

The Effects of Environmental, Social, and Governance Disclosure and Enterprise Risk Management on Firm Value, With Firm Size as a Moderating Variable: A Case Study of Companies in the Energy Sector in Indonesia

Raden Dandy Adityo Pradono*, Suhari Pranyoto, Nanda R. Nurdianto

Universitas Pertamina, Indonesia

Email: radendandy@gmail.com*, suhari.pranyoto@universitaspertamina.ac.id,

nanda.nurdianto@universitaspertamina.ac.id

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Abstract

This research examined the effects of Environmental, Social, and Governance (ESG) Disclosure and Enterprise Risk Management (ERM) on firm value, as well as the moderating role of firm size among energy-sector companies listed on the Indonesia Stock Exchange (IDX) during the 2021–2025 period. Using a quantitative explanatory design, secondary data were obtained from annual reports, sustainability reports, financial statements, IDX records, and company websites. Purposive sampling was used to select 22 companies, resulting in 110 firm-year observations. Firm value was measured using Price-to-Book Value (PBV), ESG Disclosure was measured using an 80-item index based on the Global Reporting Initiative (GRI) framework, ERM was measured using a 20-principle index based on the COSO Enterprise Risk Management framework, and firm size was measured using the natural logarithm of total assets. Return on Assets (ROA), leverage, and company growth were included as control variables. Panel data regression and Moderated Regression Analysis (MRA) were conducted using EViews 9, with the Fixed Effects Model selected as the appropriate estimation model. The results showed that ESG Disclosure ($t = 3.087$; $p = 0.0027$) and ERM ($t = 3.166$; $p = 0.0022$) had positive and significant effects on firm value. Firm size strengthened the relationship between ESG Disclosure and firm value at the 10% significance level ($t = 1.841$; $p = 0.0693$), but it did not moderate the relationship between ERM and firm value ($t = -0.708$; $p = 0.4809$). These findings demonstrate that sustainability transparency and integrated risk management contribute to enhancing firm value, while firm size selectively strengthens the value relevance of ESG disclosure.

INTRODUCTION

Global competition in the energy industry (Agency, 2020) is increasingly shaped by the transition toward lower-carbon economic systems, evolving regulatory expectations, environmental pressures (Xaviera & Rahman, 2023), and growing investor scrutiny of corporate sustainability practices (Khan et al., 2016). Energy companies operate in a sector characterized by high capital intensity, substantial environmental exposure (Melinda & Wardhani, 2020), complex stakeholder relationships, and significant strategic and operational risks. These characteristics make the sector particularly relevant for examining how sustainability disclosure and risk governance are reflected in market valuation (Qureshi et al., 2020).

Firm value represents the market's assessment of a company's performance (Segoro & Sriludia, 2021) and future prospects. In capital markets, this assessment is reflected through stock prices and valuation ratios. A high firm value generally indicates positive investor expectations regarding a company's ability to generate returns, maintain competitiveness, and manage uncertainty. In this study, firm value was measured using Price-to-Book Value (PBV), which compares market price per share with book value per share and indicates the extent to which the market values a company relative to its accounting equity.

The Indonesian energy sector provides an important research context because it is economically strategic while simultaneously being exposed to environmental, social, governance, commodity-price, regulatory, and energy-transition risks. The source study reported that the average closing share prices of energy companies fluctuated substantially during 2021–2025, indicating that market assessments varied throughout the observation period. Such variation highlights the importance of investigating firm-specific mechanisms that may assist investors in distinguishing companies with stronger sustainability transparency and risk-management capabilities.

Among the non-financial mechanisms that may influence firm value, Environmental, Social, and Governance (ESG) (Yudiansyah & Burhany, 2025) Disclosure has received increasing attention. ESG Disclosure provides information regarding environmental impacts (Mottoh & Sutrisno, 2020), social responsibilities, governance practices, and corporate responses to sustainability-related challenges. For investors, such disclosure can reduce information asymmetry by making previously less-visible aspects of corporate practices and long-term risks more transparent (Healy & Palepu, 2001).

ESG Disclosure differs conceptually from ESG ratings or externally generated ESG scores. This study focused on disclosure because the research objective was to examine whether information communicated directly by companies to the market is associated with firm value. Disclosure-based measurement also enables researchers to assess the extent of reported information using a consistent index rather than relying on differences in weighting methodologies among external rating agencies (Sugiyono, 2022).

The Global Reporting Initiative (GRI) (Initiative, 2021) framework was used as the basis for measuring ESG-related disclosure because it provides a systematic structure for reporting organizational impacts on the economy, environment, and society. In the energy sector (Agency, 2023), this approach is particularly relevant because environmental and social impacts are closely related to business operations, including emissions, resource utilization, occupational safety, community relations, and governance of material sustainability risks.

From the perspective of Signaling Theory, ESG Disclosure can function as a signal of corporate quality, transparency, governance commitment, and long-term orientation. Management generally possesses more information regarding internal sustainability practices and future prospects than external investors. By disclosing relevant ESG information, companies can reduce information asymmetry and provide investors with additional evidence of their ability to manage sustainability challenges. When such signals are perceived as credible and economically relevant, they may contribute to higher market valuation.

Agency Theory (Jensen & Meckling, 1976) also supports the value relevance of ESG disclosure. Greater transparency can reduce information asymmetry between managers and shareholders, improve monitoring mechanisms, and limit managerial actions that may conflict

with shareholder interests. From this perspective, disclosure is not merely a reporting activity but also part of a broader governance mechanism that promotes accountability.

Previous studies cited in the source document have reported mixed findings regarding the relationship between ESG disclosure and firm value. Some studies have identified positive associations between ESG performance or disclosure and firm value, whereas others have found insignificant or negative relationships. These inconsistencies create an empirical gap, particularly within Indonesia's energy sector, where sustainability issues are highly material.

Enterprise Risk Management (ERM) (Commission, 2017) provides an integrated approach to identifying, assessing, responding to, monitoring, and communicating risks that may affect organizational objectives. Unlike fragmented risk management practices, ERM connects risk governance with organizational strategy and performance. The COSO Enterprise Risk (Phan et al., 2020) Management framework emphasizes governance and culture, strategy and objective setting, performance, review and revision, and information, communication, and reporting (Spence, 1973).

For energy companies, ERM is particularly relevant because the sector faces interconnected risks arising from commodity-price volatility, operational safety issues, environmental liabilities, climate-transition pressures, regulatory changes, financing constraints, technological developments, geopolitical conditions, and community relations. These risks can influence cash flow, investment decisions, cost of capital, operational continuity, and corporate reputation. An integrated risk-management process can therefore assist management in protecting existing value while supporting strategic decision-making and long-term value creation.

Agency Theory explains ERM as a governance mechanism that strengthens monitoring, risk control, accountability, and decision quality. When risk information is systematically identified and communicated, boards of directors and shareholders are better able to evaluate managerial decisions. Therefore, ERM can reduce potential agency costs arising from inadequate oversight of risk-taking behavior.

Signaling Theory also provides a rationale for the relationship between ERM and firm value. Effective ERM can signal that management has the capability to anticipate uncertainty and incorporate risk considerations into strategic planning. For investors, this capability may reduce uncertainty regarding future performance sustainability. Empirical studies referenced in the source document, including research from emerging markets, generally indicate that stronger ERM implementation may be associated with higher firm value, although findings remain inconsistent across contexts.

This research therefore examined ESG Disclosure and ERM as two distinct mechanisms that may contribute to value creation. ESG Disclosure primarily communicates transparency and sustainability-related information to external stakeholders, whereas ERM primarily strengthens internal governance and risk-based decision-making processes. Although both mechanisms may influence market valuation, they operate through different pathways.

Firm size was introduced as a moderating variable because the effects of ESG Disclosure and ERM may vary depending on organizational characteristics. Larger companies generally have broader operational activities, more stakeholders, greater public visibility, and more complex governance structures. They may also possess greater financial, human,

technological, and reporting resources, which can increase both their capacity to implement sustainability practices and the market relevance of their disclosures.

From a perspective (Gordon et al., 2009), the effectiveness of governance mechanisms depends on the organizational context in which they operate. Therefore, firm size was considered a potential boundary condition rather than a universal determinant. For ESG Disclosure, larger firms may obtain greater valuation benefits because their disclosures receive more investor attention and are supported by stronger implementation capacity. However, the effectiveness of ERM may depend more on risk culture, process quality, strategic integration, and managerial capability than solely on organizational scale.

This study addressed four research questions: whether ESG Disclosure affects firm value; whether Enterprise Risk Management affects firm value; whether firm size moderates the relationship between ESG Disclosure and firm value; and whether firm size moderates the relationship between Enterprise Risk Management and firm value among Indonesian energy companies during 2021–2025.

The hypotheses were formulated as follows: H1: ESG Disclosure has a significant effect on firm value. H2: Enterprise Risk Management has a significant effect on firm value. H3: Firm size moderates the effect of ESG Disclosure on firm value. H4: Firm size moderates the effect of Enterprise Risk Management on firm value.

The novelty of this study lies in examining ESG Disclosure and ERM simultaneously within the Indonesian energy sector while explicitly testing whether firm size influences these two mechanisms differently. This approach enables the research to distinguish between a transparency-based value mechanism and a risk-governance-based value mechanism rather than assuming that the same organizational characteristic moderates both relationships in an identical manner.

Based on this rationale, this study aimed to analyze the direct effects of ESG Disclosure and Enterprise Risk Management on firm value and to examine the moderating role of firm size in strengthening or weakening these relationships among energy-sector companies in Indonesia during the 2021–2025 period. The findings of this research are expected to provide theoretical and practical contributions. Theoretically, this study contributes to corporate governance, sustainability disclosure, and risk management literature by demonstrating how ESG Disclosure and ERM function as distinct mechanisms in creating firm value, thereby providing a more comprehensive understanding of non-financial factors in market valuation. Practically, this research provides insights for energy-sector companies in developing sustainability and risk-management strategies, for investors in evaluating non-financial information for investment decisions, for regulators in improving disclosure policies, and for future researchers as a foundation for comparative studies across different sectors or regions.

METHOD

Research Method

This study employed a quantitative explanatory research design using secondary panel data to examine the effects of Environmental, Social, and Governance (ESG) Disclosure and Enterprise Risk Management (ERM) on firm value, as well as the moderating role of firm size. The population consisted of energy-sector companies listed on the Indonesia Stock Exchange (IDX) during the 2021–2025 period. Secondary data were collected from annual reports,

sustainability reports, published financial statements, IDX records, and the official websites of the sampled companies.

The sample was selected using purposive sampling based on the availability and completeness of annual and sustainability reports during the observation period. Of the 92 energy-sector companies listed on the IDX by the end of 2025, 70 companies were excluded because they did not meet the predetermined criteria. Therefore, 22 companies were included in the final sample, resulting in 110 firm-year observations from five years of data collection, as presented in Table 1.

Table 1. Sample Selection

Sample Selection Criteria	Number
Energy-sector companies listed on the IDX by the end of 2025	92
Companies that did not consistently publish complete annual and sustainability reports during 2021–2025	(70)
Final sample	22
Observation period	5 years
Total firm-year observations	110

Source: Secondary data processed from annual reports, sustainability reports, and financial statements of energy-sector companies listed on the Indonesia Stock Exchange (IDX), 2021–2025

The study involved one dependent variable, two independent variables, one moderating variable, and three control variables. Firm value was measured using Price-to-Book Value (PBV). ESG Disclosure was measured using an ESG Disclosure Index based on 80 items derived from the Global Reporting Initiative (GRI) indicators, while ERM was measured using an index based on the 20 principles of the COSO Enterprise Risk Management (ERM) framework. Firm size was measured using the natural logarithm of total assets. Return on Assets (ROA), leverage, and company growth were included as control variables. The operationalization of the variables is summarized in Table 2.

Table 2. Variable Measurement

Variable	Role	Measurement
Firm Value (FV)	Dependent	Price to Book Value (PBV)
ESG Disclosure (ESG)	Independent	Number of disclosed ESG items / 80
Enterprise Risk Management (ERM)	Independent	Number of implemented ERM principles / 20
Firm Size (SIZE)	Moderator	Ln (Total Assets)
Return on Assets (ROA)	Control	Net Income After Tax / Total Assets × 100%
Leverage (LEV)	Control	Total Debt / Equity × 100%
Company Growth (GROWTH)	Control	$(Sales_t - Sales_{t-1}) / Sales_{t-1} \times 100\%$

Source: Developed from the thesis instrument based on literature reviews of firm value (PBV), ESG Disclosure (GRI standards), Enterprise Risk Management (COSO ERM framework), and firm size (natural logarithm of total assets), 2025

Data analysis was performed using EViews 9. The analytical procedures included descriptive statistical analysis, panel-data model selection, diagnostic testing, panel regression, hypothesis testing, and Moderated Regression Analysis (MRA). Three panel-data estimation approaches were initially considered: the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM).

Model selection was conducted using the Chow and Hausman tests. The Chow test produced a cross-section F probability of 0.0000, indicating that the Fixed Effect Model was preferable to the Common Effect Model. The Hausman test subsequently produced a probability of 0.0033, indicating that the Fixed Effect Model was also preferable to the Random Effect Model. Consequently, the Fixed Effect Model was selected for subsequent analysis.

Table 3. Panel-Data Model Selection

Test	Comparison	Probability	Decision
Chow Test	CEM vs. FEM	0.0000	Fixed Effect Model
Hausman Test	FEM vs. REM	0.0033	Fixed Effect Model
Selected Model			Fixed Effect Model (FEM)

Source: Secondary data processed using EViews 9, 2025

The direct-effect model examined the effects of ESG Disclosure and ERM on firm value while controlling for profitability, leverage, and company growth. The regression equation was specified as follows:

$$FV_it = \alpha + \beta_1 ESG_it + \beta_2 ERM_it + \beta_3 ROA_it + \beta_4 LEV_it + \beta_5 GROWTH_it + \varepsilon_it$$

Moderated Regression Analysis was subsequently performed to examine whether firm size changed the relationships between ESG Disclosure and firm value and between ERM and firm value. The moderation model was specified as follows:

$$FV_it = \alpha + \beta_1 ESG_it + \beta_2 ERM_it + \beta_3 ROA_it + \beta_4 LEV_it + \beta_5 GROWTH_it + \beta_6 SIZE_it + \beta_7 (ESG \times SIZE)_it + \beta_8 (ERM \times SIZE)_it + \varepsilon_it$$

The interpretation of the interaction terms is summarized in Table 4. The $ESG \times SIZE$ interaction represents the moderating role of firm size in the relationship between ESG Disclosure and firm value, whereas $ERM \times SIZE$ represents the moderating role of firm size in the relationship between ERM and firm value.

Table 4. Empirical Model and Hypothesis Testing

Effect Tested	Statistical Term	Purpose	Significance Level
ESG Disclosure → Firm Value	$\beta_1 ESG$	Direct effect	5%
ERM → Firm Value	$\beta_2 ERM$	Direct effect	5%
Firm Size	$\beta_6 SIZE$	Moderator main effect	10% for moderation assessment
ESG × Firm Size	$\beta_7 (ESG \times SIZE)$	Moderating effect of firm size on ESG–firm value relationship	10%

Effect Tested	Statistical Term	Purpose	Significance Level
ERM × Firm Size	$\beta_8(\text{ERM} \times \text{SIZE})$	Moderating effect of firm size on ERM–firm value relationship	10%
ROA, Leverage, Growth	$\beta_3\text{--}\beta_5$	Control variables	—

Source: Author's research design based on panel-data regression and Moderated Regression Analysis (MRA), 2025

Prior to hypothesis testing, diagnostic tests were conducted to assess the adequacy of the regression model. The normality assessment produced a Jarque–Bera statistic of 5.49, which was below the chi-square reference value of 5.99 applied in the study. Pairwise correlations among the explanatory variables were below 0.90, indicating no severe multicollinearity based on the criterion used. The residual plot was interpreted as showing no systematic heteroskedasticity pattern, while the Durbin–Watson statistic of 1.971 was interpreted as indicating no problematic autocorrelation.

Table 5. Summary of Diagnostic Tests

Diagnostic Test	Result	Criterion Used	Assessment
Normality	Jarque–Bera = 5.49	$JB < \chi^2$ reference value of 5.99	Acceptable
Multicollinearity	Pairwise correlations < 0.90	Correlation < 0.90	No severe multicollinearity
Heteroskedasticity	No systematic residual pattern	Based on residual-pattern assessment	No indication of problematic heteroskedasticity
Autocorrelation	Durbin–Watson = 1.971	Based on reported lower and upper bounds	No problematic autocorrelation

Source: Secondary data processed using EViews 9, 2025

Overall, the panel-model selection and diagnostic results provided the empirical basis for employing the Fixed Effect Model in the direct and moderated regression analyses. The fixed-effect specification was used to account for time-invariant company-specific characteristics that could otherwise influence the relationships among ESG Disclosure, ERM, firm size, and firm value. The direct effects of ESG Disclosure and ERM were evaluated at the 5% significance level, whereas the interaction terms representing the moderating role of firm size were evaluated at the 10% significance level.

RESULTS AND DISCUSSIONS

Descriptive Statistics

The descriptive statistical analysis was conducted on 110 firm-year observations from 22 energy-sector companies listed on the Indonesia Stock Exchange (IDX) during 2021–2025. The analysis provides an overview of the distribution and variability of firm value, ESG Disclosure, Enterprise Risk Management (ERM), Return on Assets (ROA), leverage, company growth, and firm size. The descriptive statistics are presented in Table 6.

Table 6. Descriptive Statistics

Variable	Mean	Minimum	Maximum	Std. Dev.
Firm Value (PBV)	1.425	0.230	3.540	0.911
ESG Disclosure	2.851	2.620	2.960	0.072
ERM	2.804	2.650	2.930	0.068
ROA	1.719	0.570	2.660	0.529
Leverage	2.938	1.830	3.670	0.361
Growth	2.039	0.730	2.740	0.444
Firm Size	2.317	2.120	2.450	0.079

Source: Secondary data processed using EViews 9, 2025

Firm value, measured using Price to Book Value (PBV), had a mean of 1.425, ranging from 0.230 to 3.540, with a standard deviation of 0.911. This relatively broad range indicates substantial variation in market valuation across the sampled companies and observation periods. ESG Disclosure recorded a mean of 2.851, with values ranging from 2.620 to 2.960 and a standard deviation of 0.072. ERM had a mean of 2.804, a minimum of 2.650, a maximum of 2.930, and a standard deviation of 0.068. The relatively small standard deviations of ESG Disclosure and ERM indicate that the sampled companies exhibited comparatively limited variation in their disclosure and risk-management measures.

Regarding the control variables, ROA had a mean of 1.719 and a standard deviation of 0.529, while leverage recorded a mean of 2.938 and a standard deviation of 0.361. Company growth averaged 2.039, with values ranging from 0.730 to 2.740. Firm size had a mean of 2.317 and a relatively narrow range of 2.120–2.450. The limited variation in firm size is particularly relevant to the subsequent moderation analysis because the statistical strength of an interaction effect depends partly on variation in the moderating variable.

Correlation Analysis

Correlation analysis was performed to examine the initial relationships among the research variables before multivariate (Hair et al., 2019) (Ghozali, 2021) panel regression. As shown in Table 7, firm value was positively correlated with ESG Disclosure, ERM, ROA, and company growth, while negative correlations were observed with leverage and firm size.

Table 7. Selected Correlations among Research Variables

Variable Relationship	Correlation Coefficient (r)	Direction
Firm Value – ESG Disclosure	0.407	Positive
Firm Value – ERM	0.602	Positive
Firm Value – ROA	0.459	Positive
Firm Value – Leverage	–0.148	Negative
Firm Value – Growth	0.256	Positive
Firm Value – Firm Size	–0.086	Negative
ESG Disclosure – ERM	0.559	Positive

Source: Secondary data processed using EViews 9, 2025

The correlation between ESG Disclosure and firm value was 0.407, indicating a positive association between sustainability disclosure and market valuation. ERM showed a stronger positive correlation with firm value ($r = 0.602$), while ROA and company growth were also

positively correlated with firm value at 0.459 and 0.256, respectively. Conversely, leverage ($r = -0.148$) and firm size ($r = -0.086$) showed weak negative bivariate correlations with firm value.

ESG Disclosure and ERM were moderately positively correlated ($r = 0.559$), suggesting that companies with relatively stronger ESG disclosure also tended to exhibit stronger ERM implementation. Nevertheless, the reported correlations among the explanatory variables remained below the 0.90 threshold applied in this study, indicating no severe multicollinearity based on the adopted criterion. These correlations provide preliminary information regarding variable relationships but do not represent controlled causal effects; therefore, hypothesis testing was subsequently performed using panel-data regression.

Fixed Effect Model Estimation

Based on the model-selection procedures described in the research method, the Fixed Effect Model (FEM) was selected as the appropriate panel-data estimator. The direct-effects model examined whether ESG Disclosure and ERM affected firm value after controlling for ROA, leverage, and company growth. The estimated regression equation was:

$$\text{PBV} = -23.554 + 4.636 \text{ ESG} + 4.163 \text{ ERM} - 0.193 \text{ ROA} + 0.058 \text{ Leverage} + 0.124 \text{ Growth}$$

The positive coefficients of ESG Disclosure and ERM indicate that increases in both variables were associated with higher firm value after controlling for the other variables and company-specific fixed effects. The complete direct-effect results are reported in Table 8.

Table 8. Fixed Effect Regression Results

Variable	Coefficient	t-statistic	p-value	Result
ESG Disclosure	4.635989	3.086869	0.0027	Positive and significant
ERM	4.162585	3.166409	0.0022	Positive and significant
ROA	-0.193175	-1.065156	0.2899	Not significant
Leverage	0.057916	0.139707	0.8892	Not significant
Growth	0.124282	0.862220	0.3911	Not significant

Source: Secondary data processed using EViews 9, 2025

ESG Disclosure had a positive regression coefficient of 4.635989 with a t-statistic of 3.086869 and a p-value of 0.0027. Since the p-value was below the 5% significance threshold, ESG Disclosure had a statistically significant positive effect on firm value. Accordingly, H1 was supported. Within the estimated model, higher ESG Disclosure was associated with higher PBV after accounting for profitability, leverage, growth, and firm-specific fixed effects.

ERM also demonstrated a positive and statistically significant effect on firm value, with a coefficient of 4.162585, a t-statistic of 3.166409, and a p-value of 0.0022. Since the p-value was below 0.05, H2 was supported. The result indicates that higher ERM implementation was associated with higher firm value within the observed sample.

In contrast, none of the three control variables had a statistically significant effect on firm value. ROA produced a coefficient of -0.193175 ($p = 0.2899$), leverage had a coefficient of 0.057916 ($p = 0.8892$), and company growth had a coefficient of 0.124282 ($p = 0.3911$). Therefore, within the estimated specification, ESG Disclosure and ERM emerged as the principal statistically significant direct predictors of firm value.

Moderating Effect of Firm Size

Moderated Regression Analysis (MRA) was conducted to determine whether firm size changed the strength of the relationships between ESG Disclosure and firm value and between ERM and firm value. The estimated moderation equation was:

$$\text{PBV} = 123.200 - 82.963 \text{ ESG} + 34.902 \text{ ERM} - 0.284 \text{ ROA} - 0.087 \text{ Leverage} + 0.159 \text{ Growth} - 64.158 \text{ Size} + 38.069 (\text{ESG} \times \text{Size}) - 13.160 (\text{ERM} \times \text{Size})$$

The interaction coefficients were used as the primary basis for determining the moderating role of firm size. Table 9 summarizes the MRA results.

Table 9. Moderated Regression Analysis Results

Interaction Term	Coefficient	t-statistic	p-value	Decision
ESG × Firm Size	38.06887	1.841392	0.0693	Significant at 10%; H3 supported
ERM × Firm Size	−13.16008	−0.708242	0.4809	Not significant; H4 not supported

Source: Secondary data processed using EViews 9, 2025

The ESG Disclosure × Firm Size interaction had a positive coefficient of 38.06887, with a t-statistic of 1.841392 and a p-value of 0.0693. Based on the 10% significance level adopted for moderation testing, this interaction was statistically significant. Therefore, H3 was supported. The positive interaction coefficient indicates that firm size strengthens the positive relationship between ESG Disclosure and firm value. In other words, the association between ESG disclosure and market valuation became stronger as firm size increased within the observed sample.

In contrast, the ERM × Firm Size interaction produced a negative coefficient of −13.16008, a t-statistic of −0.708242, and a p-value of 0.4809. Since the p-value exceeded the 10% significance criterion, the interaction was not statistically significant. Consequently, H4 was not supported. The result indicates that firm size did not significantly alter the relationship between ERM and firm value in the sampled energy-sector companies.

Hypothesis Testing Summary

The overall hypothesis-testing results are summarized in Table 10. Of the four hypotheses proposed in this study, three were supported according to the significance criteria applied.

Table 10. Summary of Hypothesis Testing

Hypothesis	Relationship	t-statistic	p-value	Decision
H1	ESG Disclosure → Firm Value	3.087	0.0027	Supported
H2	ERM → Firm Value	3.166	0.0022	Supported
H3	ESG Disclosure × Firm Size → Firm Value	1.841	0.0693	Supported at 10%
H4	ERM × Firm Size → Firm Value	−0.708	0.4809	Not supported

Source: Secondary data processed using EViews 9, 2025

The findings show that both ESG Disclosure and ERM had positive and significant direct effects on firm value. Firm size also significantly strengthened the relationship between ESG Disclosure and firm value at the 10% significance level. However, firm size did not significantly moderate the relationship between ERM and firm value. Thus, firm size demonstrated a selective moderating role rather than uniformly strengthening the effects of both independent variables.

Explanatory Power of the Model

The coefficient of determination reported for the model was $R^2 = 0.733$, indicating that the explanatory variables included in the estimated model accounted for a substantial proportion of the variation in firm value.

Table 11. Model Explanatory Power

Indicator	Value	Interpretation
R^2	0.733	73.3% of the variation in firm value is explained by the estimated model
Unexplained variation	0.267	26.7% is attributable to factors outside the model and other variation

Source: Secondary data processed using EViews 9, 2025

The R^2 value of 0.733 indicates that approximately 73.3% of the variation in firm value was explained by the variables incorporated into the estimated model, while the remaining 26.7% was associated with other factors not captured by the specification and other firm-year variation.

Overall, the empirical findings reveal a distinct pattern across the investigated relationships. ESG Disclosure and ERM were both positively and significantly associated with firm value, demonstrating their direct value relevance within the sampled Indonesian energy-sector companies. However, the moderation analysis showed an asymmetric result: firm size strengthened the ESG Disclosure–firm value relationship but did not significantly alter the ERM–firm value relationship. Therefore, organizational scale appears to be relevant to the market valuation associated with ESG disclosure, whereas the relationship between ERM and firm value was not statistically contingent on firm size in the estimated model.

ESG Disclosure and Firm Value

The positive and significant effect of ESG Disclosure on firm value supports the argument that sustainability information is relevant to capital-market participants. In the energy sector, ESG-related issues are closely connected to environmental impact, social legitimacy, governance quality, transition risk, and long-term operating continuity. Broader disclosure can help investors assess how the company recognizes and manages these issues.

From Signaling Theory, ESG Disclosure provides a mechanism for firms to communicate information about management quality, sustainability commitment, and future preparedness. Investors cannot directly observe all environmental, social, and governance practices. Disclosure therefore reduces uncertainty by converting internal practices into externally observable information. When the information is perceived as credible and material, it can improve investor confidence and support a higher valuation.

Agency Theory provides a complementary explanation. Greater ESG transparency can reduce information asymmetry and strengthen monitoring by shareholders and other

stakeholders. The reporting process can also increase managerial accountability by requiring companies to articulate targets, policies, implementation, and outcomes. In this sense, ESG disclosure has governance value in addition to informational value.

The finding is particularly meaningful for energy companies because ESG issues are not peripheral to core operations. Environmental liabilities, climate-transition exposure, occupational safety, community relations, and governance of high-risk assets can materially affect future cash flows and reputation. The positive coefficient therefore suggests that the market rewards broader ESG communication in the sampled companies.

Enterprise Risk Management and Firm Value

The positive and significant ERM coefficient indicates that integrated risk management is associated with higher firm value. This supports the view that ERM should not be treated merely as a compliance or loss-prevention function. When risk management is linked with governance, strategy, objective setting, performance evaluation, review, and communication, it can improve the quality of corporate decisions and organizational resilience.

Energy companies face a wide range of risks that are often interconnected. Commodity-price changes may affect investment capacity; environmental incidents can create operational, legal, and reputational consequences; transition policies can alter the economics of long-lived assets; and safety failures can affect both financial performance and social legitimacy. ERM can help management evaluate these risks in a portfolio perspective rather than in isolated silos.

From an agency perspective, ERM strengthens oversight of managerial risk-taking and provides boards with more structured risk information. This may reduce the probability of decisions that create excessive downside exposure for shareholders. From a signaling perspective, visible commitment to ERM can communicate management competence and preparedness. Even where investors cannot directly inspect all internal risk processes, reported ERM practices can serve as evidence of governance quality.

The finding suggests that the valuation relevance of ERM may derive from both value protection and value creation. It protects value by reducing the likelihood and severity of adverse outcomes and creates value by enabling better risk-adjusted strategic decisions. The positive direct effect is therefore consistent with the study's conceptual treatment of ERM as a strategic governance mechanism.

Firm Size as a Moderator of ESG Disclosure

The significant positive interaction between ESG Disclosure and firm size indicates that the relationship between ESG disclosure and firm value is stronger for larger companies. This result supports the interpretation of firm size as a boundary condition for the market relevance of sustainability information.

Larger companies generally possess greater financial and organizational resources to implement, measure, assure, and communicate ESG activities. Their broader stakeholder base and higher public visibility may also increase investor attention to sustainability information. As a result, ESG disclosures from larger firms may receive greater scrutiny and may carry stronger valuation consequences.

The result can also be interpreted through stakeholder visibility. Large energy companies are more likely to have extensive environmental footprints, complex supply chains, multiple operating locations, and broader interactions with regulators, communities, and institutional investors. These conditions raise the materiality of sustainability information.

Consequently, disclosure may have greater informational value when the company is large and highly visible.

However, the finding should not be interpreted as evidence that smaller firms cannot benefit from ESG disclosure. Rather, it indicates that the marginal valuation association observed in this sample becomes stronger as firm size increases. Smaller companies may still improve market credibility by focusing on material ESG issues and providing transparent, consistent, and decision-useful information.

Why Firm Size Does Not Moderate the ERM–Firm Value Relationship

The non-significant ERM×Size interaction is theoretically important because it demonstrates that firm size does not function as a universal moderator. While ERM has a significant direct effect on firm value, the strength of that relationship does not systematically increase or decrease with company size in the sample.

This result implies that the effectiveness of ERM may depend more on implementation quality than on scale. A smaller company can have a disciplined risk culture, clearly defined risk appetite, strong board oversight, effective key risk indicators, and well-integrated risk-based decision processes. Conversely, a large company may possess extensive resources yet still fail to create value from ERM if the system remains fragmented, compliance-driven, or disconnected from strategy.

The contrast with ESG Disclosure clarifies that ESG and ERM create value through different mechanisms. ESG Disclosure is externally visible information whose market impact (Aydoğmuş et al., 2022) can increase with corporate visibility and reporting capacity. ERM is primarily an internal governance and decision mechanism whose effectiveness depends on process integration and managerial behavior. Firm size therefore strengthens the information effect of ESG disclosure but does not automatically strengthen the strategic value of ERM.

This selective moderating role contributes to the literature by cautioning against applying the same contextual variable to different governance mechanisms without considering their underlying causal pathways. It also supports a contingency-based interpretation: firm characteristics matter, but their relevance depends on the specific mechanism being examined.

CONCLUSION

This study examined the effects of ESG Disclosure and Enterprise Risk Management (ERM) on firm value and tested the moderating role of firm size among 22 energy-sector companies listed on the Indonesia Stock Exchange during the 2021–2025 period, resulting in 110 firm-year observations. Fixed Effects panel regression showed that ESG Disclosure had a positive and significant effect on firm value ($t = 3.087$; $p = 0.0027$), and ERM also had a positive and significant effect ($t = 3.166$; $p = 0.0022$). Moderated Regression Analysis (MRA) showed that firm size strengthened the relationship between ESG Disclosure and firm value at the 10% significance level ($t = 1.841$; $p = 0.0693$), whereas firm size did not moderate the relationship between ERM and firm value ($t = -0.708$; $p = 0.4809$). The findings imply that energy companies should treat ESG disclosure as a strategic communication and accountability mechanism rather than merely a reporting requirement. Disclosure should be comprehensive, material, transparent, consistent, and linked to sustainability targets and actual performance outcomes. Larger companies, in particular, should utilize their reporting capacity and visibility to communicate sustainability performance credibly. At the same time, companies of all sizes

should strengthen ERM through risk culture, risk appetite frameworks, key risk indicators, strategic integration, and board oversight, as the value relevance of ERM does not depend on firm size.

For investors, the results indicate that ESG Disclosure and ERM provide relevant non-financial information for evaluating energy-sector companies. Investors should therefore complement conventional financial indicators with assessments of sustainability transparency and risk-governance quality. For regulators, the findings support the continued development of disclosure quality, comparability, and integration between ESG considerations and enterprise risk management, particularly in sectors exposed to climate, environmental, social, and operational risks. This study was limited to Indonesian energy-sector companies and a five-year observation period. It relied on publicly available secondary data; therefore, the measurement indices may reflect reporting practices more directly than the actual quality of internal implementation. Additionally, the use of equally weighted disclosure items may not fully capture differences in materiality among ESG topics or ERM principles. Future research should expand the observation period and sector coverage, incorporate ESG ratings or materiality-weighted disclosure measures, develop ERM maturity indices, test alternative firm-value measurements, and examine mediating mechanisms such as profitability, cost of capital, corporate reputation, governance quality, and organizational resilience.

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