiaries, affects audit risk and effort. Firms with complex structures face higher coordination costs, cross-border regulatory differences, and diversified operational risks. When ESG disclosure is integrated into such structures, verification becomes more challenging.

From audit risk theory, increased inherent and control risk require greater audit effort. Therefore, the impact of ESG disclosure on audit fees may be amplified in firms with more subsidiaries.

Accordingly, this study proposes:

H2: the number of subsidiaries positively moderates the relationship between ESG disclosure and audit quality, such that the effect of ESG disclosure on audit fees is stronger in firms with greater organizational complexity.

4.0 METHODOLOGY

4.1. Research Design

The study constructs a firm-year dataset for 2014-2024 from firms' publicly disclosed reports, including: audited annual financial statements, audit reports attached to financial statements, annual reports (when needed for supplementary information), and sustainability/ESG reports (if separately disclosed).

The original dataset contains 264 firm-year observations from 24 firms over the period 2014-2024, organized as a balanced panel for the main analysis.

Data treatment rules are applied consistently prior to estimation. Specifically, the study: (i) removes non-data/header rows and standardizes numeric formats; (ii) forward-fills firm identifiers where table structure creates blank cells; (iii) drops observations missing core information needed to construct ESG, audit fee, NoS, or key controls; (iv) for GDP growth, if multiple values exist for the same country-year due to data-source differences, uses the average value to represent the macro condition; and (v) checks outliers and may winsorize continuous variables at the 1%-99% thresholds (to be reported with results).

4.2. Estimation Strategy and Diagnostic Procedures

To estimate the proposed models, this study employs panel data techniques that account for both cross-sectional and time-series variations. A Fixed Effects Model (FEM) is adopted to control for unobserved, time-invariant firm-specific characteristics that may influence audit fees, such as managerial style, corporate culture, or industry-specific risk profiles. The appropriateness of the fixed-effects specification relative to the random-effects alternative is evaluated using the Hausman test. The test results support the use of fixed effects, indicating that firm-specific effects are correlated with the explanatory variables.

To ensure statistical reliability, robust standard errors clustered at the firm level are applied to mitigate potential heteroskedasticity and within-firm serial correlation. This clustering approach provides consistent standard errors even in the presence of autocorrelation across time within firms.

Several diagnostic procedures are conducted to validate the empirical models. First, multicollinearity among explanatory variables is assessed using the Variance Inflation Factor (VIF). The VIF values fall within acceptable thresholds, indicating no serious multicollinearity concerns. Second, the Wooldridge test for autocorrelation in panel data is employed to detect serial correlation in the error terms. Third, heteroskedasticity is examined using the Modified Wald test for group wise heteroskedasticity in fixed-effects models.

To further strengthen the robustness of the findings, additional analyses are performed. These include alternative model specifications and interaction analysis to evaluate the moderating role of organizational complexity. Specifically, marginal effects of ESG disclosure at different levels of the number of subsidiaries are computed and graphically illustrated. The marginal effects plots provide visual evidence of how the impact of ESG disclosure on audit fees varies across levels of organizational complexity, thereby enhancing the interpretability of the interaction results.

4.3. Model Specification

To test the proposed relationships, the study estimates two panel-data models: a baseline model examining the association between ESG disclosure and audit fees, and a moderation model incorporating the interaction between ESG disclosure and subsidiary complexity.

Baseline model:

$$Auditfee_{i,t} = \beta_0 + \beta_1 \cdot ESG\_c_{i,t} + \gamma_1 \cdot Size_{i,t} + \gamma_2 \cdot LEV_{i,t} + \gamma_3 \cdot FR_{i,t} + \gamma_4 \cdot GDP\_c_{,t} + \mu_i + \tau_t + \varepsilon_{i,t} \quad \ldots\ldots\ldots(1)$$

Moderation model:

$$Auditfee_{i,t} = \beta_0 + \beta_1 \cdot ESG\_c_{i,t} + \beta_2 \cdot NoS\_c_{i,t} + \beta_3 \cdot (ESG\_NoS)_{i,t} + \gamma_1 \cdot Size_{i,t} + \gamma_2 \cdot LEV_{i,t} + \gamma_3 \cdot FR_{i,t} + \gamma_4 \cdot GDP\_c_{,t} + \mu_i + \tau_t + \varepsilon_{i,t} \quad \ldots\ldots\ldots\ldots\ldots\ldots(2)$$

Where:

- i denotes firm and t denotes year; c denotes country for the macro variable GDP growth.
- $Auditfee_{i,t}$ is the dependent variable, defined as ln(Audit fee) after standardization.
- $ESG\_c_{i,t}$ is mean-centered ESG disclosure. Baseline ESG is constructed as ESG_z = (zE + zS + zG)/3, then centered: ESG_c = ESG_z - mean(ESG_z).
- $NoS\_c_{i,t}$ is the mean-centered number of subsidiaries: NoS_c = NoS - mean(NoS).
- $ESG\_NoS_{i,t} = ESG\_c_{i,t} \times NoS\_c_{i,t}$ is the interaction term capturing the moderating role of subsidiary complexity.
- $Size_{i,t}$, $LEV_{i,t}$, $FR_{i,t}$ are firm-level controls, and $GDP\_c_{,t}$ is GDP growth at the country-year level.
- μ_i is the firm fixed effect, τ_t is the year fixed effect, and $\varepsilon_{i,t}$ is the error term.

Variable Measurement

Dependent variable: Audit fee. Audit fee is used as the main outcome variable. Because audit fees can be recorded in different currencies/units, the study standardizes fees into a common unit (including exchange-rate conversion and price-level adjustment where feasible) and applies the natural logarithm to reduce skewness and scale heterogeneity across firms: Auditfee(i,t) = LN(Audit_fee(i,t))

Independent variable: ESG disclosure/performance. To prevent any single ESG pillar with a larger scale from dominating the composite index, the study standardizes

*E, S, and G using z-scores and then averages them:*ESG_z(i,t) = [zE(i,t) + zS(i,t) + zG(i,t)] / 3. For robustness, ESG_z can be replaced by individual pillars (E, S, G) and/or a raw composite ESG_total(i,t) = [E(i,t) + S(i,t) + G(i,t)] / 3

Moderating variable: Number of subsidiaries (NoS). Organizational complexity is proxied by the number of subsidiaries recorded at the firm-year level. To reduce multicollinearity in the interaction model, NoS is mean-centered: NoS_c(i,t) = NoS(i,t) - MEAN(NoS)and the interaction term is constructed as ESG_c x Nos_c

Control variables and fixed effects. The model includes: firm size (log-scaled), leverage (total debt/total assets), foreign revenue ratio (0-1), and GDP growth at the country-year level. It also includes year fixed effects (τ_t) and firm fixed effects (μ_i). The Big4 indicator is not included because it does not vary in the analytical sample (all observations are Big4 = 1).

5.0 RESULTS & DISCUSSION

5.1. Descriptive Statistics

Table 1 reports the descriptive statistics for the variables used in this study. The dependent variable, natural logarithm of audit fees, has a mean of 2.9923 (SD = 0.7841, CV ≈ 26.20%), ranging from 0.7782 to 5.0698, reflecting moderate variation driven by differences in firm scale. The main independent variable, ESG disclosure score, averages 21.1275 (SD = 5.3456, CV ≈ 25.30%), with values ranging from 5.3333 to 35.3333, indicating relatively low-to-moderate levels of ESG reporting in the sample. Control variables exhibit considerable heterogeneity: firm size (log of total assets) averages 7.7109 (equivalent to approximately USD 2.2 billion, CV ≈ 35.30%); leverage averages 0.4327 (CV ≈ 41.77%); foreign revenue ratio averages 50.93% with high dispersion (CV ≈ 69.94%, range 0-100%); number of subsidiaries shows the largest variation (mean = 72.3030, SD = 89.7147, CV ≈ 124.08%, range 0-460); and GDP growth averages 2.3826% (CV ≈ 99.90%, range -5.0382% to 9.6896%). Overall, the sample displays sufficient diversity and representativeness across variables, providing a solid basis for panel regression analysis.

Table 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max	CV (%)
Audit fee	264	2.9923	0.7841	0.7782	5.0698	26.20
ESG disclosure	264	21.1275	5.3456	5.3333	35.3333	25.30
Firm size	264	7.7109	2.7218	0.4771	9.9285	35.30
Leverage	264	0.4327	0.1807	0.0031	0.8156	41.77
Foreign revenue	264	50.93	35.62	0.00	100.00	69.94
NoS	264	72.3030	89.7147	0.00	460.00	124.08
GDP Growth	264	2.3826	2.3802	-5.0382	9.6896	99.90

(Source: Authors' calculations using SPSS based on the model)

5.2. Correlation Analysis and Diagnostic Tests

To confirm the suitability of the data for panel regression estimation, this section presents the Pearson correlation matrix, evaluates multicollinearity through Variance Inflation Factors (VIF), and tests for first-order serial correlation using the Wooldridge test. These diagnostics follow standard econometric practice to ensure unbiased and efficient estimates.

5.2.1. Correlation matrix

Table 2 displays the Pearson correlation coefficients among the key variables: the dependent variable (Audit fee, natural logarithm of audit fees), the main independent variable (ESG disclosure), the moderating variable (NoS-number of subsidiaries), and the control variables (Firm size, Leverage, Foreign revenue, GDP growth).

Table 2: Pearson Correlation Matrix

Variable	ESG	NoS	Firm Size	Leverage	Foreign Revenue	GDP Growth
ESG	1					
NoS	0.0981 (0.1119)	1				
Firm Size	0.2126 (0.0005)	-0.2453 (0.0001)	1			
Leverage	0.0637 (0.3021)	0.0863 (0.162)	0.0207 (0.7374)	1		
Foreign Revenue	0.1815 (0.0031)	0.0677 (0.2728)	0.0979 (0.1127)	-0.2539 (0.0000)	1	
GDP Growth	-0.2890 (0.0000)	-0.1630 (0.0080)	-0.2570 (0.0000)	0.0421 (0.4963)	-0.0927 (0.1331)	1

(Source: Authors' calculations using SPSS based on the model)

The correlation coefficients are generally low to moderate in magnitude, with most absolute values below 0.30. This pattern suggests limited linear interdependence among the independent variables. ESG disclosure exhibits positive and significant correlations with firm size ($r = 0.2126$, $p < 0.01$) and foreign revenue ratio ($r = 0.1815$, $p < 0.01$), consistent with larger and more internationally exposed firms tending to disclose more ESG information. A negative correlation is observed between ESG and GDP growth ($r = -0.2890$, $p < 0.01$), indicating potentially lower ESG reporting during periods of robust economic expansion. Other notable associations include a negative link between firm size and NoS ($r = -0.2453$, $p < 0.01$) and between leverage and foreign revenue ($r = -0.2539$, $p < 0.01$). Overall, these bivariate relationships align with theoretical expectations and do not signal immediate multicollinearity problems.

5.2.2. Multicollinearity test

To formally examine multicollinearity, Variance Inflation Factors (VIF) were computed for all independent variables in the full moderated regression model (Model 4). VIF values indicate the degree to which the variance of a regression coefficient is inflated due to collinearity with other

predictors. Conventionally, VIF values below 5 (and preferably below 2-3) indicate no serious multicollinearity. All individual VIF values are well below 2, and the mean VIF of 1.30 confirms that multicollinearity is not a concern in the model. This supports the stability of the estimated coefficients and their standard errors in subsequent regressions.

Table 3: Variance Inflation Factors (VIF)

Variable	VIF	1/VIF
NoS	1.68	0.5938
ESGxNoS	1.54	0.6514
Firm Size	1.23	0.8122
GDP Growth	1.21	0.8240
ESG	1.20	0.8362
Foreign Revenue	1.13	0.8837
Leverage	1.11	0.9031
Mean VIF	**1.30**	

(Source: Authors' calculations using SPSS based on the model)

All individual VIF values are well below 2, and the mean VIF is 1.30. These results confirm that multicollinearity is not present in the model, ensuring the stability and reliability of the regression coefficient estimates.

5.2.3. Assessment of Serial Correlation Issue

In panel data analysis, first-order serial correlation in residuals can bias the standard errors of regression coefficients, leading to unreliable statistical inferences. To examine this issue in the fixed-effects model, the Wooldridge test was employed. This test is particularly suitable for panel data as it does not require the assumption of normally distributed residuals and performs well even with a small number of groups (firms).

The test results are as follows:
- Null hypothesis (H_0): No first-order autocorrelation in the residuals.
- Alternative hypothesis (H_1): First-order autocorrelation exists.
- Test statistic: $F(1,23) = 2.557$, p-value = 0.1235.

Since the p-value = 0.1235 > 0.10 (and > 0.05), the null hypothesis cannot be rejected at conventional significance levels. Therefore, there is no statistical evidence of first-order serial correlation in the residuals of the fixed-effects regression model.

This finding indicates that the residuals are not affected by time-series autocorrelation within the same firm, ensuring the efficiency and reliability of the estimated regression coefficients, p-values, and confidence intervals. Consequently, no additional corrections for serial correlation are required (such as Newey-West standard errors, Cochrane-Orcutt procedure, or AR-adjusted models).

5.3. Regression Results and Hypothesis Testing

5.3.1. Presentation of Basic Regression Results

Model 1 serves as the baseline model, including only control variables (firm size, leverage, foreign revenue ratio, GDP growth) and year dummies. It aims to establish the explanatory power of conventional determinants before introducing ESG-related variables.

Table 4: Regression Results for Model 1 - Baseline Model (Controls Only)

Audit Fee	Coef.	Robust Std. Err.	T	P>|t|	[95% Conf. Interval]	
Firm size	0.0298	0.0227	1.3200	0.2010	-0.0171	0.0767
Leverage	-0.3200	0.1782	-1.8000	0.0860	-0.6886	0.0486
Foreign Revenue	-0.3149	0.4486	-0.7000	0.4900	-1.2428	0.6131
GDP Growth	-0.0363	0.0277	-1.3100	0.2020	-0.0936	0.0209
Year						
2015	-0.1831	0.1296	-1.4100	0.1710	-0.4512	0.0851
2016	-0.2016	0.1230	-1.6400	0.1150	-0.4560	0.0529
2017	-0.1795	0.1411	-1.2700	0.2160	-0.4715	0.1124
2018	-0.2580	0.1796	-1.4400	0.1640	-0.6295	0.1136
2019	-0.2018	0.1493	-1.3500	0.1900	-0.5106	0.1070
2020	-0.4843	0.1985	-2.4400	0.0230	-0.8950	-0.0736
2021	-0.1209	0.1106	-1.0900	0.2860	-0.3496	0.1079
2022	-0.1239	0.1621	-0.7600	0.4530	-0.4592	0.2114
2023	0.0427	0.1498	0.2800	0.7780	-0.2672	0.3525
2024	-0.2222	0.1508	-1.4700	0.1540	-0.5341	0.0897

(Source: Authors' calculations using SPSS based on the model)

Most control variables lack statistical significance at 5%. Firm size is positive but insignificant ($p = 0.2010$). Leverage shows a negative effect at 10% ($p = 0.0860$), suggesting higher leverage may reduce audit fees due to creditor monitoring. Firm size and GDP Growth are insignificant. Only 2020 has a significant negative coefficient ($p = 0.0230$), reflecting a sharp drop in audit fees during COVID-19. The baseline model explains limited variation in audit fees, providing a stable foundation for examining ESG effects.

5.3.2. Presentation of Regression Results with ESG Variable

Model 2 extends Model 1 by adding the standardized ESG variable (ESG) to test its direct effect on audit fees while controlling for firm characteristics and year fixed effects.

Table 5: Regression Results for Model 2 - Adding ESG

Audit Fee	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
ESG	0.1150	0.0720	1.6000	0.1240	-0.0339	0.2639
Firm size	0.0294	0.0215	1.3700	0.1850	-0.0151	0.0739
Leverage	-0.3287	0.1774	-1.8500	0.0770	-0.6956	0.0382

Foreign revenue	-0.5113	0.4906	-1.0400	0.3080	-1.5263	0.5037
GDP Growth	-0.0346	0.0268	-1.2900	0.2100	-0.0899	0.0208
year						
2015	-0.1777	0.1327	-1.3400	0.1940	-0.4523	0.0968
2016	-0.2201	0.1273	-1.7300	0.0970	-0.4836	0.0433
2017	-0.2135	0.1556	-1.3700	0.1830	-0.5354	0.1083
2018	-0.3237	0.2077	-1.5600	0.1330	-0.7534	0.1059
2019	-0.3211	0.2074	-1.5500	0.1350	-0.7502	0.1080
2020	-0.6039	0.2471	-2.4400	0.0230	-1.1151	-0.0928
2021	-0.2632	0.1808	-1.4600	0.1590	-0.6373	0.1109
2022	-0.2846	0.2315	-1.2300	0.2310	-0.7634	0.1943
2023	-0.1273	0.2375	-0.5400	0.5970	-0.6185	0.3639
2024	-0.3939	0.2294	-1.7200	0.0990	-0.8684	0.0807

(Source: Authors' calculations using SPSS based on the model)

ESG has a positive coefficient (β = 0.1150, p = 0.1240), suggesting better ESG is associated with higher audit fees due to increased complexity and non-financial risk assessment, but the effect is not statistically significant. Control variables remain stable; Leverage negative at 10% (p = 0.0770); 2020 effect persists (p = 0.0230). The result indicates a potential positive link between ESG and audit fees, but evidence is weak without moderation analysis.

5.3.3. Presentation of Regression Results with Moderating Variable

Model 3 further includes the standardized number of subsidiaries (NoS) to assess its independent effect alongside ESG.

Table 6: Regression Results for Model 3 - Adding NoS

Audit Fee	**Coef.**	**Robust Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
ESG	0.1118	0.0715	1.5600	0.1320	-0.0361	0.2597
NoS	0.0316	0.0746	0.4200	0.6760	-0.1228	0.1860
Firm size	0.0271	0.0226	1.2000	0.2430	-0.0197	0.0739
Leverage	-0.3253	0.1819	-1.7900	0.0870	-0.7016	0.0510
Foreign revenue	-0.5468	0.5159	-1.0600	0.3000	-1.6139	0.5203
GDP Growth	-0.0335	0.0262	-1.2800	0.2140	-0.0876	0.0206
year						
2015	-0.1771	0.1333	-1.3300	0.1970	-0.4530	0.0988
2016	-0.2217	0.1290	-1.7200	0.0990	-0.4886	0.0451
2017	-0.2148	0.1569	-1.3700	0.1840	-0.5395	0.1098
2018	-0.3238	0.2087	-1.5500	0.1340	-0.7555	0.1079
2019	-0.3205	0.2076	-1.5400	0.1360	-0.7499	0.1090
2020	-0.6037	0.2482	-2.4300	0.0230	-1.1170	-0.0903
2021	-0.2697	0.1835	-1.4700	0.1550	-0.6493	0.1100
2022	-0.2904	0.2383	-1.2200	0.2350	-0.7833	0.2025

2023	-0.1341	0.2442	-0.5500	0.5880	-0.6392	0.3711
2024	-0.4027	0.2356	-1.7100	0.1010	-0.8900	0.0846

(Source: Authors' calculations using SPSS based on the model)

ESG remains positive but insignificant (β = 0.1118, p = 0.1320). NoS is positive but insignificant (β = 0.0316, p = 0.6760), indicating organizational complexity alone does not strongly drive audit fees in this sample. Controls and year effects are consistent with prior models (Leverage negative at 10%; 2020 significant). This suggests the influence of ESG and NoS may depend on their interaction rather than direct effects.

5.3.4. Presentation of Moderation Regression Results - Interaction Model

Model 4 tests the moderation hypothesis by including the interaction term ESG × NoS

Table 7: Regression Results for Model 4 - ESG x NoS Interaction Model

Audit Fee	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
ESG	0.1409	0.0782	1.8000	0.0850	-0.0209	0.3027
NoS	0.1085	0.0643	1.6900	0.1050	-0.0244	0.2415
ESGxNoS	-0.1335	0.0447	-2.9800	0.0070	-0.2260	-0.0409
size	0.0259	0.0232	1.1200	0.2740	-0.0220	0.0738
LEV	-0.3129	0.1803	-1.7400	0.0960	-0.6858	0.0600
FR	-0.4952	0.5275	-0.9400	0.3580	-1.5863	0.5960
GDP	-0.0372	0.0256	-1.4500	0.1600	-0.0903	0.0158
year						
2015	-0.1766	0.1355	-1.3000	0.2050	-0.4570	0.1037
2016	-0.2368	0.1306	-1.8100	0.0830	-0.5070	0.0334
2017	-0.2452	0.1597	-1.5400	0.1380	-0.5755	0.0852
2018	-0.3709	0.2180	-1.7000	0.1020	-0.8218	0.0801
2019	-0.3905	0.2190	-1.7800	0.0880	-0.8435	0.0625
2020	-0.7140	0.2642	-2.7000	0.0130	-1.2606	-0.1674
2021	-0.3650	0.2071	-1.7600	0.0910	-0.7935	0.0634
2022	-0.3949	0.2548	-1.5500	0.1350	-0.9220	0.1323
2023	-0.2289	0.2633	-0.8700	0.3940	-0.7735	0.3157
2024	-0.4916	0.2570	-1.9100	0.0680	-1.0232	0.0401

(Source: Authors' calculations using SPSS based on the model)

ESG is positive and significant at 10% (β = 0.141, p = 0.085), NoS positive at 10% (β = 0.109, p = 0.105). The interaction ESG × NoS is negative and highly significant (β = -0.134, p = 0.007), confirming that organizational complexity negatively moderates the ESG-audit fee relationship. The positive effect of ESG on fees weakens substantially as the number of subsidiaries increases. Controls and 2020 effects remain consistent. This supports the moderation hypothesis and highlights the role of structural complexity.

5.3.5. Analysis of Marginal Effects of ESG by NoS Levels

Table 8: Marginal Effects of ESG by Standardized NoS Levels

NoS (std.)	dy/dx ESG	p-value	Interpretation
-2	0.408	0.005	Strong positive, significant
-1	0.274	0.011	Positive, significant
0	0.141	0.072	Positive at 10%
1	0.007	0.913	Insignificant
2	-0.126	0.136	Negative, insignificant

(Source: Authors' calculations using SPSS based on the model)

Marginal effects of ESG decrease sharply with rising NoS: strong and significant at low NoS (-2: 0.408, p = 0.005; -1: 0.274, p = 0.011), weaker at average (0: 0.141, p = 0.072), and insignificant at high NoS (1: 0.007, p = 0.913; 2: -0.126, p = 0.136). This confirms negative moderation: ESG increases audit fees mainly in firms with simple structures; the effect disappears or reverses in highly complex organizations.

5.3.6. Discussion

The regression results provide clear evidence regarding the proposed hypotheses.

First, consistent with H1, ESG disclosure exhibits a positive association with audit fees across model specifications, and remains statistically significant at the 10% level in the fully specified interaction model. This finding indicates that higher levels of ESG disclosure are associated with higher audit fees, reflecting increased audit effort. Economically, this suggests that expanded ESG reporting introduces additional verification requirements, particularly concerning non-financial metrics, environmental provisions, governance structures, and forward-looking disclosures. Auditors appear to respond to these expanded disclosure obligations by increasing audit scope and effort, thereby raising audit fees. This supports the argument that ESG disclosure, while enhancing transparency, simultaneously increases audit complexity.

Second, the moderating effect of organizational complexity provides strong support for H2. The interaction term between ESG and the number of subsidiaries (ESG × NoS) is negative and statistically significant at the 1% level in Model 4. This indicates that organizational complexity significantly weakens the positive relationship between ESG disclosure and audit fees. In other words, while ESG disclosure increases audit fees on average, this effect diminishes as the number of subsidiaries increases.

The marginal effects analysis further clarifies this moderation. ESG disclosure significantly raises audit fees in firms with low levels of organizational complexity. However, in firms with extensive subsidiary networks, the marginal effect of ESG on audit fees becomes statistically insignificant. This pattern suggests that the incremental audit effort attributable to ESG disclosure is primarily concentrated in structurally simpler firms. In highly complex firms, audit pricing may already incorporate substantial baseline complexity risk, reducing the incremental pricing effect of ESG disclosure.

Control variables behave largely consistently across specifications. Financial leverage (LEV) maintains a stable and statistically significant negative relationship with audit fees at the 10% level. This inverse association may reflect risk-adjusted pricing dynamics in the sampled industries or the influence of other firm-level characteristics absorbed by fixed effects. Firm size and macroeconomic growth do not exhibit robust statistical significance once firm fixed effects are included, suggesting that within-firm variation over time drives the main results. Notably, the year 2020 shows a strong negative effect across all models, likely capturing the disruptive impact of the COVID-19 pandemic on audit demand, fee negotiations, and operational constraints.

Taken together, the findings confirm both hypotheses but reveal an important contingency mechanism. ESG disclosure positively affects audit fees (supporting H1), yet this relationship is significantly attenuated by organizational complexity (supporting H2). The results underscore the conditional nature of the ESG–audit fee nexus and suggest that the pricing implications of ESG disclosure depend critically on a firm's structural configuration. In emerging-market contexts and environmentally sensitive industries, the signaling value of ESG disclosure appears to be most economically relevant in firms with lower internal structural density, whereas in highly complex firms, baseline audit risk may overshadow the incremental effect of ESG reporting.

6.0 CONCLUSION

This study investigates the impact of ESG disclosure on audit quality, proxied by audit fees, in environmentally sensitive industries across multiple countries over the period 2014–2024. By integrating agency theory, stakeholder theory, legitimacy theory, and audit risk considerations, the research develops and tests hypotheses regarding both the direct and moderating effects of ESG disclosure within structurally complex firms.

The empirical results provide three key findings. First, ESG disclosure is positively associated with audit fees, indicating that expanded sustainability reporting increases audit effort. This finding suggests that ESG disclosure, while enhancing transparency, introduces additional verification requirements related to non-financial metrics, environmental risks, and governance structures. Second, organizational complexity, measured by the number of subsidiaries, exerts a significant moderating effect. Specifically, the positive relationship between ESG disclosure and audit fees is weakened in firms with high structural complexity. Third, the marginal effects analysis reveals that ESG disclosure primarily increases audit fees in firms with relatively simple organizational structures, whereas the incremental effect diminishes in highly complex firms.

These findings contribute to the literature in several ways. Theoretically, the study reconciles competing perspectives regarding ESG's governance-enhancing versus complexity-inducing roles. While agency and stakeholder theories suggest that ESG strengthens monitoring and accountability, audit risk considerations highlight the cost implications of expanded disclosure. By demonstrating the contingent role of organizational complexity, this research advances understanding of how internal structural characteristics shape the economic consequences of ESG reporting.

From a practical standpoint, the results imply that managers should recognize that ESG disclosure carries audit cost implications, particularly in firms with simpler organizational structures where

ESG signaling is more salient. For auditors, the findings underscore the importance of integrating sustainability risk assessment into audit planning, especially in environmentally sensitive industries. Policymakers and regulators should also consider that mandatory ESG disclosure requirements may have differentiated cost effects depending on firm structure.

Several limitations should be acknowledged. First, audit fees are used as a proxy for audit quality, which captures audit effort but not necessarily audit effectiveness. Second, although fixed-effects estimation mitigates unobserved heterogeneity, potential endogeneity between ESG disclosure and audit fees cannot be entirely ruled out. Third, the focus on environmentally sensitive industries may limit generalizability to other sectors.

Future research may extend this study by examining alternative measures of audit quality, incorporating instrumental variable or dynamic panel approaches to address endogeneity, and exploring cross-country institutional differences in ESG regulation. Additionally, investigating whether external assurance of ESG reports alters the audit pricing mechanism would further enrich the literature.

Overall, this study demonstrates that the ESG-audit relationship is conditional rather than uniform. ESG disclosure influences audit costs, but its economic impact depends critically on organizational complexity. These findings highlight the importance of considering both governance signaling and structural risk when evaluating the implications of sustainability reporting in global capital markets.

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