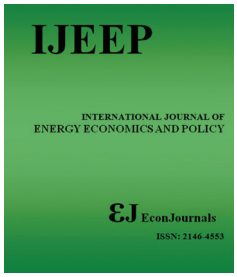

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ESG Disclosure, Intellectual Capital, and Firm Value in the Energy Sector in Indonesia: The Moderating Role of Firm Size

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ABSTRACT

This study aims to analyze the impact of environmental, social, and governance (ESG) disclosure, intellectual capital (IC), and capital structure proxied by debt to equity ratio (DER) on firm value (FV), with firm size (FS) as a moderating variable, in energy sector companies listed on the indonesia stock exchange (IDX) for the 2021-2023 period. Using a panel data regression method on 31 companies, this study found that ESG disclosure had a positive and significant effect on FV. However, IC did not show a positive impact on FV, even tending to be negative in Model 1, indicating that the market has not fully valued this intangible asset in the energy sector. Meanwhile, DER showed contradictory results (positive in Model 1, negative in Model 2), reflecting sensitivity to model specifications. FS itself had a negative and significant effect on FV, implying diseconomies of scale or agency problems in large companies. The important moderating role of FS is evident in its adverse moderating impact on the relationship between ESG and FV, where larger firms are less effective in translating ESG disclosure into higher value. Conversely, FS positively moderates the relationship between DER and FV, indicating that larger firms utilize debt more optimally. However, FS does not moderate the relationship between IC and FV. This research provides critical insights for investors and management of energy sector companies, particularly in addressing the complex relationship between sustainability practices, intangible assets, financing structures, and market value amid the global energy transition.

Keywords: Environmental, Social, and Governance Disclosure, Intellectual Capital, Firm Value, Energy Sector, Indonesia
JEL Classifications: G32, M14, 034, Q51, Q56

1. INTRODUCTION

Environmental, Social, and Governance (ESG) disclosure for companies in the energy sector is becoming increasingly important because it is considered the most sensitive sector due to its high environmental and social impacts compared to other industries (Zatonatska et al., 2024). Disclosure of ESG issues is proper for corporate stakeholders who care about social features beyond their financial performance. Specifically, ESG signals information about corporate promises on welfare, social, and environmental issues, contributing to building strong relationships between stakeholders and the public interest (Carroll, 1991). Therefore, ESG disclosure can enhance a company's reputation and the value of intangible assets as reflected in intellectual capital (IC).

In Indonesia, attention to sustainability has increased in recent years, particularly with the issuance of the Sustainable Finance Roadmap and regulations by the Financial Services Authority (OJK) through POJK No. 51/POJK.03/2017 concerning the implementation of sustainable finance for financial services institutions, issuers, and public companies. This regulation is a strategic step to encourage companies to implement sustainability principles in their business activities. However, issues reported by the Indonesia business council for sustainable development (IBCSD) in 2021 indicate that ESG implementation in Indonesia is still in its infancy. With the ESG index ranking 36th out of 47 global capital markets, as many as 40% of companies in Indonesia still do not recognize the importance of ESG implementation. Therefore, ESG practices in the energy sector

are recognized as beneficial in creating value for companies in the market (Awad Bakry, 2022).

Empirical literature has not yet produced studies which is entirely consistent and conclusive in the impact of ESG disclosure on firm value (FV). Several studies report that ESG can increase the FV (Behl et al., 2022; Aydoğmuş et al., 2022; Fiana and Endri, 2025; Qureshi et al., 2020). Zhao et al. (2018) found that higher ESG performance can improve the financial performance of energy companies in China. Dorothy and Endri (2024) found that ESG disclosure, with return on assets as an independent moderator, positively impacted the value of energy sector companies in Indonesia. Sadiq et al. (2020) found different results, indicating that ESG disclosure and awareness contributed to a decrease in FV. In addition, several studies have reported that there is no connection between ESG and market company (Atan, 2018; Haryono and Alexander, 2015; Servaes and Tamayo, 2013).

In addition to ESG, Intellectual Capital (IC) also plays a crucial role in increasing FV, as stakeholders show a strong interest in sustainable business practices, a global trend (Shahab et al., 2022). With increasingly fierce competition in today's global market, IC plays a crucial role in business strategies for long-term sustainability (Vitolla et al., 2020). IC, as an intangible asset based on knowledge and human resources, is considered capable of increasing competitiveness and reducing information asymmetry in the market (Caputo et al., 2016). In the modern business landscape, investment in knowledge is crucial for competitive survival, and IC disclosure is expected to improve financial performance and FV (Alfraih, 2018). Several studies have shown a positive relationship between IC and FV (Mavridis, 2004; Bontis et al., 2000). Other studies have revealed an indirect impact of human capital on structural capital, leading to the conclusion that, overall, IC has an impact on performance (Bollen et al., 2025). The inconsistency of the results prevents us from concluding the relationship between IC and FV.

The study has several novelties and contributions. First, disclosure of ESG in energy sector companies in Indonesia is essential because ESG can have the most outstanding value where regulations, corporate governance, and transparency are weakest. Second, use Firm Size as a moderating variable from ESG, IC, and DER to mark. Third, ESG is linked to the value of intangible assets in the form of a company's IC, where intangible assets can play a significant role in increasing productivity, and where ESG information is important for characterizing a company's sustainability focus and signaling its social promise and fourth, contributing to the understanding of the role of management in decision making and stakeholder insight.

2. LITERATURE REVIEW AND DEVELOPMENT HYPOTHESIS

2.1. ESG Disclosure and Firm Value

Stakeholder theory states that companies align their interests with stakeholder expectations in their decision-making processes. The goal is for companies to maintain stronger relationships between management and stakeholders, ultimately generating and distributing value that benefits all parties involved (Diez-Cañamero et al., 2020). Regarding ESG disclosure, stakeholder theory encourages companies to practice ESG activities through programs that benefit stakeholders (Bashir et al., 2023). Integrating ESG issues by companies builds a good reputation, reduces operational risk, and strengthens relationships with stakeholders. Therefore, optimal ESG practices by companies open attractive market opportunities for investors for long-term investment and result in increased FV (Huang, 2022). Furthermore, improved ESG disclosure impacts FV by reducing investor information asymmetry and agency costs (Yu et al., 2018). Previous studies investigating the relationship between ESG disclosure and FV have demonstrated mainly that implementing ESG activities can increase FV (Fuadah et al., 2022; Abdi et al., 2021; Aouadi and Marsat, 2018; Bashir et al., 2023; Velte, 2019). Arévalo et al. (2025) revealed that transparent environmental practices can increase FV through positive investor perceptions and market valuations. Zhou et al. (2025) demonstrated that high ESG performance can increase FV. Yu and Xiao (2022) revealed that ESG disclosure increases FV in China. Based on previous empirical evidence, the following hypotheses are developed:

H_1: ESG disclosure has a positive impact on Firm Value.

2.2. Intellectual Capital and Firm Value

IC is defined as the intangible assets associated with knowledge within an organization, including intellectual competencies, intellectual property, and intellectual resources (Chen et al., 2014). IC can improve company performance by developing competitive advantages based on knowledge, skills, and behavior (Tran and Do, 2020). Abualoush et al. (2018) revealed that IC is related to knowledge management processes and organizational performance. IC also encompasses broader components such as customer relationships, innovation, organizational systems, and technological proficiency. Therefore, IC is recognized as contributing positively to a company's financial performance (Amin and Aslam, 2017) and is a strong driver of increasing FV (Wingren, 2004). Empirical studies of the impact of IC on FV have increased significantly in recent years. Ni et al. (2020) demonstrated that IC has a positive impact on FV. Bontis et al. (2005) found that a company's IC is positively related to financial performance and market value. Salvi et al. (2020) demonstrated that the higher the quality of IC disclosure in integrated reports, the more positive the impact on FV (Salvi et al., 2020). Nguyen and Doan (2020) and Maditinos et al. (2011) also concluded that IC positively impacts FV. Therefore, this study develops the following hypothesis:

H_2: Intellectual Capital has a positive impact on Firm Value.

2.3. Capital Structure and Firm Value

Capital structure relates to a company's financial strategy decisions regarding the combination of debt and equity used to finance its operations. Companies tend to choose capital structures that simultaneously reduce the cost of capital and increase FV, depending on the stability of cash flows and the company's creditworthiness (Razak et al., 2020). Investors tend to prefer capital structures with a low Debt-to-Equity Ratio (DER), as this indicates good risk management (Endri et al.,

2019). Conversely, poor debt management can lead to financial distress and even bankruptcy if not managed carefully, thus hampering the increase in FV. Endri et al. (2021) and Harahap et al. (2020) demonstrated that debt levels, as measured by the Debt-to-Asset Ratio (DAR), negatively impact FV. Ali and Shaik (2022) found that debt financing has a negative relationship with the financial performance of Saudi Arabian energy companies. Tripathi et al. (2024) showed that leverage has both direct and moderating effects on FV. Sinha (2017) revealed that financial leverage negatively impacts FV, as measured using Tobin's Q. Vo and Ellis (2017) demonstrated that firms with low leverage tend to create value for shareholders. Therefore, the hypothesis formulated in this study is:

H_3: Capital structure has a negative impact on Firm Value.

2.4. Firm Size and Firm Value

Firm size (FS) plays a crucial role in determining its market value. Companies with larger assets reflect reliable financial stability, diverse investments, and a broader market share (Kyere and Ausloos, 2021). Reflecting the scale of its operations, FS plays a crucial role as a key indicator for assessing an entity's financial condition and economic strength. Specifically, in Indonesia's energy sector, large-scale companies tend to have higher market values, partly due to their ability to comply with sustainability regulations. Furthermore, large companies can operate efficiently through economies of scale, which increases FV. Numerous studies have demonstrated that FS positively impacts FV (see, for example, Akin et al., 2025; Dang et al., 2019; Laili et al., 2019). Fareed et al. (2016) revealed that FS is a strong determinant of financial performance. Aljaaidi and Hassan (2020) found different results, indicating that FS negatively impacts the performance of Saudi Arabian energy industry companies. Rheynaldi et al. (2023) demonstrated that FS is unrelated to the market value of industrial companies in Indonesia. Therefore, the hypothesis developed from this study is:

H_4: FS size has a positive impact on firm value.

2.5. Moderating Role of Firm Size

Large companies tend to have more stakeholders and greater financial resources than smaller companies, encouraging them to increase ESG disclosure due to the high demand and use of community economic resources. Large companies that implement ESG concepts are expected to increase their market value due to their high sustainability capabilities, growing market share, and the potential for significant improvements in financial performance. D'Amato and Falivena (2020) and Bissoondoyal-Bheenick et al. (2023) revealed that FS can positively moderate the relationship between ESG performance and FV. This finding suggests that companies with greater resources can invest more effectively in ESG practices, potentially increasing FV. López-Pérez et al. (2017) also demonstrated a strong relationship between ESG and financial value for large companies. Park and Shin (2021) revealed variations in ESG activities, financial results, and short- and long-term FV among large and medium-sized companies. Handayati et al. (2022) demonstrated that FS strengthens the relationship between CSR disclosure and FV. Ericho and Amin (2024) demonstrated a positive effect of environmental performance on FV, moderated by FS.

FS influences a company's ability to create added value through the utilization and enhancement of IC. Companies that successfully manage resources can create a competitive advantage, improve market perception, and attract high valuations from investors. This is in line with the view that the higher a company's IC, the higher its value and share price. Ardiantini et al. (2020) demonstrated that FS can moderate the effect of IC on FV, as measured by price to book value (PBV). Corvino et al. (2019) found that FS has a moderating effect on the relationship between IC and several variables related to firm performance. Ericho and Amin (2024) revealed that green IC is negatively related to FV, moderated by FS.

A healthy capital structure, characterized by a low Debt to Equity Ratio (DER), generally reflects sound financial risk management and has the potential to increase FV (Brigham and Houston, 2009). However, this relationship is not a single factor and can be moderated by other factors, one of which is FS. Larger firms are more trusted by creditors and investors, thus easily obtaining funding for profitable investment activities, which has implications for increasing firm value. Jaisinghani and Kanjilal (2017) found that FS moderates the relationship between capital structure and firm performance. Larger firms can increase their debt to finance various profitable investment activities, thus positively impacting financial performance. Wulandari and Stiqomah (2024) revealed that FS can moderate the relationship between capital structure and FV. Therefore, regarding the role of FS as a moderating variable, the following hypothesis is developed:

H_5: Firm size moderates the relationship between ESG and firm value

H_6: Firm size moderates the relationship between IC and firm value

H_7: Firm size moderates the relationship between capital structure and firm value

3. METHODOLOGY

3.1. Data and Samples

This study used all energy sector companies listed on the Indonesia Stock Exchange (IDX) from 2021 to 2023 as the population, totaling 83 companies. To determine the sample, a purposive sampling technique was used with specific criteria. These criteria included energy companies consistently listed on the IDX, publishing financial reports and sustainability reports consecutively from 2021 to 2023, and providing complete required data. Based on these selection criteria, the sample size used in this study was 31 companies.

3.2. Variable Measurement

3.2.1. Firm values

The measurement of FV in this study uses Tobin's Q. This method was chosen because of its ability to compare a company's market value with the replacement value of its assets, thus comprehensively considering the influence of intangible assets. One way to measure Tobin's Q is by using the following formula: Tobin's Q = Market value/total assets. This formula can be used to measure the relative value of a company's stock or the market as a whole.

3.2.2. ESG

The ESG disclosure measurement in this study refers to the global reporting initiative (GRI) standards, which are global guidelines for reporting economic, environmental, and social activities (Global Reporting Initiative, 2021). This method uses a ratio approach to calculate the ESG score, with a value of 1 assigned to disclosed items and 0 to non-disclosed items. The ESG score calculation for each company (ESGj) is based on the ratio of the number of relevant disclosure items to the total applicable GRI disclosure standards, as shown in the following formula:

ESGj = Total GRI disclosure standard items/number of company disclosure items

3.2.3. Intellectual capital

To measure IC, this study adopted the value added intellectual coefficient (VAIC™) approach. This concept is based on value added and consists of three main components: Value added capital employed (VACA), value added human capital (VAHU), and structural capital value added (STVA). The steps for calculating VAIC™ are as follows:

a. Calculating value added (VA)
   Value added (VA) indicates a company's ability to create value and is an accurate metric for assessing business success. VA is calculated using the following formula:
   VA = OUTPUT−INPUT
   Information:
   OUTPUT: Total sales and other income.
   INPUT: Selling expenses and other costs (other than employee expenses).
b. Calculating value added capital employed (VACA)
   VACA is a ratio that shows the value added contribution generated by each unit of physical capital employed (capital employed/CE).
   VACA = VA/CE
   Information:
   VACA: Value added capital employed
   VA: Value added
   CE: Capital employed (Equity + Net Profit)
c. Calculating value added human capital (VAHU)
   VAHU measures the efficiency of value-added generated from funds allocated to labor or human capital (HC). This ratio reflects the contribution of each rupiah invested in human capital to value added.
   VAHU = VA/HC
   Information:
   VAHU: Value added human capital
   VA: Value added
   HC: Human capital (employee expenses)
d. Calculating structural capital value added (STVA)
   STVA indicates the effectiveness of structural capital (SC) in creating value added. This ratio measures the amount of structural capital required to generate one rupiah of Value Added.
   STVA = SC/VA
   Information:
   STVA: Structural capital value added
   SC: Structural capital (VA - HC)
   VA: Value added
e. Calculating value added intellectual coefficient (VAIC™)
   VAIC™ is an indicator of an organization's intellectual capacity, also known as a Business Performance Indicator. VAIC™ is the sum of the three components above:
   VAIC™ = VACA+VAHU+STVA

3.2.4. Capital structure

In this study, capital structure is proxied using the debt-to-equity ratio (DER). DER is a ratio that compares a company's total debt (including current liabilities) to its total equity. This ratio helps assess the proportion of funding from lenders compared to owner capital. DER is calculated using the following formula:

DER = Total equity/total debt × 100%

3.2.5. Firm size

Firm size (FS) can be measured by total assets, sales, or capital (Shalit and Sankar, 1977). Based on the assumption that FS increases with increasing assets and sales, this study uses total assets as a proxy. To standardize data and reduce heteroscedasticity, FSe is calculated using the natural logarithm of total assets:

FS = Ln (total assets)

3.3. Estimation Model Specifications

The relationship between ESG, IC, DER, and FV moderated by FS is tested, formulated in two panel data regression model estimation equations. The dependent variable is FV, the independent variables are ESG and IC, and the control variables are DER and FS as moderating variables. Therefore, the study considers two models with and without moderation. Model 1 examines the effect of ESG, IC, DER, and FS on FV.

$$FV_{it} = \beta_0 + \beta_1 ESG_{it} + \beta_2 IC_{it} + \beta_3 DER_{it} + \beta_4 FS_{it} + \epsilon_{it} \quad (1)$$

Model 2 tests the influence of ESG, IC, DER, and FS on FV and the moderating influence of FS for each independent variable on FV.

$$FV_{it} = \beta_0 + \beta_1 ESG_{it} + \beta_2 IC_{it} + \beta_3 DER_{it} + \beta_4 FS_{it} + \beta_5 (ESG_{it} \times FS_{it}) + \beta_6 (IC_{it} \times FS_{it}) + \beta_7 (DER_{it} \times FS_{it}) + \epsilon_{it} \quad (2)$$

This study examines the relationship between several independent and moderating variables on firm value. FV, as the dependent variable, is measured using Tobin's Q, which compares a firm's market value to the replacement value of its assets, thus including intangible assets. The independent variables analyzed are ESG, IC, and DER. ESG disclosure is measured based on the Global Reporting Initiative (GRI) standards with a dummy variable approach (1 if disclosed, 0 otherwise). IC is measured by the Value Added Intellectual Coefficient (VAIC™), which consists of the value added of physical capital (VACA), human capital (VAHU), and structural capital (STVA).

Meanwhile, Capital Structure is proxied by the Debt to Equity Ratio (DER), which is the ratio of total debt to total equity. In addition, this study also investigates the moderating role of

the FS variable, which is measured by the natural logarithm of total assets. The regression model used tests the direct impact of ESG, IC, and DER on FV, as well as the moderating effect of FS on the relationship between each of these independent variables and FV. Interactions between the independent variables and FS (ESG*FS, IC*FS, and DER*FS) are included to test this moderating effect.

This study uses panel data regression analysis with the help of Eviews 12 software, which combines time-series data (2021-2023) and cross-sectional data (31 sample companies). Panel data regression model selection is carried out using the Chow Test, Hausman Test, and Lagrange Multiplier Test to determine the best model (common effect, fixed effect, or random effect). The suitability of the panel data regression model is evaluated through two main tests. First, the model significance test (F-Test) is used to assess whether all independent variables simultaneously have a significant influence on the dependent variable. This test determines the overall validity of the model. Second, the coefficient of determination (R^2) measures how well variation in the dependent variable can be explained by variation in the independent variables, with values closer to 1 indicating higher model predictive ability. Next, hypothesis testing is conducted using the Independent Variable Significance Test (t-Test). This test serves to determine the individual influence of each independent variable on the dependent variable, identifying which variables significantly contribute to changes in FV.

4. RESULTS

4.1. Descriptive Statistics

Based on the descriptive statistical analysis in Table 1, the study sample of 31 energy sector companies on the IDX for the 2021-2023 period exhibits substantial heterogeneity across all variables. FV as measured by Tobin's Q varies significantly (0.178-12.791, with an average of 1.492). This indicates a broad spectrum of market perceptions, ranging from companies valued far below their asset value to companies with very high market premiums, reflecting the presence of intangible assets and varying growth expectations. For the ESG variable, there is a significant disparity in adoption and performance levels (0.171-1.000, with an average of 0.565).

IC variable, measured by VAIC, exhibited a very extreme range of values (−10.282-5.476, with an average of 3.466). The presence of a significant negative minimum value indicates that not all companies successfully optimize their IC; some even experience value loss, while others are very efficient in creating added value. DER variable also exhibited significant variation (−7.544-1.771, with an average of −0.515). This unusually negative average indicates very conservative financing patterns or unique financial conditions, while the wide range confirms heterogeneity in leverage policies among energy sector companies.

Finally, FS, both in natural logarithm form (mean 3,390, range 3,297-3,489) and in real asset value (mean IDR 19.5 trillion, range IDR 547 billion-IDR 168 trillion), confirms the wide variety of companies, from substantial to giant. The highly right-skewed asset distribution justifies the need for a natural logarithm transformation for statistical analysis. Overall, these descriptive data highlight the deep and broad heterogeneity among Indonesian energy sector companies in terms of FV, ESG practices, IC management, DER, and FS. The extreme variation in some variables implies complex and unique dynamics in this sector, which provide an important basis for further regression analysis.

4.2. Correlation Analysis

Table 2 presents the correlation matrix between the research variables, including FV, ESG, IC, DER, and FS. The correlation results indicate that FV has a very weak relationship with all independent variables: a very weak negative correlation with ESG (−0.0219) and FS (−0.0317), and a very weak positive correlation with IC (0.0669) and DER (0.0053). In contrast, FS shows a moderate positive correlation, most prominently with ESG (0.5320) and DER (0.4070). The relationship between IC and DER (0.2734) and IC and FS (0.2577) shows a weak to moderate positive correlation, as does the correlation between ESG and DER (0.2577). Overall, there are no very high correlation coefficients, indicating that these variables are pretty independent of each other in the model.

4.3. Results Estimation

4.3.1. Impact of ESG, IC, DER, and FS on FV

Panel data regression estimation of FV was conducted on two research models: Model one without moderation and model two with moderation. The panel data regression models used three methods: CEM, FEM, and REM. Table 3 presents the diagnostic results of model selection based on the Chow test, Hausman test, and LM test, which concluded that FEM was the most appropriate method. Thus, the interpretation and analysis of the study were based on the FEM estimation results. Table 4 presents the panel data regression model estimation based on the FEM method. Hypothesis testing was conducted using a t-test on a fixed effect model with a significance level (α) of 0.05, to examine the partial influence of independent and moderating variables on the value of energy sector companies listed on the IDX in 2021-2023.

Table 1: Descriptive statistics

Description	FV	ESG	IC	DER	FS
Mean	1.492	0.565	3.466	−0.515	3.390
Maximum	12.791	1.000	5.476	1.771	3.489
Minimum	0.178	0.171	−10.282	−7.544	3.297

Table 2: Correlation matrix

	FV	ESG	IC	DER	FS
FV	1	−0.0219	0.0669	0.0053	−0.0317
ESG	−0.0219	1	0.0479	0.2577	0.5320
IC	0.0669	0.0479	1	0.2734	0.2577
DER	0.0053	0.2577	0.2734	1	0.4070
SIZE	−0.0317	0.5320	0.2577	0.4070	1

Table 3: Diagnostic test results without moderation

Effects test	Coefficients	Prob	Result
Chow test	131.314	0.0000	CEM<FEM
Hausman test	17.689	0.0014	FEM>REM
LM test	23.741	0.0000	CEM<REM

The test results show that the ESG estimated coefficient has a positive and significant effect on FV. The t-statistic probability value (0.0466) <0.05, and the regression coefficient is positive (0.730827). This indicates that a 1% increase in the ESG score is estimated to increase FV by 0.73%. Meanwhile, IC has a negative and significant effect on FV. The t-statistic probability value (0.0045) <0.05, but the regression coefficient is negative (−0.264295). This means that every 1% increase in IC has the potential to reduce FV by 0.26%. The DER estimated coefficient has a positive and significant effect on FV. The t-statistic probability value (0.0112) <0.05, and the regression coefficient is positive (0.520090). This indicates that every 1% increase in DER will potentially increase FV by 0.52%. Finally, FS has a negative and significant effect on FV. The t-statistic probability value (0.0022) is <0.05, but the regression coefficient is substantial (−61.05280). This means that every 1% increase in FS is estimated to decrease FV by 61.05%.

4.3.2. Analysis of the moderating effect

Tables 5 and 6 present the estimated impact of ESG, IC, DER, and FS on FV, with FS acting as a moderator variable. The diagnostic test results for selecting a panel data regression model indicate that FEM is the appropriate method. Hypothesis testing was conducted using a t-test on a fixed effects model for the 2021-2023 period for energy sector companies listed on the IDX, with a significance level (α) of 0.05 and $\alpha = 0.10$.

Table 4: Panel data regression model estimation without moderation

Variables	Coefficients	t-value	P-value
ESG	0.730827	4.470055	0.0466
IC	−0.264295	−14.78231	0.0045
DER	0.520090	9.362045	0.0112
FS	−61.05280	−21.36097	0.0022
R^2		0.983439	
Adjusted^{R2}		0.973731	
F statistic		101.3003	

***, **, and *indicate significance at the 1%, 5%, and 10% levels, respectively

Table 5: Diagnostic test results with moderating effects

Effects test	Coefficients	Prob	Result
Chow test	125.566	0.0000	CEM<FEM
Hausman test	16.7565	0.0190	FEM>REM
LM test	20.8595	0.0000	CEM<REM

Table 6: Panel data regression model estimation with moderation effects

Variables	Coefficients	t-value	P-value
ESG	9.744598	6.221567	0.0249
IC	0.231546	0.173014	0.8786
DER	−8.419857	−2.957996	0.0978
FS	−56.43602	−17.26434	0.0033
ESG*FS	−2.660653	−5.682964	0.0296
IC*FS	−0.140298	−0.355783	0.7560
DER*FS	2.657929	3.077460	0.0914
R^2		0.986206	
Adjusted^{R2}		0.976927	
F statistic		106.2776	

***, **, and *indicate significance at the 1%, 5%, and 10% levels, respectively

The test results show that the estimated coefficients show varying findings regarding the influence on FV. ESG is proven to have a positive and significant effect on FV (coefficient 9.744598; P = 0.0249), supporting the hypothesis that ESG transparency increases market appreciation. In contrast, IC does not show a significant effect on FV (P = 0.8786), rejecting the proposed positive hypothesis. For DER, a negative and significant effect is found at the $\alpha = 0.10$ level (coefficient -8.419857; P = 0.0978), which means that increasing debt tends to decrease FV and rejects the positive hypothesis. Similarly, FS has a negative and significant effect on FV (coefficient -56.43602; P = 0.0033), rejecting the positive hypothesis and indicating that oversized firms may face challenges that depress value. In the moderation test, FS was shown to significantly weaken the positive impact of ESG on FV (interaction coefficient −2.660653; P = 0.0296), supporting the moderation hypothesis. However, FS did not significantly moderate the relationship between IC and FV (P = 0.7560). Finally, FS significantly moderated the relationship between DER and FV at the $\alpha = 0.10$ level (interaction coefficient 2.657929; P = 0.0914), indicating that for large firms, the negative impact of debt may be reduced or even turn positive.

5. DISCUSSION

ESG disclosure has a positive and significant impact on FV. This finding aligns with previous relevant studies such as Friede et al. (2015), Albitar et al. (2020), and Nur'aeni and Sari (2023), which also reported a positive relationship. From a signaling theory perspective (Connelly et al., 2011), high-quality ESG disclosure serves as a positive signal from management to the market, demonstrating the company's proactivity and ability to manage non-financial risks. Investors respond to this signal with higher valuations, viewing the company as a more resilient and sustainable entity (Fatemi et al., 2018). Similarly, stakeholder theory (Freeman, 2010) asserts that good ESG practices reflect a company's commitment to various stakeholders, which in turn enhances reputation, customer loyalty, talent attraction, and reduces legal risk, collectively contributing to improved financial performance and FV (Buallay, 2019).

IC has a negative and significant impact on FV. This counterintuitive finding, which contradicts the Resource-Based View (Barney, 1991) and numerous studies that find a positive relationship (e.g., Salvi et al., 2020; Firer and Williams, 2003), indicates that the optimization and recognition of the value of IC has not yet entirely occurred in the Indonesian market, in line with studies that found a negative or insignificant impact (Anggraini et al., 2020; Pramita et al., 2021). This negative trend can be explained by several factors, including the focus of energy sector companies on physical assets, investors' myopic view of intangible asset investments that reduces short-term profitability (Titman and Wessels, 1988), and difficulties in measuring IC, which is not yet standardized, preventing the market from accurately assessing its contribution. Nevertheless, in the future, along with the energy transition, IC will become crucial for company survival and growth, driving the need to optimize the management and communication of IC value to investors.

DER has a complex influence on FV. Although initially seen as having a positive and significant effect, consistent with research by Margaritis and Psillaki (2007) and the notion of an optimal capital structure where debt can be an efficient tool to increase value, further analysis, when estimating the regression along with the interaction variable at the 90% confidence level, shows a significant and negative effect (Al-Smadi et al., 2021). This indicates that excessive use of debt beyond the optimal point can increase bankruptcy risk and agency costs (Haugen and Senbet, 1988), thereby reducing firm value in the eyes of investors. This variation reflects that the impact of DER on FV in the Indonesian energy sector depends on the optimal debt threshold, where exceeding this threshold can harm firm valuation, even though debt remains crucial for financing the future energy transition.

FS has a negative and significant effect on FV. This finding is interesting because it contradicts the conventional view that associates large firms with higher value, stability, and economies of scale (Fama and French, 1992; Jensen and Meckling, 1976). This result aligns with research by Chan et al. (1991), which also found a negative effect of FS on FV. This adverse effect may indicate the presence of diseconomies of scale or agency problems that are more prevalent in huge firms (Jensen, 1993; Jensen and Meckling, 1976). Huge size can lead to complex organizational structures, bureaucracy, and a lack of flexibility that hinders innovation and responsiveness. Growth opportunities for large firms are also often limited compared to smaller, more agile firms (Lang and Stulz, 1994). Investors in the IDX energy sector during this period may have valued efficiency, adaptability, or a focus on market niches more than simply FS. A considerable size can be considered a liability if the company is unable to convert large scale into profitability or sustainable growth, indicating the importance of active management of internal complexity and response to market dynamics.

FS has a significant and negative moderating effect on the relationship between ESG and FV. This indicates that FS weakens the relationship between ESG and FV, in line with research by Wulandari and Istiqomah (2024) and Arifah (2024), and even suggests that even large companies implementing ESG are not automatically considered comparatively superior (Qodari et al., 2021). This finding contrasts somewhat with the standard narrative that large companies should reap more significant ESG benefits due to their resources and visibility (Elkington, 1997). However, diseconomies of scale or unique challenges for large energy companies in Indonesia may be the cause; large companies with established infrastructure and significant carbon footprints face greater barriers to ESG integration and cultural change. Older or fossil fuel-oriented asset portfolios can increase perceived transition risks (Porter and Kramer, 2011), while large scale is also vulnerable to accusations of greenwashing (Gohar et al., 2024; Al-Amarneh et al., 2024) and the burden of substantial ESG implementation costs, which may be perceived as sunk costs with no commensurate returns (Handayati et al., 2022). Furthermore, large companies with long-standing ESG disclosure practices may experience the law of diminishing returns (Hu et al., 2021), while governance complexity and bureaucracy can hinder the agility of ESG responses (Najah and Jilani, 2022), and high visibility can magnify reputational risks (Qodari et al., 2021). Therefore, for large energy companies, size alone is not enough to reap ESG benefits; they must overcome the challenges inherent in their scale and demonstrate substantive commitments with high credibility to an increasingly sustainability-conscious market.

FS was not shown to moderate the relationship between IC and FV significantly. This finding indicates that FS does not significantly alter the influence of IC on FV. Although resource-based theory (RBV) (Wernerfelt, 1984; Barney, 1991) and various studies (Firer and Williams, 2003; Chen et al., 2005) highlight IC as a value driver, these results imply that the value creation potential of this intangible asset is relatively similar across different energy firm sizes, or that the challenges and opportunities related to IC are not dominated by differences in FS (Wang, 2008). The contribution of IC to FV in this sector is more intrinsic, depending on the quality and effectiveness of the management of the intangible assets themselves, rather than the scale of operations. Furthermore, the market's difficulty in consistently recognizing and valuing IC across different FS may also be a factor (Firer and Williams, 2003), where the determination of FV in the energy sector tends to be more dominated by external factors such as commodity prices and regulations, as well as investment in physical assets. Although large companies may face IC efficiency challenges due to bureaucracy, while smaller companies are more agile (Tarus and Sitienei, 2015), these findings suggest that in the energy sector, the challenges in converting IC into value are neither significantly exacerbated nor alleviated by FS, highlighting the need for all companies to be more proactive in managing and communicating their IC impacts.

FS positively and significantly moderates the relationship between DER and FV. This means that larger firms tend to have a more substantial or positive relationship between debt levels and FV. This finding aligns with research by Al-Sa'eed et al. (2020) and Asadi et al. (2022), but contradicts research by Mudjijah et al. (2019) and Mahdaleta et al. (2016). Theoretically, larger firms have easier access to debt markets at lower costs, allowing them to maximize debt tax shields without overly worrying about bankruptcy risk (Modigliani and Miller, 1963; Myers and Majluf, 1984). They can also strategically utilize leverage for expansion and long-term investment, ultimately increasing value in the eyes of investors (Chen et al., 2021; Setiawan and Suryani, 2020). Thus, in the Indonesian energy sector, larger firm size strengthens the positive impact of debt-driven capital structure on FV in the capital market.

6. CONCLUSION

This study analyzes the impact of ESG disclosure, IC, DER, and the moderating role of FS on FV in 31 energy sector companies listed on the Indonesia Stock Exchange (IDX) for the 2021-2023 period using panel data regression. The results indicate that ESG disclosure has a positive and significant effect on FV, consistent with signaling theory and stakeholder theory, which emphasize the value of transparency and sustainability in the energy sector. IC does not have a positive effect on FV; one model found a significant adverse effect, while the other model found an insignificant effect.

This indicates that in the energy sector, IC has not consistently or positively translated into FV, possibly due to management optimization, investor focus on physical assets, or measurement difficulties. The effect of DER on FV shows contradictory findings: significantly positive in one model and significantly negative in another, indicating a relationship that is highly dependent on model specification. FS consistently has a negative and significant effect on FV, indicating that larger firms tend to have lower values due to diseconomies of scale and agency problems, particularly in the energy sector facing significant transition challenges.

Regarding moderation, FS negatively and significantly moderates the relationship between ESG and FV, meaning that large size weakens the positive impact of ESG. However, FS does not significantly moderate the relationship between IC and FV, implying that the contribution of IC is intrinsic and not significantly influenced by FS. Finally, FS positively and significantly moderates the relationship between DER and FV, indicating that larger firms can strengthen the positive impact of debt use on FV.

This research has important implications for both the literature and practice. It confirms the positive role of ESG on FV, but challenges conventional wisdom by demonstrating an adverse effect of IC and FS, as well as contradictory findings on capital structure. It also enriches the moderation literature by revealing that FS weakens the positive impact of ESG but strengthens the effect of debt on FV, while not significantly moderating the IC relationship. These findings from the Indonesian energy sector are relevant to other emerging economies. Managerially, energy companies should ensure substantive ESG initiatives, optimize IC regardless of size, and allow large companies to utilize debt strategically with caution. Investors should analyze these factors, considering firm size as an important context. For regulators, these findings suggest the need for differentiated policies, such as stricter ESG guidelines for large companies and support for IC development at all scales.

This study has several limitations, including the short observation period (2021-2023), which limits long-term generalization and variation in economic conditions. The exclusive focus on the energy sector limits the generalizability of the findings to other industries, and the measurement of key variables such as IC (VAIC™) and ESG disclosure uses proxies that may not fully capture their accurate dimensions or quality. Finally, this study does not qualitatively explore the mechanisms behind specific findings such as negative moderation of ESG or the insignificance of IC, thus limiting comprehensive understanding. Based on these limitations, recommendations for future research include extending the observation period (5-10 years), expanding the scope of industry sectors, using alternative proxies or more sophisticated measurement methods for IC and ESG. Furthermore, the use of qualitative or mixed methods is recommended to understand the mechanisms behind complex findings.

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