



Environmental, Social, and Governance (ESG), Green Innovation, and Firm Value in Indonesia: A Study of Companies Operating in Energy Sector for The Year 2020 - 2024

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ABSTRACT

This study examines the relationship between Environmental, Social, and Governance (ESG) and firm value, with particular attention to the mediating role of green innovation. The research aims to: (1) analyze the influence of ESG pillars on green innovation, (2) evaluate the impact of ESG pillars on firm value, (3) assess the effect of green innovation on firm value, and (4) investigate whether green innovation mediates the relationship between ESG pillars and firm value. A quantitative approach is employed using panel data from 12 companies observed over the 2020–2024 period, resulting in 60 firm-year observations. The study utilizes secondary data obtained from sustainability reports, ESGi, and Bloomberg databases. ESG performance is measured through environmental, social, and governance scores, while green innovation is proxied by PROPER ratings and firm value is measured using Tobin's Q. The empirical results indicate that the governance pillar is the only ESG dimension that significantly and positively affects firm value. Moreover, governance performance also influences firm value indirectly through green innovation. The findings further show that green innovation positively contributes to firm value and partially mediates the relationship between governance performance and firm value.

Keywords: ESG, firm value, green innovation

INTRODUCTION

In recent years, Environmental, Social, and Governance (ESG) practices have become a central consideration in corporate strategy and investment decisions. Increasing regulatory pressure, rising investor demand for sustainable assets, and growing societal expectations for responsible corporate behavior have encouraged firms to integrate ESG considerations into their operations. In Indonesia, this trend is supported by government policies promoting environmental responsibility and sustainable finance, including mandatory Environmental Impact Assessments (AMDAL) under Law No. 32 of 2009, stricter emission regulations, and national renewable energy targets outlined in Presidential Regulation No. 22 of 2017 (KPMG, 2024; PwC, 2024). These initiatives have strengthened Indonesia's position as an emerging hub for sustainable finance within the ASEAN region.

Alongside regulatory developments, investors increasingly incorporate ESG criteria into investment decisions. The expansion of sustainable investment funds, green bonds, and ESG-linked financial instruments has intensified pressure on firms to improve their ESG performance. Strong ESG ratings are often associated with improved corporate reputation, reduced cost of capital, and greater access to international funding. Consequently, ESG performance is increasingly viewed as a strategic factor influencing firm value.

Despite the growing importance of ESG practices, empirical findings regarding the relationship between ESG performance and firm value remain inconclusive. Several studies report a positive relationship, suggesting that ESG activities enhance firm value through improved stakeholder relations and long-term risk mitigation (Chen et al., 2024; Kartikasary et al., 2023; Radwan & Wang, 2023). In contrast, other studies find negative or insignificant effects, arguing that ESG initiatives may impose additional costs without generating immediate financial benefits (Prabawati & Rahmawati, 2022; Yori & Rahmawati, 2025; Al-Tarawneh et al., 2024). Furthermore, some studies identify non-linear or context-dependent relationships, indicating that the ESG–firm value nexus may vary across industries, institutional environments, and economic conditions (Ersoy et al., 2022;

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Garsaa, 2024). These mixed findings highlight the need for further investigation into the mechanisms through which ESG performance affects firm value.

One potential mechanism is green innovation. Green innovation refers to the development and implementation of environmentally friendly technologies, processes, or practices that reduce environmental impact while improving operational efficiency. Recent studies suggest that green innovation can transform ESG initiatives from symbolic compliance into tangible competitive advantages by enhancing efficiency, reducing environmental costs, and creating new market opportunities (Bai et al., 2024). Empirical evidence indicates that green innovation can strengthen the positive impact of ESG performance on firm value and may serve as a mediating mechanism linking sustainability practices to financial outcomes (Chouaibi & Chouaibi, 2021; Zheng & Feng, 2024).

The energy sector provides a particularly relevant context for examining this relationship. As one of the most environmentally intensive industries, the energy sector faces substantial regulatory pressure, high carbon emissions, and increasing expectations to transition toward low-carbon energy systems. Indonesia's energy sector plays a strategic role in both national development and global energy markets. As the largest economy in ASEAN and a major energy producer and consumer, Indonesia is currently pursuing an energy transition agenda aimed at expanding renewable energy capacity while maintaining energy security. However, the sector continues to face structural challenges, including heavy reliance on fossil fuels, infrastructure constraints, and financing gaps for renewable energy projects.

These conditions create a complex environment in which energy companies must balance sustainability commitments with financial performance. Some firms continue to rely heavily on fossil fuel markets, while others actively integrate renewable energy investments and ESG-driven innovation into their business models. These contrasting approaches suggest that the financial benefits of ESG practices may depend on whether firms translate sustainability initiatives into tangible operational innovations.

Despite the increasing relevance of ESG and green innovation, empirical evidence examining their interaction in the Indonesian energy sector remains limited. Most previous studies focus either on ESG disclosure or firm value independently, while relatively few explore the mediating role of green innovation in explaining the ESG–firm value relationship. Moreover, the period between 2020 and 2024 represents a critical phase characterized by accelerating ESG adoption and energy transition initiatives.

Therefore, this study aims to examine the relationship between ESG performance and firm value in Indonesia's energy sector while investigating the mediating role of green innovation. Specifically, this research analyzes the impact of ESG pillars on green innovation, the influence of ESG performance on firm value, and whether green innovation serves as a mechanism that strengthens the relationship between ESG performance and firm value. By focusing on the energy sector during the 2020–2024 period, this study contributes to the literature by providing sector-specific evidence on the financial implications of ESG integration and the strategic role of green innovation in emerging markets.

THEORITICAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

Research-Based View

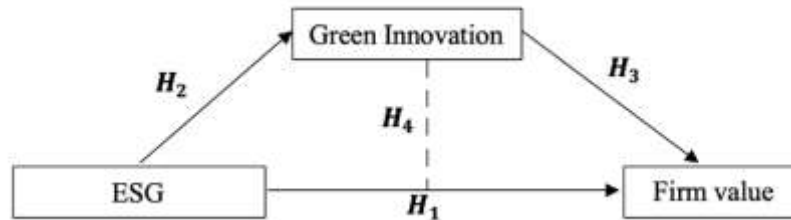
The Resource-Based View (RBV) theory explains firm performance by emphasizing the importance of internal resources and capabilities as sources of sustained competitive advantage (Wernerfelt, 1984; Barney, 1991). According to RBV, firms achieve superior performance when their resources are valuable, rare, inimitable, and non-substitutable (VRIN). These resources include both tangible assets and intangible capabilities such as knowledge, innovation capacity, governance quality, and stakeholder relationships. Because intangible capabilities are often socially complex and difficult to replicate, they can generate long-term competitive advantages and influence firm value.

In the context of sustainability, ESG performance and green innovation can be viewed as strategic capabilities that contribute to competitive advantage. ESG practices reflect a firm's ability to manage environmental risks, maintain transparent governance, and respond to stakeholder expectations. Green innovation further strengthens this capability by enabling firms to develop environmentally friendly technologies and processes that improve efficiency and support long-term sustainability. From the RBV perspective, firms that effectively integrate ESG practices with green innovation are more likely to enhance firm value by transforming sustainability initiatives into tangible economic benefits.

Conceptual Framework

This study examines the relationship between Environmental, Social, and Governance (ESG) performance and firm value, with green innovation acting as a mediating variable. ESG reflects a firm's commitment to sustainable practices across environmental, social, and governance dimensions.

Figure 1. Conceptual Framework



The Effect of ESG on Firm Value

From the perspective of the Resource-Based View (RBV), ESG can enhance firm value by representing firm-specific resources and capabilities that support sustainable competitive advantage. RBV suggests that variations in firm value arise from differences in resources that are valuable, rare, inimitable, and non-substitutable (Barney, 1991). Strong ESG practices may reflect internal capabilities such as effective governance systems, stakeholder relationship management, environmental risk control, and transparent organizational processes. When embedded in corporate strategy and decision-making, these capabilities can improve operational efficiency, reduce regulatory and reputational risks, and strengthen firms' long-term competitiveness (Hart, 1995).

Beyond internal capabilities, ESG disclosures also serve as signals to external investors regarding a firm's management quality, ethical standards, and preparedness for sustainability-related challenges. Because many aspects of firm quality are not directly observable, ESG practices help reduce information asymmetry and increase investor confidence. Prior studies show that firms with stronger ESG practices often benefit from lower costs of capital and higher market valuation, commonly measured using Tobin's Q (Alareeni & Hamdan, 2020; Shen et al., 2023). Similar evidence in the Indonesian context suggests that ESG practices can strengthen transparency and stakeholder trust, thereby enhancing firm value (Nur'aeni & Sari, 2023). Based on this reasoning, ESG performance is expected to positively influence firm value.

H1A. Environmental pillar positively affects firm value

H1B. Social pillar positively affects firm value

H1C. Governance pillar positively affects firm value

The Effect of ESG on Green Innovation

From the perspective of the Resource-Based View (RBV), ESG can promote green innovation by reflecting firm-specific resources and capabilities that support sustainable innovation. RBV argues that firms achieve competitive advantage through resources that are valuable, rare, inimitable, and non-substitutable (Barney, 1991). Strong ESG practices may signal internal capabilities such as effective environmental management systems, transparent governance structures, and strong stakeholder engagement. These capabilities help firms develop a sustainability-oriented organizational culture and strengthen human capital, which can facilitate the development of environmentally friendly technologies, products, and processes.

ESG may also shape internal conditions that support innovation. Firms with stronger ESG commitments tend to demonstrate higher environmental awareness, ethical management practices, and stronger accountability mechanisms, which collectively foster an innovative organizational environment (Antonius & Ida, 2023). Such environments encourage knowledge sharing, collaboration, and long-term strategic thinking, all of which are essential for green innovation activities. In addition, governance mechanisms can ensure that adequate resources and managerial attention are allocated to sustainability initiatives, while strong social practices may help firms attract and retain skilled employees capable of generating innovative solutions.

Empirical evidence further supports the positive relationship between ESG performance and green innovation. Green innovation, which focuses on reducing environmental impact while improving operational efficiency, often requires substantial investment and organizational commitment (Khan et al., 2023). Prior studies show that firms with stronger ESG performance are more likely to engage in green innovation as a response to



regulatory pressure and stakeholder expectations (Xie et al., 2019; Albort-Morant et al., 2021). These initiatives can improve resource efficiency, strengthen corporate reputation, and create long-term competitive advantages. Based on this reasoning, ESG performance is expected to positively influence green innovation.

H2A. Environmental pillar positively influences green innovation

H2B. Social pillar positively influences green innovation

H2C. Governance pillar positively influences green innovation

The Effect of Green Innovation on Firm Value

From the perspective of the Resource-Based View (RBV), green innovation can enhance firm value by representing a strategic capability that contributes to sustainable competitive advantage. RBV suggests that firms achieve superior performance when they possess valuable, rare, inimitable, and non-substitutable (VRIN) resources (Barney, 1991). Green innovation—defined as the development of environmentally friendly products, processes, or technologies that reduce environmental risks—can reflect such capabilities when embedded within a firm’s operations and strategic decision-making (Khan et al., 2023). By developing these capabilities, firms can strengthen their ability to create long-term value and improve market performance.

Green innovation may influence firm value through both operational and reputational mechanisms. Environmentally efficient technologies and resource-saving processes can improve operational efficiency, reduce production costs, and enhance profitability. At the same time, green innovation can strengthen intangible assets such as corporate reputation and brand value. Firms that successfully introduce environmentally responsible products or processes may gain a favorable market position and attract investors and stakeholders who value sustainability-oriented business practices (Albort-Morant et al., 2021). These advantages can reduce perceived business risk and improve firms’ market valuation.

Empirical studies further support the positive relationship between green innovation and firm value. Prior research indicates that firms engaging in green innovation tend to achieve stronger financial and market performance due to improved efficiency, enhanced competitiveness, and greater stakeholder trust (Xie et al., 2019). Moreover, green innovation often requires firm-specific capabilities such as research and development capacity and organizational commitment to sustainability, making it difficult for competitors to replicate (Antonius & Ida, 2023). As a result, markets may reward firms that successfully implement green innovation with higher valuation, commonly reflected in measures such as Tobin’s Q (Shen et al., 2023). Based on this reasoning, green innovation is expected to positively influence firm value.

H3. Green innovation positively affects firm value

The Role of Green Innovation in Mediating the effect of ESG on Firm Value

From the perspective of the Resource-Based View (RBV), green innovation may serve as a mechanism through which ESG contributes to firm value. RBV argues that sustainable competitive advantage arises from firm-specific resources that are valuable, rare, inimitable, and non-substitutable (Barney, 1991). ESG can reflect internal capabilities such as strong governance structures, stakeholder engagement, and sustainability-oriented management practices. These capabilities may foster a supportive organizational environment that encourages firms to pursue green innovation. In this sense, ESG performance functions as an antecedent strategic orientation that helps firms develop innovation-related capabilities aligned with sustainability objectives.

Green innovation can then translate ESG commitments into tangible economic outcomes that enhance firm value. Through environmentally friendly technologies, processes, and products, firms may improve operational efficiency, reduce environmental risks, and strengthen corporate reputation (Chen et al., 2006). Prior empirical studies also suggest that green innovation can channel the positive effects of sustainability practices into improved financial and market performance (Wu et al., 2022; Cheng et al., 2014). By converting sustainability initiatives into measurable innovation outcomes, green innovation may act as an important pathway linking ESG performance to firm value. Therefore, green innovation is expected to mediate the relationship between ESG and firm value.

H4A. Green innovation mediates the relationship between environmental pillar and firm value

H4B. Green innovation mediates the relationship between social pillar and firm value

H4C. Green innovation mediates the relationship between governance pillar and firm value

RESEARCH METHODOLOGY

Variable and Measurement

The following are variables used and their measurements:

Table 1. Variable and Measurement

Variable	Type	Symbols	Measurement
E, S and G scores	Independent	E, S, G	Total GRI items disclosed $E \text{ score} = \frac{E \text{ Disclosure}}{E \text{ Index}}$ $S \text{ score} = \frac{S \text{ Disclosure}}{S \text{ Index}}$ $G \text{ score} = \frac{G \text{ Disclosure}}{G \text{ Index}}$
Firm Value	Dependent	TQ	$\text{Tobin's } Q = \frac{(\text{Market Value of Equity} + \text{Market Value of Debt})}{(\text{Book Value of Equity} + \text{Book Value of Debt})}$
Green Innovation	Mediator	PROPER	PROPER(<i>Program Penilaian Peringkat Kinerja Perusahaan dalam Pengelolaan Lingkungan Hidup</i>) by Ministry of Environment and Forestry

Population and Sample

The population of this study consists of energy sector companies listed on the Indonesia Stock Exchange (IDX) during the 2020–2024 period. Based on the IDX Industrial Classification (IDX-IC), the energy sector includes several sub-sectors: oil and gas (A11), coal (A12), oil, gas, and coal support services (A13), alternative energy equipment (A21), and alternative fuels (A22). The sample was selected using purposive sampling with the following criteria:

1. Companies classified under the IDX energy sector,
2. Companies that published complete annual and/or sustainability reports from 2020 to 2024, and
3. Companies with available ESG disclosure data, PROPER ratings, and financial information required to calculate Tobin's Q during the observation period.

Data Analysis Method

The regression models used in this study are specified as follows:

1. Effect of E, S, and G on Firm Value

$$TQ = \alpha + \beta_1 E + \beta_2 S + \beta_3 G + \epsilon$$

2. Effect of E, S, and G on Green Innovation

$$PROPER = \alpha + \beta_1 E + \beta_2 S + \beta_3 G + \epsilon$$

3. Mediation Model (ESG pillars, and Green Innovation on Firm Value)

$$TQ = \alpha + \beta_1 E + \beta_2 S + \beta_3 G + \beta_4 PROPER + \epsilon$$

Where:

- TQ : Firm Value
- E, S, G : Environment, Social and Governance scores
- PROPER : Green Innovation
- ϵ : Error term

Sobel Test

The Sobel test is employed to examine whether green innovation significantly mediates the relationship between ESG and firm value in the fourth hypothesis. It tests the significance of the indirect effect using the regression coefficients of the independent variable on the mediator and the mediator on the dependent variable (Sobel, 1982). In this study, the Sobel test is calculated using the online calculator developed by Soper (Quantpsy.org) based on the estimated coefficients and their standard errors.

RESULTS AND DISCUSSION

Description of Research Object

The sample was selected from companies that remained listed during the 2020–2024 period, consistently published annual and/or sustainability reports, and disclosed complete ESG, PROPER, and financial data required for the analysis.

Table 2. Sample and Population

Description	Quantity
Energy sector companies listed on the IDX continuously during 2020–2024	91
Energy companies that did not disclose E, S, G scores during 2020–2024	(70)
Energy companies that did not obtain a PROPER rating during 2020–2024	(8)
Energy companies that met all sample criteria	13
<i>Outlier</i> data based on statistical testing	(1)
Total companies used as research objects	12
Total eligible samples: 12 companies × 5 years	<u>60</u>

Descriptive Statistical Analysis

Table 3. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
E	60	0.567666	0.274710	0.000000	1.000000
S	60	0.667666	0.281089	0.000000	1.000000
G	60	0.765500	0.322771	0.000000	1.000000
TQ	60	1.256900	0.495599	0.680000	2.930000

Source: STATA 17 Output, Secondary Data for 2025

The ESG pillar scores range from 0 to 1, indicating variation in sustainability disclosures among the sampled firms. The environmental pillar (E) has a mean of 0.56 (SD = 0.27), the social pillar (S) shows a higher mean of 0.66 (SD = 0.28), and the governance pillar (G) records the highest average score of 0.76 (SD = 0.32), suggesting that governance-related disclosures are generally more extensive than environmental and social disclosures. However, the relatively large standard deviations indicate substantial variation across firms. Firm value, measured by Tobin's Q (TQ), has a mean of 1.25 (SD = 0.49) with values ranging from 0.68 to 2.93, implying that, on average, the market values the sampled firms slightly above their book value, although notable dispersion exists among observations.

Table 4. Frequency Distribution

PROPER	Freq.	Percent	Cum.
2	1	1.67	1.67
3	27	45.00	46.67
4	23	38.33	85.00
5	9	15.00	100.00
Total	60	100.00	

Source: STATA 17 Output, Secondary Data for 2025

Table 4 presents the distribution of PROPER ratings as an ordinal measure of firms' green innovation performance. Most observations fall within the Adequate category (score 3), accounting for 27 observations (45.00%), followed by the Good category (score 4) with 23 observations (38.33%). The Excellent rating (score 5) represents 9 observations (15.00%), while the Poor category (score 2) appears only once (1.67%). Overall, the distribution indicates that most firms demonstrate adequate to good green innovation performance during the study period.

F-test

Table 5. F-test

Model	Prob > F
Regression 1	0.0476
Regression 2	0.0340
Regression 3	0.0579

Source: STATA 17 Output, Secondary Data for 2025

The F-test results show probability values of 0.0476 for Model 1, 0.0340 for Model 2, and 0.0579 for Model 3. Models 1 and 2 are statistically significant at the 5% level, indicating that their independent variables jointly explain variations in the dependent variable. Model 3 is not significant at the 5% level but remains marginally significant at the 10% level.

T-test

Table 6. T-test Regression 1

TQ	Coefficient	Robust Std. Err.	t	P > t
E	-0.463834	0.321239	-1.44	0.154
S	-0.593012	0.337231	-1.76	0.084
G	0.544642	0.307934	1.77	0.082
_cons	1.482548	0.156588	9.47	0.000

Source: STATA 17 Output, Secondary Data for 2025

Table 7. T-test Regression 2

PROPER	Coefficient	Robust Std. Err.	t	P > t
E	0.303273	0.430113	0.71	0.484
S	-0.785643	0.436596	-1.80	0.077
G	0.902915	0.374553	2.41	0.019
_cons	3.327875	0.190642	17.46	0.000

Source: STATA 17 Output, Secondary Data for 2025

Table 8. T-test Regression 3

TQ	Coefficient	Robust Std. Err.	t	P > t
PROPER	0.230634	0.087742	2.63	0.011
E	-0.533780	0.298901	-1.79	0.080
S	-0.411815	0.288507	-1.43	0.159
G	0.336398	0.256057	1.31	0.194
_cons	0.715024	0.282751	2.53	0.014

Source: STATA 17 Output, Secondary Data for 2025

Based on the regression results, the equations of the three models in this study are as follows:

1. TQ = 1.482548 – 0.463834E – 0.593012S + 0.544642G + ε
2. PROPER = 3.327875 + 0.303273E – 0.785643S + 0.902915G + ε
3. TQ = 0.715024 – 0.533780E – 0.411815S + 0.336398G + 0.230634PROPER + ε

Sobel Test

Table 9. Sobel Test Results

Variable	<i>a</i>	<i>b</i>	<i>S_a</i>	<i>S_b</i>	<i>p-value</i>
E	0.303273	0.230634	0.430113	0.087742	0.495879
S	-0.785643	0.230634	0.436596	0.087742	0.137581
G	0.902915	0.230634	0.374553	0.087742	0.075628

Source: Output of the sobel test calculation via <https://quantpsy.org/>

The Sobel test results show that the indirect effect of the environmental pillar (E) on firm value (TQ) through green innovation (PROPER) yields a p-value of 0.4959, indicating no significant mediation effect. The indirect effect of the social pillar (S) through green innovation has a p-value of 0.1376, which is also not statistically significant at the 5% level. In contrast, the indirect effect of the governance pillar (G) through green innovation records a p-value of 0.0756, suggesting marginal significance at the 10% level.

The Effect of ESG on Firm Value

The regression results reveal different effects across the ESG pillars on firm value (TQ). The environmental (E) pillar shows a negative coefficient (-0.46) with a p-value of 0.15, suggesting that its effect on firm value is not statistically significant at the 5% level. Similarly, the social (S) pillar records a negative coefficient (-0.59) with a p-value of 0.08, indicating that the relationship is not significant at the 5% level, although it is marginally significant at the 10% level. In contrast, the governance (G) pillar demonstrates a positive coefficient (0.54) with a p-value of 0.08, indicating a positive association with firm value that is marginally significant at the 10% level. These findings suggest that governance quality plays a more prominent role in explaining firm valuation compared with the environmental and social dimensions.

From the perspective of the Resource-Based View (RBV), these results suggest that environmental and social activities undertaken by the sampled firms may not yet constitute valuable, rare, inimitable, and non-substitutable (VRIN) resources capable of generating sustained competitive advantage. Such activities may be perceived as compliance-driven or easily replicable practices that do not immediately translate into market value. In contrast, governance structures are socially complex and difficult to imitate, making them more likely to function as strategic capabilities that reduce agency costs, enhance decision-making credibility, and strengthen investor confidence.

These findings also engage with prior empirical studies. While some research, such as Antonius and Ida (2023), reports a broader positive ESG premium on firm value, other studies highlight the heterogeneous value relevance of individual ESG pillars, with governance often emerging as the most consistent driver of firm valuation. The results of this study align with this perspective, suggesting that capital markets may respond more strongly to governance-related signals than to environmental and social performance, which may involve longer-term benefits and greater measurement uncertainty, particularly within the energy sector.

The Effect of ESG on Green Innovation

The regression results show heterogeneous effects of the ESG pillars on green innovation, proxied by the PROPER rating. The environmental pillar (E) records a positive coefficient (0.30) with a p-value of 0.48, indicating no statistically significant relationship with green innovation. Similarly, the social pillar (S) shows a negative coefficient (-0.78) with a p-value of 0.07, suggesting a negative association that does not reach statistical significance at the 5% level, although it is marginal at the 10% level. In contrast, the governance pillar (G) demonstrates a positive coefficient (0.90) with a p-value of 0.01, indicating a statistically significant positive relationship with green innovation. These results suggest that governance quality plays a more prominent role in explaining firms' green innovation performance compared with the environmental and social dimensions.

From the perspective of the Resource-Based View, these findings imply that governance structures may represent firm-specific capabilities that enable firms to develop and implement innovation strategies more effectively. Strong governance mechanisms—such as transparent decision-making, effective oversight, and strategic resource allocation—can facilitate the transformation of sustainability initiatives into tangible innovation outcomes. Conversely, environmental and social activities may function primarily as compliance-oriented or reputational practices that do not necessarily translate directly into innovation capabilities.



These findings contribute to the ongoing discussion in the literature regarding the ESG–innovation relationship. While some studies (e.g., Xie, Huo, & Zou, 2019; Khan et al., 2023) report broader positive effects of ESG on green innovation, other research highlights the enabling role of governance and firm-specific capabilities. These findings are consistent with recent studies highlighting the mediating or enabling role of governance and firm-specific capacities (Wang & Guo, 2024; Lu et al., 2025). Overall, the results suggest that the influence of ESG on green innovation is not uniform across its dimensions and appears to depend significantly on the strength of corporate governance within firms.

The Effect of Green Innovation on Firm Value

The regression results indicate a positive and statistically significant relationship between green innovation and firm value. Green innovation, proxied by the PROPER rating, shows a positive coefficient of 0.23 with a p-value of 0.01, indicating significance at the 5% level. This result suggests that firms with higher PROPER ratings tend to exhibit higher firm value, as measured by Tobin's Q. The descriptive statistics further support this relationship, showing that most firms in the sample achieve PROPER ratings of 3 or higher, indicating an adequate level of environmental management, while firms with higher ratings are more frequently associated with higher firm valuations.

From the perspective of the Resource-Based View, this finding suggests that green innovation may function as a firm-specific capability that contributes to competitive advantage. Achieving higher PROPER ratings often reflects the implementation of advanced environmental management systems, eco-efficient technologies, and innovative processes that reduce environmental risks and operational costs. Such capabilities can enhance corporate reputation, improve stakeholder trust, and strengthen investor confidence, thereby contributing to higher market valuation.

These findings are consistent with prior research demonstrating that green innovation can enhance firm performance and market value. Studies by Khan et al. (2023), Albort-Morant et al. (2021), and Xie, Huo, and Zou (2019) report that firms engaging in green innovation tend to experience improved financial and market outcomes. In the context of the Indonesian energy sector, the results suggest that strong environmental innovation—validated through the PROPER program—can serve as an important strategic asset that enhances firm legitimacy, reduces environmental risk, and supports long-term value creation.

The Role of Green Innovation in Mediating the effect of ESG on Firm Value

The sobel test results indicate that green innovation does not consistently mediate the relationship between ESG and firm value. The indirect effect of the environmental pillar (E) on firm value through green innovation shows a p-value of 0.496, indicating no significant mediation effect. Similarly, the social pillar (S) records a p-value of 0.138, which is also not statistically significant. In contrast, the governance pillar (G) yields a p-value of 0.076, suggesting marginal significance at the 10% level, indicating a limited mediating role of green innovation in the relationship between governance performance and firm value.

From the perspective of the Resource-Based View (RBV), these findings suggest that environmental and social initiatives may not yet function as firm-specific capabilities that can be transformed into innovation-driven value creation. Such activities may be perceived as compliance-oriented or externally driven practices rather than strategic resources embedded in firms' innovation processes. Conversely, governance structures may act as higher-order organizational capabilities that facilitate the coordination and implementation of sustainability-related strategies, thereby enabling green innovation to contribute to firm value. However, the weak statistical evidence indicates that governance alone may not fully translate ESG commitments into innovation-mediated financial outcomes.

These findings contribute to the broader discussion in the literature regarding the ESG–innovation–firm value nexus. While prior studies (e.g., Chen et al., 2006; Wu et al., 2022) suggest that green innovation can mediate the relationship between sustainability practices and firm performance, the present results highlight contextual limitations. In the Indonesian energy sector during the 2020–2024 period, green innovation appears to influence firm value directly but does not consistently act as the primary mechanism linking ESG to market valuation. This suggests that investors may perceive the value of environmental and social initiatives through alternative channels such as risk mitigation, regulatory compliance, or stakeholder legitimacy rather than through innovation-driven pathways.



CONCLUSION

This study examines the relationship between ESG, green innovation, and firm value among energy companies listed on the Indonesia Stock Exchange (IDX) during 2020–2024, using the Resource-Based View (RBV) as the theoretical foundation. The results reveal that the impact of ESG on firm value is not uniform across its pillars. Governance shows a positive and significant association with firm value, while environmental and social performance do not demonstrate significant effects. This suggests that investors in the Indonesian energy sector place greater emphasis on governance quality as an indicator of managerial discipline, transparency, and risk management.

The findings further indicate that ESG does not uniformly promote green innovation. Among the three pillars, only governance exhibits a significant positive relationship with green innovation, proxied by PROPER ratings. In contrast, environmental and social dimensions show no significant relationship with innovation outcomes. Nevertheless, green innovation itself is found to positively influence firm value, indicating that firms achieving higher PROPER ratings tend to receive higher market valuation.

The mediation analysis shows that green innovation does not consistently mediate the relationship between ESG and firm value. No significant indirect effects are found for the environmental and social pillars, while the governance pillar demonstrates only marginal mediation. Overall, the results highlight that governance plays a central role in driving both innovation and firm value, while environmental and social initiatives appear to contribute less directly to market valuation within the observed context. These findings suggest that effective governance structures are critical for transforming sustainability commitments into value-creating capabilities in emerging market energy sectors.

Limitations

This study has several limitations that should be considered when interpreting the findings. First, the sample size is relatively small, consisting of only 12 firms (60 firm-year observations) due to limited availability of ESG pillar scores and PROPER ratings, which may restrict the generalizability of the results. Second, green innovation is measured solely using PROPER ratings, which mainly capture environmental compliance and operational performance and may not fully reflect broader innovation activities such as green R&D or technological development. Third, the study covers a relatively short period (2020–2024), which may be insufficient to observe the long-term effects of ESG investments and green innovation on firm value. Fourth, the empirical model does not include additional control variables such as firm size, leverage, or profitability, which may influence ESG performance and firm value. Finally, the findings are specific to the Indonesian energy sector during a period characterized by the COVID-19 pandemic and ongoing energy transition policies, which may limit their applicability to other sectors or institutional contexts.

Suggestions

- Future research should include a larger sample and extend the observation period to better capture the long-term effects of ESG performance and green innovation on firm value. Including firms from multiple sectors may also improve external validity and enable cross-industry comparisons.
- Researchers could combine PROPER ratings with additional indicators such as green patents, environmental R&D intensity, eco-innovation indices, or the introduction of green products and processes to better capture firms' innovation activities.
- Future studies should incorporate relevant control variables (e.g., firm size, profitability, leverage) and examine other mediating or moderating factors such as corporate reputation, access to green financing, ownership structure, or regulatory pressure. Combining the Resource-Based View with other frameworks such as stakeholder theory, institutional theory, or legitimacy theory may provide a more comprehensive understanding of ESG outcomes and value creation in emerging markets.

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