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ESG and Firm Value: The Moderating Role of Environmental Performance and Profitability in Indonesia's Mining Sector

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Abstract

This study examines the relationship between Environmental, Social, and Governance (ESG) performance and firm value in Indonesia's mining sector, with a focus on the moderating roles of environmental performance and profitability. ESG performance is proxied by the Sustainable Report Disclosure Index (SRDI), firm value is measured using Tobin's Q, environmental performance is measured using the PROPER rating, and profitability is represented by Return on Assets (ROA). The research sample comprises 10 mining companies listed on the Indonesia Stock Exchange (IDX) that consistently publish sustainability reports and participate in the government's PROPER environmental compliance rating program, observed over 4 years (2020–2023), resulting in 40 firm-year observations. The study employs panel data regression with a random effects model, based on the results of the Chow, Hausman, and Lagrange Multiplier tests. The findings reveal that ESG performance has a negative and statistically significant effect on firm value. Furthermore, profitability significantly moderates the relationship between ESG and firm value, while environmental performance does not show a moderating effect. These results suggest that investors may view ESG initiatives as costly when not supported by strong financial performance. The study contributes to the literature by providing empirical evidence from an emerging market context and offers practical insights for firms aiming to improve ESG implementation while maintaining financial sustainability.

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1 Introduction

Maximizing firm value remains a central objective of corporate management, as it reflects both company performance and investor confidence (Brigham & Ehrhardt, 2011). In recent years, the growing emphasis on sustainability has led companies to integrate Environmental, Social, and Governance (ESG) practices into their long-term business strategies (Gillan et al., 2010). While ESG adoption is often associated with improved reputation and enhanced firm value, empirical evidence regarding this relationship remains inconclusive, varying across industries, regions, and observation periods (Behl et al., 2022; Duque-Grisales & Aguilera-Caracuel, 2021).

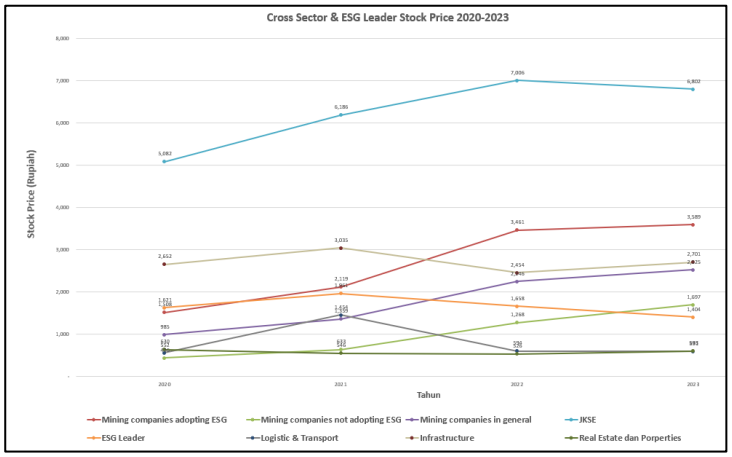

Figure 1. Cross Sector & ESG Leader Stock Price 2020-2023

Table 1
Cross sector & ESG leader stock price growth 2020-2023

Industry Group	2020-2021	2021-2022	2022-2023	2020-2023
mining companies adopting ESG	41%	63%	4%	138%
mining companies not adopting ESG	45%	100%	34%	290%
mining companies in general	38%	65%	12%	156%
JKSE	22%	13%	-3%	34%
ESG Leader	21%	-15%	-15%	-13%
Logistic & Transport	163%	-59%	0%	7%
Infrastructure	14%	-19%	10%	2%
Real Estate dan Porperties	-13%	-4%	13%	-6%

In the mining sector, characterized by environmental sensitivity and social impact, the relevance of ESG practices is particularly significant. Interestingly, data suggest that mining companies not adopting ESG may experience higher short-term stock price growth, yet their average stock value remains lower than that of ESG-adopting firms, illustrated by Figure 1 and Table 1. This paradox raises questions about the role of internal firm characteristics, particularly environmental performance and profitability, in shaping the ESG–firm value nexus.

Building on this context, the study examines the impact of ESG performance on firm value in the Indonesian mining sector, with a specific focus on the moderating roles of environmental performance and profitability. This investigation provides new insights into how internal corporate factors may amplify or attenuate the relationship between ESG and firm value. Grounded in stakeholder theory, the study highlights the strategic importance of aligning corporate actions

with stakeholder expectations to foster trust and achieve sustainable value creation (Freeman et al., 2004). Additionally, guided by signaling theory, the research views ESG disclosures as credible signals of a firm's long-term commitment to sustainability, capable of reducing information asymmetry between management and investors (Spence, 1973). By integrating these theoretical perspectives, the study explores the extent to which ESG performance, when supported by strong environmental practices and financial health, can shape investor perception and contribute to enhanced firm value.

Based on the above context, this study seeks to answer the following research questions: (1) Does ESG performance influence firm value in the Indonesian mining sector? (2) Does environmental performance moderate the relationship between ESG and firm value? (3) Does profitability moderate the relationship between ESG and firm value?

Literature Review

Stakeholder Theory

Stakeholder theory emphasizes the importance of addressing the interests of all stakeholders affected by or involved in corporate activities, including employees, customers, suppliers, communities, and government institutions (Freeman et al., 2004). This approach views the firm not merely as a profit-generating entity, but as a network of interdependent relationships among stakeholders (Donaldson & Preston, 1995). Accordingly, value creation is seen as a collaborative outcome arising from socially responsible and inclusive corporate practices.

Instrumentally, stakeholder theory argues that firms that balance stakeholder interests are more likely to achieve superior performance in terms of profitability, stability, and long-term growth (Donaldson & Preston, 1995). Meeting stakeholder expectations can also enhance corporate trust and increase firm value over time (Porter & Kramer, 2018). In this context, ESG disclosure serves as a vital mechanism to signal a firm's ethical commitment and transparency to its stakeholders (Dorothy & Endri, 2024).

Signalling Theory

Signaling theory highlights the importance of accurate and credible information disclosure by firms to investors, particularly in situations where information asymmetry exists between internal and external stakeholders (Ross, 1977; Spence, 1973). In this framework, the firm acts as a signal sender, conveying messages about its current condition, future prospects, and intrinsic value through various forms of disclosure (Jones & Murrell, 2001). Investors, as signal receivers, interpret this information to reduce uncertainty and make informed investment decisions (Connelly et al., 2011). The theory underscores the need for alignment between market expectations and the information provided, in order to facilitate accurate firm valuation (Bergh et al., 2014).

In this context, ESG disclosure functions as a strategic signal, reflecting the firm's governance quality, sustainability commitment, and long-term orientation (Ching & Gerab, 2017). Environmental performance and profitability also serve as reinforcing signals that enhance investor perceptions of a firm's credibility and operational soundness. However, under conditions of high information asymmetry, limited or poor ESG disclosure may lead to market distrust and a decline in firm value (Huang, 2022; Xie et al., 2019). Therefore, signaling theory supports the strategic importance of ESG communication in shaping stakeholder perception and improving firm valuation (Connelly et al., 2011).

Firm Value

Firm value reflects a company's market valuation, shaped by trading activities in the stock capital market (Hafidz & Deviyanti, 2022). It serves as an indicator of how investors perceive the effectiveness of management in generating long-term profitability and also reflects the firm's credibility in the eyes of shareholders (Setiadharma & Machali, 2017). A high firm value signals strong investor confidence in the company's future prospects and acts as a critical reference point for investment decision-making (Keter et al., 2024).

Tobin's Q ratio is commonly used to measure firm value, as it captures the relationship between a firm's market value and the book value of its assets. This ratio reflects investors' confidence in the firm's growth potential, while also incorporating their expectations for risk and future returns (Broadstock et al., 2018; Keter et al., 2024). A Tobin's

Q greater than one indicates that the market values the firm higher than its asset base, making it an attractive investment opportunity (Surya et al., 2023).

Numerous studies have demonstrated a positive correlation between strong ESG practices and higher firm value as measured by Tobin's Q. These findings suggest that corporate commitment to sustainability is increasingly recognized by investors as a driver of long-term value creation (Fatemi et al., 2018; Melinda & Wardhani, 2020).

Environmental, Social, Governance (ESG)

Environmental, Social, and Governance (ESG) refers to a set of criteria used to evaluate a company's commitment to sustainable and ethical business practices. ESG encompasses three core dimensions: environmental responsibility (e.g., emissions, resource use), social engagement (e.g., labor practices, community relations), and governance quality (e.g., board diversity, transparency, shareholder rights) (Bhaskaran et al., 2020; Yoon et al., 2018). Rather than being seen merely as regulatory obligations or cost burdens, ESG initiatives are increasingly regarded as strategic investments that contribute to long-term value creation (Behl et al., 2022; Sharma et al., 2024).

In emerging markets, ESG disclosure serves a dual function: enhancing transparency and reducing information asymmetry, particularly where institutional frameworks are still developing (Ching & Gerab, 2017). Firms often communicate their ESG performance through sustainability reports, which provide structured narratives and data on non-financial performance indicators, promoting transparency, accountability, and signaling corporate responsibility to investors and stakeholders (de Villiers et al., 2022; Melinda & Wardhani, 2020; Yunarsih et al., 2023). In developing countries, reporting frameworks such as the Global Reporting Initiative (GRI) are widely adopted to enhance legitimacy and build public trust (Khan et al., 2023).

While a growing body of research supports the positive impact of ESG on firm value, empirical findings remain mixed. Several studies report a positive association between ESG scores and market value, particularly in industries with low environmental sensitivity (Naeem et al., 2021; Quintiliani, 2022). Conversely, other research identifies negative or inconclusive results, especially in sectors with high environmental exposure or over shorter time horizons (Behl et al., 2022; Duque-Grisales & Aguilera-Caracuel, 2021). Despite these inconsistencies, ESG practices are widely recognized for strengthening governance structures and stakeholder relationships, thereby fostering competitive advantage and contributing to enhanced firm value (Friske et al., 2023).

Environmental Performance

Environmental performance refers to a company's tangible actions and outcomes in managing its ecological impact, including waste control, emissions reduction, and land rehabilitation, particularly critical in high-risk industries such as mining (Harahap et al., 2019; Mishra & Mohanty, 2020). In Indonesia, environmental performance is formally evaluated through the government-mandated PROPER program, which assesses corporate compliance with environmental regulations based on the 4R principle (reduce, reuse, recycle, recovery) and five key dimensions: water and air pollution control, hazardous waste (B3) management, and other sustainability indicators (Juniarti et al., 2019).

Table 2
Indonesian PROPER Rating System

PROPER Rating	Score
Gold	5
Green	4
Blue	3
Red	2
Black	1

Unlike ESG disclosures that rely on voluntary reporting frameworks like the Global Reporting Initiative (GRI), PROPER operates under a regulatory framework and employs a color-coded rating system, from Gold to Black which are publicly released to ensure corporate accountability. PROPER rating used in this study is shown on Table 2. Firms that demonstrate strong environmental performance often exhibit superior market and accounting outcomes. These firms benefit from reduced operational costs, enhanced access to strategic resources, and improved public reputation

(Eccles et al., 2014; Juniarti et al., 2019). Moreover, environmental performance disclosures act as positive signals of a company's sustainability commitment, fostering investor trust and contributing to increased firm value (Choi et al., 2023; Clarkson et al., 2008). The adoption of green accounting practices and transparency through PROPER has also been shown to positively influence corporate valuation (Hafidz & Deviyanti, 2022; Lestari & Restuningdiah, 2021).

Profitability

Financial performance reflects a firm's ability to generate profits and create value through operational efficiency and effective resource management (Vaitiekuniene et al., 2024). One of its key indicators is profitability, often used to evaluate managerial success in enhancing firm value (Dorothy & Endri, 2024; Setiawanta & Hakim, 2019). Return on Assets (ROA) is a widely adopted measure of profitability, assessing how efficiently a company utilizes its assets to generate earnings. A high ROA indicates optimal asset management, which is particularly critical in asset-intensive industries such as mining (Aydoğmuş et al., 2022; Endri et al., 2019).

Profitability also plays an important moderating role in the relationship between ESG performance and firm value (Ayem et al., 2024). Highly profitable companies tend to possess greater financial capacity to implement sustainability initiatives strategically and consistently, thereby meeting stakeholder expectations and enhancing corporate reputation (Akhmadi & Januarsi, 2021; Sulistyawati & Dwi, 2023). Thus, profitability serves not only as a financial performance indicator but also as a vital enabler of successful ESG integration, ultimately contributing to long-term value creation.

2 Materials and Methods

This study adopts a quantitative explanatory research design utilizing panel data regression to analyze the influence of ESG performance on firm value, with environmental performance and profitability acting as moderating variables. The research population includes all mining companies listed on the Indonesia Stock Exchange (IDX). Using a nonprobability purposive sampling technique, the study selected 10 companies that consistently appeared in the IDX, published a sustainability report, and were nominated in the PROPER award over a four-year observation period (2020–2023). The final dataset comprised 40 firm-year observations.

Regression model selection between common effect, fixed effect, and random effect was determined through the Chow test, the Hausman test, and the Lagrange Multiplier (LM) test. These tests ensured the robustness of the regression model used to interpret the interaction between ESG performance and firm value in the presence of moderating variables. Operating variables and their respective indicator are summarized in Table 3.

Table 3
Operational Variables

Firm Value (Y)	$Tobin's\ Q = \frac{[(Closing\ Price\ x\ Total\ Share)+(Total\ Liabilities]}{Total\ Asset}$
Environmental, Social, Governance (ESG) (X)	$SRDI = \frac{Disclosed\ items}{Expected\ items}$
Environmental Performance (M1)	PROPER
Profitability (M2)	*ROA = Net Income / Total Asset*

3 Results and Discussions

Chow Test

Table 4
Chow test result

TobinsQ	Coef.	Std. Error	t	P> |t|	[95% conf.	interval]
SRDI	-0,116	0,702	-0,17	0,870	-1,564	1,330
PROPER	-0,065	0,127	-0,51	0,615	-0,328	0,198
ROA	-2,325	1,095	-2,12	0,044	-4,581	-0,069
xm1	-0,071	0,166	-0,43	0,672	-0,414	0,271
xm2	2,488	1,248	1,99	0,057	-0,083	5,059
cons	1,075	0,535	2,01	0,056	-0,027	2,179
R-squared = 0,161						
Prob > F = 0,002						

A Chow Test was performed to compare the Common Effect Model (CEM) and the Fixed Effect Model (FEM). The test returned a p-value of 0.002, which is below the 5% significance threshold. This result indicates that the null hypothesis stating that the CEM is more appropriate must be rejected. Therefore, the Fixed Effect Model is deemed superior to the Common Effect Model in capturing the individual heterogeneity across firms.

Lagrange Multiplier Test

Table 5
LM test result

	Var	*SD= sqrt(Var)*
TobinsQ	***0,048***	***0,218***
e	***0,019***	***0,139***
u	***0,023***	***0,152***
Prob > chibar2 = 0,007		

LM Test was employed to evaluate whether the Random Effect Model (REM) outperforms the Common Effect Model. With a p-value of 0.007, the test also leads to the rejection of the null hypothesis, suggesting that REM is preferred over the CEM.

Hausman Test

Table 6
Hausman test result

	-Coeficients-			
	(b) FE	(B) RE	(b-B) Difference	Sqrt(diag(v_b-v_B)) Std. Err.
SRDI	-0,116	-0,216	0,100	0,160
PROPER	-0,065	-0,046	-0,018	0,033
ROA	-2,325	-2,401	0,076	0,211
xm1	-0,071	-0,044	-0,026	0,037
xm2	2,488	2,321	0,167	0,236
Prob > chi2 = 0,449				

The Hausman Test was applied to determine the most consistent and efficient model between FEM and REM. The result indicates a p-value of 0.449, accepting the null hypothesis that the REM is appropriate. This implies that the

Random Effect Model provides more consistent estimators than the Fixed Effect Model and should therefore be used for the final analysis.

Classic Assumption Test

The Random Effect Model does not require classical assumption testing, as it is estimated using Generalized Least Squares (GLS), which is considered more efficient than Ordinary Least Squares (OLS) in addressing issues such as heteroskedasticity and autocorrelation (Bai et al., 2021). Therefore, in this study, classical assumption testing is limited to multicollinearity diagnostics.

The initial multicollinearity test revealed a mean Variance Inflation Factor (VIF) greater than 10, indicating a violation of the classical assumption. To address this issue, the data were mean-centered, and the multicollinearity test was subsequently repeated. The post-centering results showed a mean VIF below 10, suggesting that the model successfully passed the multicollinearity assumption test.

Table 7
Multicollinearity test

Variable	VIF
SRDI * PROPER	1,21
SRDI * ROA	1,19
ROA	1,18
SRDI	1,14
PROPER	1,09
Mean VIF	1,16

Hypothesis Testing

Panel-Corrected Standard Errors (PCSE) enhance the accuracy of estimation results in panel data that combine time-series and cross-sectional dimensions (Bailey & Katz, 2011). Accordingly, hypothesis testing in this study was conducted using the Random Effect Model with panel-corrected standard errors to ensure robust and reliable inference.

Table 8
Random Effect Model with PCSE result

TobinsQ	Coef.	Std. Error	z	P> |t|	[95% conf.	interval]
SRDI	-0,233	0,082	-2,83	0,005	-0,395	-0,071
PROPER	-0,010	0,032	-0,31	0,755	-0,074	0,054
ROA	-0,965	0,259	-3,73	0,000	-1,473	-0,457
SRDI*PROPER	0,022	0,113	0,20	0,845	-0,200	0,244
SRDI*ROA	2,219	1,079	2,06	0,040	0,104	4,334
_cons	-0,014	0,013	-1,12	0,263	-0,041	0,011
		R squared = 0,336				
		Wald Chi2 (5)=82,72				
		Prob > chi2 = 0,000				

1) R-squared value
   The R-squared value of 0.336 indicates that 33.6% of the variation in the dependent variable Tobin's Q can be explained by the independent variable SRDI, which serves as a proxy for ESG. This implies that ESG disclosure, as measured by the SRDI, accounts for approximately one-third of the variation in firm value. The remaining 66.4% of the variation is attributed to other factors not included in the scope of this study.
2) F-statistic test
   The F-statistic (or Wald chi-squared value) obtained is 82.72 with a p-value (Prob > chi^2) of 0.000. The hypotheses for the F-test are formulated as follows:
   H_0: The independent and moderating variables do not simultaneously affect the dependent variable.
   H_1: At least one of the independent or moderating variables has a simultaneous effect on the dependent variable.

Given the significance threshold of 5% (0.05), the p-value of 0.000 is below the critical level, indicating that H_0 is rejected. Therefore, it can be concluded that at least one of the independent or moderating variables significantly influences the dependent variable when considered jointly.

T-statistic test

The Influence of ESG on Firm Value
H1. ESG significantly influences firm value

ESG, as proxied by the Sustainable Report Disclosure Index (SRDI), yields a p-value of 0.005 and a coefficient of -0.233. The statistical test results indicate that ESG has a negative and statistically significant effect on firm value. In other words, a higher ESG score is associated with a lower firm value. In the context of emerging markets such as Indonesia, particularly in the mining sector, the direct costs and perceived risk signals associated with ESG implementation tend to outweigh its long-term strategic benefits. Unlike developed markets where ESG is increasingly seen as a value-enhancing initiative, investors in Indonesia often interpret ESG-related activities as burdensome compliance costs rather than long-term investments. This perception is particularly evident in capital-intensive industries like mining, where firms face high upfront costs for implementing environmental technologies, reporting systems, and stakeholder engagement initiatives. Consequently, increased ESG engagement may lead to reduced short-term profitability and, in turn, a lower market valuation.

This phenomenon may also reflect a lack of standardized ESG reporting practices and limited investor awareness of the long-term value potential of sustainability initiatives in emerging markets. The findings of this study provide empirical support for this view, revealing a significant negative relationship between ESG performance and firm value. These results align with recent studies reporting similar outcomes, where ESG implementation is associated with reduced firm value in the short term (Budhiananto & Fatimah, 2024; J. Huang et al., 2025; Ningwati et al., 2022; Safriani & Utomo, 2020). The evidence highlights the need for greater institutional support, improved ESG frameworks, and increased investor education to shift perceptions and fully capture the strategic value of ESG in emerging market contexts.

Environmental Performance as moderator of the influence of ESG on Firm Value
H2. Environmental performance moderates ESG influence on firm value

The analysis in Table 8 indicates that the p-value for the interaction term SRDI × PROPER is 0.845. Since the p-value exceeds the 0.05 significance level, the null hypothesis is accepted. This indicates that environmental performance does not moderate the effect of Environmental, Social, and Governance (ESG) on firm value.

This finding suggests that, within environmentally sensitive sectors such as mining, environmental compliance—as reflected by the PROPER program in Indonesia—has not yet been perceived as a source of competitive advantage or a value-adding factor by the market. Even firms with high environmental performance ratings are not necessarily rewarded with higher valuations in investment decisions. This may be due to the perception that regulatory compliance is a baseline requirement rather than a strategic differentiator, particularly in sectors with high regulatory scrutiny.

The limited role of environmental performance in enhancing the ESG–firm value relationship also highlights the importance of stakeholder perception and market maturity. In emerging economies like Indonesia, where ESG disclosure standards and investor emphasis on environmental factors are still evolving, environmental performance may not yet carry significant weight in investment evaluations.

These findings are consistent with prior studies that reported no significant influence of environmental performance on firm value (Abdi et al., 2022; Aydoğmuş et al., 2022; Zhou et al., 2025). Supporting evidence also comes from Chang & Lee (2022), who argue that industry context plays a critical role in determining the effectiveness of ESG in driving firm value. As such, environmental performance metrics like PROPER may be more meaningful in sectors where environmental impact is a strategic concern for stakeholders and investors, and less so in industries where such concerns are perceived as regulatory obligations.

Profitability as a Moderator of the Influence of ESG on Firm Value
H3. Profitability moderates ESG influence on firm value

Table 8 reports a p-value of 0.040 and a coefficient of 2.219 for the interaction term SRDI × ROA. Since the p-value is below the 0.05 significance threshold, the null hypothesis is rejected in favor of the alternative hypothesis. This finding indicates that profitability positively and significantly moderates the effect of Environmental, Social, and Governance (ESG) on firm value.

The findings of this study demonstrate that profitability weakens the negative influence of ESG on firm value, indicating that investors are more likely to appreciate ESG initiatives when implemented by firms with strong financial performance. Specifically, firms with higher levels of profitability, measured by Return on Assets (ROA) are better positioned to gain positive investor responses to ESG activities. This implies that ESG efforts are more effective in enhancing firm value when undertaken by financially stable companies.

In the context of the mining industry, which is capital-intensive and subject to high operational risks, profitability may serve as a critical signal of managerial efficiency and financial resilience. Investors may interpret ESG implementation in profitable firms as a strategic and credible commitment to sustainability, rather than as a cost burden. In contrast, similar initiatives undertaken by less profitable firms may be perceived as financially unsustainable or as attempts to divert attention from weak fundamentals.

This study reinforces the argument that ESG should not be evaluated in isolation, but rather in conjunction with the firm's financial capacity to implement and sustain such practices. When firms are profitable, they are more capable of integrating ESG into long-term strategy, communicating value to stakeholders, and absorbing the potential short-term costs associated with sustainable practices.

These results are in line with recent empirical studies, which assert that investors consider both ESG performance and financial health when valuing firms—especially those with high ROA—thereby enhancing the positive perception of sustainability efforts in the market (Akbar & Setiana, 2024; Choi et al., 2023; Intan & Santi Paramita, 2025; Sumarno et al., 2023; Wahyuni et al., 2025). Collectively, the findings emphasize that profitability plays a critical moderating role, shaping the effectiveness of ESG in influencing firm value, particularly in emerging market contexts like Indonesia.

4 Conclusion

This study investigates the influence of Environmental, Social, and Governance (ESG) performance on firm value, with environmental performance and profitability serving as moderating variables, in mining companies listed in the IDX in Indonesia. The empirical findings reveal that ESG performance has a negative and statistically significant effect on firm value, suggesting that, within the context of Indonesia's mining sector, ESG initiatives are perceived more as cost burdens than as value-creating strategies, particularly in the short term.

The analysis further shows that environmental performance does not significantly moderate the relationship between ESG and firm value. This implies that, despite the environmental sensitivity of the mining industry, environmental compliance and performance (as proxied by the PROPER rating) are not yet regarded by investors as indicators of competitive advantage or strategic value enhancement.

In contrast, profitability demonstrates a significant moderating effect, where high profitability attenuates the negative impact of ESG on firm value. This indicates that investors are more receptive to ESG initiatives when implemented by financially sound firms. ESG practices appear to be most effective when undertaken by companies with strong financial fundamentals, as these firms are better positioned to manage the costs and signal long-term commitment to sustainability.

Overall, the study underscores the importance of contextual and firm-level factors—such as industry characteristics, market maturity, and financial health—in determining how ESG performance influences firm value. These findings highlight the need for increased investor awareness, enhanced ESG reporting standards, and stronger regulatory frameworks to align sustainability efforts with long-term value creation in emerging markets.

Conflict of interest statement
The authors declared that they have no competing interests.

Statement of authorship
The authors have a responsibility for the conception and design of the study. The authors have approved the final article.

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