



Original Article

Sustainability Committee Moderating Firm Value, Profitability, and Board Characteristics on Carbon Disclosure

Suciati^{1✉}, Indah Fajarini Sri Wahyuningrum²

^{1,2}Universitas Negeri Semarang.

Correspondence Author: suciati@students.unnes.ac.id✉

Abstract:

The purpose of this study is to examine the influence of firm value, profitability, board size, and board gender diversity on carbon emissions disclosure, as well as to determine whether sustainability committees act as moderating variables in these relationships. This quantitative study analyzes panel data from 55 energy sector companies listed on the Indonesia Stock Exchange with a five-year research period (2019-2023) selected through purposive sampling. The analysis technique employs Moderated Regression Analysis (MRA) with a fixed-effects model and the Driscoll-Kraay standard error, as implemented in STATA 19. The results indicate that firm value has a significant positive effect on carbon emissions disclosure, while profitability, board size, and board gender diversity do not affect carbon emissions disclosure. The sustainability committee does not moderate the relationship between the independent variables and carbon emissions disclosure. This study adopts two innovative approaches, namely positioning the sustainability committee as a moderating variable, which has been minimally explored in previous literature, and applying corporate value as an independent predictor, which is generally treated as a dependent variable in previous studies.

Keywords: Board characteristics, Carbon emission disclosure, Firm value, Profitability, and Sustainability committee

Introduction

Climate change has become a global issue that threatens the future of the world (Choi et al., 2013; Kılıç & Kuzey, 2019). The main cause of climate change is the release of greenhouse gases, such as carbon dioxide CO₂, methane CH₄, dinitrogen N₂O, fluorinated gases, and aerosols (Block et al., 2024). The concentration of greenhouse gases dispersed in the atmosphere and oceans can have a fatal impact on natural ecosystems and human life, as well as hinder sustainable economic growth and



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accelerate global warming (Al-Qahtani & Elgharbawy, 2020; Yang et al., 2023). According to data from EDGAR (Emissions Database for Global Atmospheric Research), global greenhouse gas emissions in 2023 reached a new record of 53.0 GtCO₂eq, up 1.9% or 994 MtCO₂eq compared to 2022. In 2023, Indonesia was recorded as producing greenhouse gas emissions of 1,200.2 MtCO₂eq and contributing 2.3% of global greenhouse gas emissions (Crippa et al., 2024).

The worsening climate crisis caused by increased greenhouse gas emissions has made companies' carbon footprints a focus of public attention. In response, the global order is now moving toward the development of a low-carbon economy as a global policy based on pollution reduction, low energy consumption, and emission control (Wu et al., 2022). This situation has put companies under pressure from various stakeholders, including governments, investors, and consumers, to reduce and effectively control their carbon emissions (Toukabri & Youssef, 2023). As a major contributor to carbon emissions, companies in the energy sector are facing increasing pressure from stakeholders to implement sustainability practices in their business activities. Amid global scrutiny of the energy sector's contribution to greenhouse gas emissions, Indonesia's strategic measures are showing concrete progress. According to a report from the Ministry of Energy and Mineral Resources, by 2023, the Indonesian government will be able to reduce greenhouse gas emissions in the energy sector by 127.67 tons of CO₂e. This achievement is a positive development as it exceeds the target set of 116 million tons of CO₂e or 110%. While energy companies in Indonesia have made progress in reducing greenhouse gas emissions, have all companies in the energy sector disclosed their carbon emissions to the public?

Carbon emission disclosure practices in Indonesia are still voluntary. Based on data from companies listed on the Indonesia Stock Exchange (IDX) up to 2023, only around 56.7% of energy sector companies in Indonesia have published sustainability reports. The publication of sustainability reports by companies indicates that they are concerned and responsible for their business activities' environmental impact, as these reports include information on carbon emissions. The measurement and disclosure of carbon emissions presented in corporate sustainability reports also reflect the transparency and accountability of companies. In addition, disclosing carbon emissions can maintain a company's image and respond to stakeholder demands while demonstrating the company's commitment to environmental governance practices to mitigate climate change issues. A company's reputation and image in the public eye can serve as a business defense mechanism, as public perception directly impacts a company's performance in the market (Anggraeni, 2015). The Paris Agreement is Indonesia's commitment to reduce greenhouse gas emissions by 29% by 2030 from BAU (business as usual) independently or by 41% with international support. This commitment was strengthened through the enhanced NDC following the COP26 Glasgow meeting. Indonesia set a target to reduce greenhouse gas emissions by 31.89% by 2030 (contributing 358 million tons in the energy sector) independently or 43.20% with international support.

In theory, carbon disclosure is based on legitimacy theory and stakeholder theory. According to legitimacy theory, companies need to meet stakeholder expectations and social norms related to carbon emissions disclosure in order to maintain legitimacy and social norms, while also convincing the public of the company's concern and commitment to sustainability (Alsayegh et al., 2020; Choi et al., 2013; Nasih et al., 2019). Legitimacy theory supports companies in continuing to exist in society by

ensuring that their activities and performance obtain social legitimacy (M. W. Abdullah et al., 2020). Meanwhile, stakeholder theory states that a company's responsibility is not only to optimize shareholder welfare but must also include the interests of all other stakeholders through the disclosure of carbon emissions (Toukabri & Youssef, 2023). The phenomenon of climate change and increasing awareness of the impact of greenhouse gas emissions have prompted stakeholders to demand transparency from companies in reporting carbon emissions information (Al-Qahtani & Elgharbawy, 2020). Both theories collectively provide a strong theoretical foundation for understanding companies' motivations in responding to government regulatory demands and public expectations regarding carbon emissions disclosure, which is part of a company's environmental performance (Elsayih et al., 2021; Xhindole & Tarquinio, 2024).

Many previous studies have discussed carbon emissions disclosure. A study by (Kılıç & Kuzey, 2019) examined the influence of board size, board independence, board gender diversity, board national diversity, and sustainability committees on carbon emissions disclosure in Turkey. Another study by (Saadah et al., 2024) examined the influence of female directors and female employees on carbon emissions disclosure in the banking sectors across ASEAN. Generally, previous studies have focused on the relationship between carbon emissions disclosure and corporate governance or board characteristics. Meanwhile, this study examines the influence of company performance (firm value and profitability) and board characteristics (board size and board gender diversity) on carbon emissions disclosure and adds the existence of a sustainability committee in the company as a moderating variable to test whether the sustainability committee can strengthen or weaken the relationship between variables. The objectives of this study are to examine whether firm value, profitability, board size, and board gender diversity influence carbon emissions disclosure and to examine whether the sustainability committee acts as a moderating variable in these relationships.

Companies with high market value are generally more open in disclosing their carbon emissions to the public. These companies have high visibility in the eyes of investors, regulators, and the public. In addition, companies also realize that carbon emission disclosure serves as an indicator of corporate transparency towards the environment, which can build and strengthen a positive corporate reputation (Jin et al., 2025). According to (Akbaş & Canikli, 2019) voluntary carbon emissions disclosure by companies can serve as a consideration for investors in the capital market when making decisions. Company value is often studied in the context of financial performance, while the context of environmental transparency or carbon emissions is still rarely studied. A study by (Akbaş & Canikli, 2019) proves that companies with high market value have a positive effect on carbon emissions disclosure. Hypothesis 1 (H1) is whether company value has a positive influence on carbon emissions disclosure. The implementation of carbon emission disclosure in companies requires costs. Companies with high profitability will be more capable of financing it as a form of legitimacy strategy because they are supported by sound financial conditions. Meanwhile, companies with low profitability face obstacles in implementing carbon emissions disclosure because the costs become a heavy financial burden on the company (Akhiroh & Kiswanto, 2016; Xhindole & Tarquinio, 2024). Inconsistencies in research regarding the influence of profitability on carbon emissions disclosure are evident in the studies by (Abdalla et al., 2024; M. W. Abdullah et al., 2020; Akhiroh & Kiswanto, 2016; Rahman & Alsayegh, 2021), which states that profitability has a positive effect on carbon emissions disclosure. Meanwhile, the study by (Ratmono et al., 2022; Sari & Nisa, 2020; Xhindole &

[Tarquinio, 2024](#)) states that profitability does not affect carbon emissions disclosure. Hypothesis 2 (H2) is whether Profitability has a positive effect on carbon emissions disclosure.

A larger board of directors in a company has the potential to enhance the company's strategic capabilities in managing carbon emissions disclosure, as a larger board allows the company to have commissioners and directors with a broad understanding, thereby achieving transparency toward stakeholders ([Kılıç & Kuzey, 2019](#); [Nasih et al., 2019](#); [Tila & Augustine, 2019](#)). Each commissioner or director on the board brings different qualifications that can enrich expertise, knowledge, skills, and broad insights into carbon emissions disclosure ([Gürbüz & Gürbüz, 2025](#)). In addition, a large board of directors provides advantages for companies because it provides broader access to information, diversity of managerial experience, and the ability to select experienced members to implement environmentally friendly practices and mitigate risks from environmental issues in the business world ([A. Abdullah et al., 2024](#)). Research by ([Gürbüz & Gürbüz, 2025](#); [Nasih et al., 2019](#); [Riantono & Sunarto, 2022](#); [Rossi et al., 2021](#); [Tila & Augustine, 2019](#); [Toukabri & Youssef, 2023](#)) states that the size of the board of directors influences carbon emissions disclosure, while research by ([Kılıç & Kuzey, 2019](#)) states that the size of the board does not influence carbon emissions disclosure. Hypothesis 3 (H3) is whether Board size has a positive effect on carbon emissions disclosure. Gender diversity on the board of directors is reflected in the percentage of women in the company. The presence of female directors in a company can enrich the quality of discussions and develop the board's ability to control carbon emissions ([Konadu, 2017](#); [Toukabri & Youssef, 2023](#)). Research by ([Saadah et al., 2024](#); [Saraswati et al., 2021](#); [Tingbani et al., 2020](#)) states that gender diversity in the board has a positive effect on carbon emissions disclosure, while research by ([Kılıç & Kuzey, 2019](#); [Tila & Augustine, 2019](#)) states that gender diversity does not affect carbon emissions disclosure. Hypothesis 4 (H4) is whether Gender diversity on the board has a positive effect on carbon emissions disclosure.

Optimal implementation of environmental policies in companies can be achieved through subcommittees, where sustainability committees can be formed to assist the board in addressing carbon emission issues within the company ([Baraibar-Diez & Odriozola, 2019](#); [Konadu, 2017](#)). The existence of a sustainability committee in a company demonstrates the company's concern for the environment, thereby having a positive impact on stakeholders regarding carbon emissions disclosure ([Córdova et al., 2018](#)). Furthermore, the existence of a sustainability committee in a company reflects proactive and visionary corporate governance that guides the company's long-term strategy to achieve low-carbon targets ([Rankin et al., 2015](#)). The role of the sustainability committee encourages companies to implement responsible sustainability practices and report their sustainability performance transparently through annual reports and sustainability reports ([Kılıç & Kuzey, 2019](#)). There are several studies examining sustainability committees, such as the study by ([Arayssi et al., 2020](#); [Baraibar-Diez & Odriozola, 2019](#); [Daniel-Vasconcelos et al., 2022](#); [Kılıç & Kuzey, 2019](#); [Tingbani et al., 2020](#); [Xhindole & Tarquinio, 2024](#)). This study positions the sustainability committee as a moderator to identify whether its presence in a company strengthens or weakens the relationship between firm value, profitability, board size, and board gender diversity with carbon emissions disclosure in the company. Hypotheses 5, 6, 7, and 8 (H5, H6, H7, H8) are whether the sustainability committee moderates the relationship between company value, profitability, board size, and board gender diversity on carbon emissions

disclosure.

Methods

This study uses a quantitative approach to examine the influence of independent variables (firm value, profitability, board size, and board gender diversity) on the dependent variable (carbon emissions disclosure), considering the role of a moderating variable (sustainability committee). The data used in this study is panel data (a combination of time-series and cross-section) with an observation period of five years, namely 2019 to 2023. The population in this study includes all energy sector companies listed on the Indonesia Stock Exchange (IDX) during the period 2019 to 2023. The sample selection in this study was conducted using purposive sampling with the following criteria: (1) Energy sector companies listed on the Indonesia Stock Exchange (IDX) from 2019 to 2023, (2) Companies that published complete annual reports during the study period, and (3) Availability of complete and accessible variable data. Companies that were delisted, did not publish complete annual reports, or had incomplete data were excluded from the sample. Based on the applied criteria, 55 companies were selected as the final sample, with a total of 275 observations.

The dependent variable in this study is carbon emissions disclosure. Content analysis techniques were used to measure carbon emissions disclosure by GRI 305: Emissions. GRI 305 is a standard that regulates the reporting of carbon emissions released into the atmosphere. The disclosure index based on the GRI 305 standard includes seven indicators representing carbon emissions reporting. In measuring the level of carbon emissions disclosure, each indicator is given a binary score (1 or 0) (Wahyuningrum et al., 2022). A score of 1 is given if the company discloses information related to the indicator at least once in its report, and a score of 0 if it is not disclosed at all. Furthermore, the total carbon emissions disclosure score for each company is divided by the maximum score (7) for carbon emissions disclosure. Carbon emission disclosure indicators are presented in Table 1. The independent variables in this study are firm value, profitability, board size, and board gender diversity. The moderating variables in this study are the sustainability committee, and the control variables used in this study are firm size and company age. Explanations of research variables and operational definitions of variables are presented in Table 2.

Table 1. Carbon Emission Disclosure Indicators

GRI Disclosure	Definition
305-1	Direct greenhouse gas emissions (scope 1).
305-2	Indirect greenhouse gas emissions (scope 2).
305-3	Other indirect greenhouse gas emissions (scope 3).
305-4	Greenhouse gas emission intensity.
305-5	Greenhouse gas emission reduction.
305-6	Ozone-depleting substance (ODC) emissions.
305-7	Nitrogen oxides, sulfur oxides, and other significant air emissions.

Table 2. Operational Definition of Research Variables

Variable	Operational definition	Data source
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Dependent variable:		
Carbon emissions disclosure (CED)	The number of indicators disclosed by companies out of the total number of indicators in the disclosure index.	Annual reports and sustainability reports
Independent variable:		
Firm value (TOBINSQ)	Sum the market value of equity and the total book value of liabilities, then divide by the total book value of the company's assets.	Annual report and IDX website
Profitability (ROE)	Net income to total equity.	Annual report
Board size (BSIZE)	Total number of members of the company's board of directors, consisting of directors and commissioners.	Annual report
Board gender diversity (BGD)	The total number of female board members in the company is relative to the total number of board members overall.	Annual report
Moderating variable:		
Sustainability committee (SCOM)	A dummy variable with a value of 1 if the company has a sustainability committee, and 0 if it does not have a sustainability committee.	Annual report and sustainability report
Control variables:		
Firm size (SIZE)	Natural logarithm of total assets.	Annual report
Company Age (AGE)	The total years the company has been operating until the end of 2023.	Annual report

Data collection in this study was conducted through documentation. Statistical analysis was applied to test the empirical model to answer the research hypothesis. Data analysis in this study was conducted using multiple linear regression models (Wahyuningrum et al., 2022; Wahyuningrum, Chegenizadeh, et al., 2023; Wahyuningrum, Agustina, et al., 2025). To test the hypothesis regarding the influence of independent variables and examine the role of moderating variables in the relationship between variables, this study included an interaction between variables through a moderated regression analysis (MRA) approach (Wahyuningrum et al., 2024). Data processing was performed using STATA 19 software.

Model specification tests consisting of the Chow test, LM test, and Hausman test were conducted before determining the final model, confirming that the Fixed Effect (FE) model was the best specification and was selected for this study. Before conducting the regression test, classical assumption tests were performed first, including normality, multicollinearity, heteroscedasticity, and autocorrelation tests. The form of the multiple linear regression equation used in this study is shown as follows:

Model 1:

$$CED = \beta_0 + \beta_1 \text{ TOBINSQ} + \beta_2 \text{ ROE} + \beta_3 \text{ BSIZE} + \beta_4 \text{ BGD} + \beta_5 \text{ SCOM} + \beta_6 \text{ SIZE} + \beta_7 \text{ AGE} \dots\dots\dots (1)$$

Model 2:

$$\text{CED} = \beta_0 + \beta_1 \text{TOBINSQ} + \beta_2 \text{ROE} + \beta_3 \text{BSIZE} + \beta_4 \text{BGD} + \beta_5 \text{SCOM} + \beta_6 (\text{TOBINSQ} \times \text{SCOM}) + \beta_7 (\text{ROE} \times \text{SCOM}) + \beta_8 (\text{BSIZE} \times \text{SCOM}) + \beta_9 (\text{BGD} \times \text{SCOM}) + \beta_{10} \text{SIZE} + \beta_{11} \text{AGE} + \varepsilon \dots\dots\dots (2)$$

Results

Descriptive Statistics

Table 3. Descriptive Statistics

Variable	N	Mean	Std. dev.	Min	Max
CED	275	0.32	0.35	0.00	1.00
TOBINSQ	275	1.63	2.25	0.14	18.11
ROE	275	0.11	0.82	-2.90	11.54
BSIZE	275	7.69	3.01	4.00	23.00
BGD	275	0.10	0.11	0.00	0.50
SCOM	275	0.14	0.35	0.00	1.00
SIZE	275	29.15	1.64	24.90	32.76
AGE	275	27.79	12.40	4.00	58.00

Source: Data Processed by STATA 19

Table 3 presents descriptive statistics for the dependent variables, independent variables, moderating variables, and control variables included in the research regression model. The descriptive statistics in Table 3 show that the mean CED value is 0.32, indicating that carbon emissions disclosure by energy companies listed on the IDX over five years is 32%, which is still relatively low. The standard deviation of CED is 0.35, which is close to the mean, indicating considerable variation between companies. The table shows that some companies disclose almost all carbon emission information in their reports (maximum value of 1.00), but some companies do not disclose any information at all (minimum value of 0.00). The mean TOBINSQ value is 1.63, indicating that the market generally values market value higher than book value. However, the fairly large standard deviation of TOBINSQ, which is 2.25, reflects very wide variation among companies. Most companies have a low Tobin's Q value (minimum 0.14), while a few companies have a very high Tobin's Q value (maximum 18.11). ROE showed a mean value of 0.11 with a standard deviation of 0.82, reflecting significant performance variation among companies. While some companies recorded exceptional profitability with a maximum ROE value of 11.54, others suffered losses with a minimum ROE value of -2.90.

The mean BSIZE is 7.69; the majority of companies in the energy sector have around 8 board members. However, the range of BSIZE is quite wide, from a minimum of 4.00 to a maximum of 23.00. This wide range has the potential to reduce the effectiveness of supervision and cause inefficiency. BGD is very low, with a mean proportion of women at 0.10 or 10%, indicating that board members are predominantly male. In fact, some companies do not include any women on their boards, as shown in Table 3, with a minimum BGD value of 0.00. The number of companies with sustainability committees in the energy sector remains very low. Table 3 shows that the mean SCOM score is 0.14. This means that only around 14% of companies have established special committees to address climate change, while the majority (82.2%) do

not yet have sustainability committees. The mean SIZE of 29.15 indicates that the companies in the sample generally operate on a large scale. The variation in firm size is relatively stable, as indicated by a standard deviation of 1.64. This finding supports the use of SIZE as a control variable. The mean AGE is 27.78, indicating that companies around 28 years old dominate the sample.

Correlation Matrix

Table 4. Correlation Matrix

	CED	TOBINSQ	ROE	BSIZE	BGD	SCOM	SIZE	AGE
CED	1.000							
TOBINSQ	-0.104* (0.085)	1.000						
ROE	0.136** (0.025)	0.275*** (0.000)	1.000					
BSIZE	0.412*** (0.000)	0.020 (0.740)	0.172*** (0.004)	1.000				
BGD	0.148** (0.014)	-0.102* (0.092)	-0.016 (0.786)	-0.071 (0.239)	1.000			
SCOM	0.482*** (0.000)	-0.098 (0.105)	0.036 (0.551)	0.287*** (0.000)	0.078 (0.197)	1.000		
SIZE	0.692*** (0.000)	-0.114* (0.059)	0.207*** (0.001)	0.603*** (0.000)	0.084 (0.163)	0.427*** (0.000)	1.000	
AGE	0.199*** (0.001)	-0.163*** (0.007)	-0.028 (0.647)	0.185*** (0.002)	-0.164*** (0.007)	0.186*** (0.002)	0.051 (0.398)	1.000

Note: ***p<0.01; **p<0.05; *p<0.10, Source: Data Processed by STATA 19.

Table 4 presents the correlation matrix between all variables used in the study. The results of the correlation matrix analysis reveal a significant relationship between carbon emission disclosure (CED) and a number of factors, including firm value (TOBINSQ), profitability (ROE), board size (BSIZE), board gender diversity (BGD), the existence of a sustainability committee (SCOM), firm size (SIZE), and company age (AGE). The strongest positive correlation was found between firm size (SIZE) and carbon emission disclosure (CED) (0.692; p-value<0.01), indicating that larger companies tend to be more active in disclosing their carbon emission information to the public. Meanwhile, the existence of a sustainability committee (SCOM) also has a highly significant positive correlation (0.482; p-value<0.01), reinforcing the assumption that the existence of a sustainability committee encourages companies to be transparent about carbon emissions. Board size (BSIZE) is positively correlated (0.412; p-value<0.01), indicating that larger boards of directors in companies tend to support carbon emissions disclosure practices. Profitability (ROE) shows a positive correlation (0.136; p-value<0.05), consistent with the assumption that companies with high profitability have greater resources and incentives to disclose carbon emissions to the public. Board gender diversity (BGD) has a significant positive correlation (0.148; p-value<0.05), indicating

that a board of directors with a balanced gender composition has the potential to increase environmental transparency. Company age (AGE) also shows a positive relationship (0.199; $p\text{-value} < 0.01$), reflecting that older companies tend to be more open in reporting emissions to the public. However, firm value (TOBINSQ) shows a negative correlation with carbon emission disclosure (CED) (-0.104 ; $p\text{-value} < 0.10$), suggesting that high market valuation does not guarantee a company's commitment to carbon emissions transparency to the public. Overall, all independent, moderating, and control variables show a significant relationship with carbon emissions disclosure. As shown in Table 4, carbon emissions disclosure is positively related to ROE, BSIZE, BGD, SCOM, SIZE, and AGE, while TOBINSQ shows an opposite relationship.

This study conducted a series of statistical tests to test the hypothesis and determine the most appropriate model among the following models: Common Effect (OLS), Random Effect (RE), and Fixed Effect (FE). Based on the results of the three tests, the most appropriate model to use in this study is the Fixed Effect (FE) model. Before performing multiple linear regression analysis, it is necessary to ensure that the classical assumptions are met, including normality, multicollinearity, heteroscedasticity, and autocorrelation tests. In the normality test, two methods were applied, namely the skewness and kurtosis tests, and the Shapiro-Wilk test. Both tests produced $p\text{-values} > 0.05$, indicating that the data were normally distributed. Meanwhile, the multicollinearity test revealed issues with several variables having a Value Inflation Factor (VIF) > 10 , namely SCOM (33.91), SIZE (21.13), BSIZE (13.59), TOBINSQ_SCOM (12.29), and BSIZE_SCOM (11.35). The overall average VIF was 9.98 ($VIF > 5$), confirming the presence of multicollinearity in the model. Centering was then performed to reduce the VIF value and overcome this problem. Afterward, the average VIF decreased to 3.38 ($VIF < 5$), with each variable having a VIF value below 10. Next, a heteroscedasticity test was conducted using the modified Wald test, which produced a $p\text{-value} < 0.05$, indicating heteroscedasticity. On the other hand, the autocorrelation test using the Wooldridge test also showed a $p\text{-value} < 0.05$, indicating the presence of autocorrelation. The problems of heteroscedasticity and autocorrelation in this panel data regression model were addressed by applying Driscoll-Kraay Standard Errors as a correction with a maximum lag of 4.

Table 5 presents the results of the principal regression in this study. This study uses two regression models to analyze the influence of independent variables and the moderating role of the sustainability committee on carbon emissions disclosure. Model 1 serves as the baseline, testing the direct effects of firm value (TOBINSQ), profitability (ROE), board size (BSIZE), board gender diversity (BGD), and control variables (SIZE and AGE) on carbon emissions disclosure (CED) without interaction with the sustainability committee (SCOM). Model 2 expands the analysis by incorporating interactions between each independent variable (TOBINSQ, ROE, BSIZE, and BGD) and SCOM to test the moderating role of the sustainability committee, while maintaining the control variables. Comparing the two models allows for the empirical identification of the mechanisms of SCOM.

Table 5. Regression Results

	Model 1	Model 2
TOBINSQ	0.020** (4.30)	0.019** (3.46)

ROE	-0.004 (-0.88)	-0.032** (-3.19)
BSIZE	-0.002 (-0.50)	-0.005 (-0.97)
BGD	0.061 (1.21)	0.067* (2.34)
SCOM	-0.010 (-0.42)	0.050 (1.91)
TOBINSQ_ SCOM		-0.004 (-0.18)
ROE_ SCOM		-0.209** (-4.47)
BSIZE_ SCOM		-0.007** (-3.02)
BGD_ SCOM		-0.403** (-3.44)
SIZE	0.100*** (7.30)	0.105*** (7.57)
AGE	0.091*** (25.80)	0.091 *** (24.71)
Constant	-2.217*** (-22.45)	-2.211*** (-21.32)
N	275	275
R ²	0.519	0.524
F-test	252.60	5.74
Hausman's test	156.23	132.72
LM test	40.14	26.01
Heteroscedasticity test	1287.69	1667.89
N	275	275

Note: ***p<0.01; **p<0.05; *p<0.10, Source: Data Processed by STATA 19.

The results of multiple linear regression analysis using Moderated Regression Analysis (MRA) in Table 5 show that both models are statistically significant, with F-test values of 252.50 for model 1 and 5.74 for model 2. The R² value increased from 0.519 (model 1) to 0.524 (model 2), indicating that the independent variables and moderation collectively explain approximately 52% of the variation in carbon emissions disclosure. However, there was only a marginal increase (0.49%) compared to the model, implying that interaction with the sustainability committee did not substantially strengthen the explanatory power of the model. The high Hausman test (156.23 and 132.72) supports the use of the Fixed Effects (FE) model. The results of model 1 indicate that firm value

(TOBINSQ), firm size (SIZE), and firm age (AGE) significantly influence carbon emissions disclosure (CED). For profitability (ROE), board size (BSIZE), board gender diversity (BGD), and sustainability committee (SCOM) do not significantly affect carbon emissions disclosure (CED). TOBINSQ shows a positive coefficient (0.020; $t=4.30$) and is significant at the 5% level, proving that companies with high market value have a significant positive effect on carbon emissions disclosure. ROE shows a negative coefficient (-0.004; $t=-0.88$) and is not significant, proving that companies with high profitability do not significantly influence carbon emissions disclosure. BSIZE shows a negative coefficient (-0.002; $t=-0.50$) and is not significant, proving that companies with a high board size do not have a significant effect on carbon emissions disclosure. BGD shows a positive coefficient (0.061; $t=1.21$), but has no significant impact on carbon emissions disclosure.

The results of model 2 prove that firm value (TOBINSQ), profitability (ROE), board gender diversity (BGD), the interaction between profitability and the sustainability committee (ROE_SCOM), the interaction between board size and the sustainability committee (BSIZE_SCOM), the interaction between board gender diversity and the sustainability committee (BGD_SCOM), firm size (SIZE), and company age (AGE) significantly influence carbon emissions disclosure (CED). Meanwhile, board size (BSIZE), sustainability committee (SCOM), and the interaction between firm value and sustainability committee (TOBINSQ_SCOM) do not significantly influence carbon emissions disclosure (CED). Based on the regression results, the TOBINSQ coefficient is positive (0.019; $t=3.46$) and significant at 5%, proving that firm value positively increases carbon emission disclosure, thus accepting Hypothesis 1 (H1). This finding aligns with research by (Akbaş & Canikli, 2019). Theoretically, companies with high market value have high public trust and a good reputation, encouraging them to voluntarily disclose their environmental performance, such as carbon emissions, to maintain social legitimacy in the public eye. From a stakeholder theory perspective, high corporate value indicates pressure from stakeholders for transparency in environmental matters. This pressure encourages companies to disclose their carbon emissions as a form of environmental accountability. Thus, the results of this study not only support the hypothesis but also strengthen the second proposition of the theory that voluntary disclosure serves as an instrument in maintaining social legitimacy and fulfilling stakeholder expectations.

The ROE coefficient is negative (-0.032; $t=-3.19$) and significant at the 5% level, proving that profitability actually significantly suppresses carbon emissions disclosure, thus rejecting Hypothesis 2 (H2). This finding aligns with research by (Ratmono et al., 2022; Sari & Nisa, 2020; Xhindole & Tarquinio, 2024). However, this finding contradicts research by (M. W. Abdullah et al., 2020; Akhiroh & Kiswanto, 2016; Rahman & Alsayegh, 2021). These findings suggest that highly profitable companies tend to prioritize maximizing shareholder value over environmental transparency. From a legitimacy perspective, companies with high profitability may feel that they have sufficient legitimacy, thereby neglecting carbon emissions disclosure to the public. The finding of a negative BSIZE coefficient (-0.005; $t=-0.97$) and insignificant results indicates that board size does not have a significant effect on carbon emissions disclosure, thus rejecting Hypothesis 3 (H3). This finding aligns with the research by (Kılıç & Kuzey, 2019). Still, it contradicts the findings of (Gürbüz & Gürbüz, 2025; Nasih et al., 2019; Riantono & Sunarto, 2022; Rossi et al., 2021; Tila & Augustine, 2019; Toukabri & Youssef, 2023). According to stakeholder theory, this insignificant finding

suggests that a company's response to stakeholder demands to disclose carbon emissions to the public is not automatically strengthened by the size of its board. This may be due to ineffective coordination within large boards, which can impede the implementation of environmental strategies. Furthermore, legitimacy theory explains that corporate legitimacy is achieved through real operational commitments, not merely symbolic additions to the board structure.

The positive BGD coefficient (0.067; $t=2.34$) with a $p\text{-value}=0.079$ (>0.05) indicates that board gender diversity is not significant at $\alpha=5\%$ (only significant at $\alpha=10\%$), thus rejecting Hypothesis 4 (H4). This finding is consistent with research by (Kılıç & Kuzey, 2019; Tila & Augustine, 2019). Still, it contradicts that of (Al-Qahtani & Elgharbawy, 2020; Arayssi et al., 2020; Ben-Amar et al., 2017; Nuber & Velte, 2021; Romano et al., 2020; Saadah et al., 2024; Saraswati et al., 2021; Tingbani et al., 2020; Xhindole & Tarquinio, 2024). From a stakeholder theory perspective, the results reveal that board gender diversity has not become an effective channel for fulfilling stakeholder demands regarding carbon emissions disclosure as a concrete action by the company toward the environment. This may stem from structural authority hegemony, such as financial agenda hegemony or the limited agency capacity of female board members in advocating for sustainability policies. Meanwhile, legitimacy theory explains that the presence of women on the board serves as symbolic validation without operational policy support, thereby failing to build substantive legitimacy for environmental disclosure.

The results of this study reject all moderation hypotheses. The TOBINS_SCOM coefficient is negative (-0.004; $t=-0.18$) and not statistically significant, indicating that the sustainability committee does not act as a moderator of the relationship between firm value and carbon emissions disclosure, thus rejecting Hypothesis 5 (H5). Meanwhile, the ROE_SCOM coefficient is negative (-0.209; $t=-4.47$) and significant at the 5% level, indicating that the sustainability committee strengthens the negative influence of profitability on carbon emissions disclosure, thus rejecting hypothesis 6 (H6). The BSIZE_SCOM coefficient is negative (-0.007; $t=-3.02$) and significant at the 5% level, indicating that the sustainability committee strengthens the negative influence of board size on carbon emissions disclosure, thus rejecting Hypothesis 7 (H7). The coefficient for BGD_SCOM is negative (-0.403; $t=-3.44$) and significant at the 5% level, indicating that the sustainability committee weakens the relationship between board gender diversity and carbon emissions disclosure, thus rejecting Hypothesis 8 (H8). The two control variables, firm value (SIZE) and company age (AGE), show statistically significant positive coefficients (1%) in both models, indicating their contribution to promoting carbon emissions disclosure.

Conclusion

The study was conducted to examine whether firm value, profitability, board size, and board gender diversity influence carbon emissions disclosure, as well as whether the existence of a sustainability committee in a company can moderate these relationships. To achieve this objective, the sample consisted of energy sector companies listed on the Indonesia Stock Exchange (IDX), and the research period was five years from 2019 to 2023. The study sample comprised 55 companies, and the analysis produced a total of 275 observations. The findings of the study indicate that company value exerts a substantial and positive influence on the disclosure of carbon emissions in energy companies listed on the Indonesia Stock Exchange (IDX), in line with legitimacy theory, which emphasizes that high-value companies are transparent to maintain social

legitimacy Conversely, profitability, board size, and board gender diversity were not proven to be significant predictors, contrary to stakeholder theory expectations that assume financial performance and governance structure as drivers of corporate environmental practices. Furthermore, the existence of a sustainability committee failed to moderate the relationship between the four independent variables and carbon emissions disclosure, indicating that the role of the sustainability committee in the context of this study has not been effective in facilitating the influence of these factors on environmental disclosure practices. In practice, the OJK and energy sector companies need to strengthen regulations, implement more specific and mandatory carbon emissions disclosure guidelines, and enhance the capabilities and authority of sustainability committees to be more proactive in integrating environmental issues into corporate strategies. Additionally, there is a need to refine stakeholder theory to account for the contextual nature of developing markets like Indonesia, where pressure for environmental disclosure may not yet be sufficiently strong or may be influenced by non-economic/non-traditional governance factors.

Suggestion

For future research, it is recommended to: (1) Explore more objective methods of carbon emissions measurement, (2) Expand the sample to other high-risk environmental sectors, incorporating alternative mediator/moderator variables (such as green investor pressure or institutional ownership, (3) Investigating the possible influence or organizational culture or corporate leadership on carbon emissions disclosure in Indonesia.

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