

The Mediating Role of Greenhouse Gas Emissions Disclosure in The Relationship Between Board Gender Diversity, Sustainability Committees and Firm Value: Empirical Evidence of the Listed Companies on the Stock Exchange of Thailand

Buncha Chaisomkun^{1*}

Abstract

This research aims to investigate the mediating role of Greenhouse Gas emissions disclosure (GHD) in the relationship between board gender diversity (BGD), sustainability committee (SC), and firm value (FV) among the listed companies on the Stock Exchange of Thailand (SET) during the period from 2019 to 2023. The sample consists of 580 firms-years, with secondary data collected from the Workspace database. Data was analyzed by using the panel data analysis approach. The results show that BGD has a positive and significant direct effect on FV, while SC exhibits a negative direct effect. Mediation analysis reveals that GHD partially mediates the relationship between BGD and FV and fully mediates the relationship between SC and FV. These findings suggest that BGD enhance FV in part by improving environmental transparency, while the value of SC depends on its ability to oversee sustainability to increase GHD levels. This study contributes to the corporate governance and sustainability literature by providing evidence from an emerging market and offers practical implications for policymakers, investors, and corporate boards aiming to strengthen sustainability governance and disclosure practices.

Keywords: Board Gender diversity, Sustainability committees, Greenhouse gas emissions disclosure, Firm value

Introduction

Corporations typically prioritize the maximization of shareholder wealth. However, the adoption of corporate social and environmental responsibility can be viewed as a strategic alternative in achieving long-term sustainability (Lee & Cho, 2021). In particular, corporate executives may tend to avoid engaging in non-profitable activities that could reduce returns for both shareholders and themselves. Although, an increasing number of investors are currently incorporating sustainability considerations into their investment decisions. Consequently, companies are facing growing challenges in managing their own sustainability-related issues, especially environmental concerns such as GHD, which are recognized as a primary cause of

¹ Lecturer, Faculty of Liberal Arts and Management Science, Kasetsart University, Thailand

*Corresponding Author e-mail: buncha.cha@ku.th

global warming posing significant threats to both human life and the environment (Borsuk et al., 2023; Deng et al., 2023).

A substantial body of literature has explored the relationship between GHD and FV, yet the findings remain inconclusive. Some studies have reported a positive relationship, suggesting that GHD signals proactive environmental management and strengthens investor confidence (Noor & Ginting, 2022; Hardiyansah et al., 2021; Kurnia et al., 2021; Saraswati et al., 2021). Conversely, other research has found a negative association, citing potential compliance costs, resource constraints, and competitive disadvantages (Rachmadhika & Firmansyah, 2025; Siddique et al., 2021). Still, several studies report no significant link between GHD and FV (Mahmudah et al., 2023; Kurnia et al., 2020), indicating that the relationship may be contingent upon other structural factors.

Despite these mixed results, prior studies have tended to overlook the role of corporate governance mechanisms that directly influence GHD. In particular, BGD and the establishment of SC have been recognized as critical governance structures that foster accountability and promote environmental transparency (Gull et al., 2025; Orazalin et al., 2024; Zampone et al., 2024; Tingbani et al., 2020). Recent scholarship has shown growing interest in these mechanisms as they can serve as strategic levers for aligning corporate practices with environmental objectives (Driss et al., 2024; Kurnia et al., 2025; Muhammad & Migliori, 2023). However, the extent to which these governance structures shape firm value through GHD remains insufficiently explored, representing a notable gap in literature. Particularly in Thailand, as an emerging market, corporate governance policies have yet to mandate gender quotas for board membership or require the establishment of SC. Likewise, GHD remains largely voluntary. This regulatory context provides a unique setting in which governance practices, such as BGD and SC formation, are driven primarily by internal strategic considerations rather than compliance obligations, thereby offering valuable insights into their potential influence on environmental disclosure and firm value.

Addressing this gap, the present study examines the mediating role of GHD in the relationship between BGD, SC, and FV. By integrating stakeholder theory, legitimacy theory and resource-based view, this research offers a more nuanced understanding of how governance mechanisms can influence firm value via environmental disclosure practices. The study makes three primary contributions. First, it advances academic literature by empirically testing the mediating effect of GHD, thereby providing a foundation for future inquiries into governance performance linkages. Second, it offers empirical evidence to guide firms in designing board structures that enhance both environmental disclosure and firm valuation. Third, it delivers actionable insights for investors and policymakers, including strategies for identifying high-potential firms and recommendations for governance reforms that promote gender diversity and institutionalize sustainability committees as part of broader climate change mitigation efforts.

Literature Review

Theoretical framework

In general, companies manage their environmental performance through diverse approaches and are motivated by varying factors. Stakeholder Theory (Freeman, 1984), firms are expected to address the needs and expectations of multiple stakeholder groups, including investors, customers, regulators, and communities, through socially responsible and environmentally sustainable practices. BGD and SC function as governance mechanisms that can strengthen stakeholder engagement and enhance responsiveness to sustainability concerns. In this context, GHD serves as a strategic communication tool, enabling firms to demonstrate accountability and fulfill stakeholder expectations, which in turn can improve firm reputation and firm value (Huq et al., 2024).

Legitimacy theory (Lindblom, 1994) complements this perspective by emphasizing the importance of aligning corporate actions with prevailing social norms and regulatory expectations to maintain a social license to operate (Saraswati et al., 2021). As environmental norms become more explicit through international reporting frameworks (e.g., GRI, CDP, SET ESG Ratings), BGD and SC can play an active role in ensuring transparent GHG emissions disclosure (Hummel & Schlick, 2016). Such disclosure helps firms legitimize their operations in the eyes of stakeholders and the broader public, mitigating reputational risks and supporting long-term survival.

Finally, the Resource-Based View (Barney, 1991) provides insight into how governance structures themselves can be valuable, rare, inimitable, and non-substitutable (VRIN) resources that contribute to sustained competitive advantage. BGD brings diverse perspectives and decision-making capabilities, while SC institutionalizes specialized expertise in sustainability issues. When leveraged effectively, these governance resources can enhance the quality and credibility of GHD, differentiating the firm from competitors and contributing to superior firm value (Gharios et al., 2024).

By integrating these three theoretical perspectives, this study proposes that BGD and SC act as governance resources that not only respond to stakeholder demands and maintain societal legitimacy but also provide strategic capabilities that create long-term value. GHD is positioned as the key mechanism through which these governance factors influence firm value, offering a holistic explanation for the interplay between governance, environmental disclosure, and firm performance.

Hypotheses development

Board gender diversity and Firm Value

BGD has gained increased recognition in recent years. The inclusion of women on corporate board contributes to broader perspectives in decision-making processes, particularly in policy formulation and corporate governance, which are crucial for organizational performance. Prior studies have found that board gender diversity can enhance financial performance (Gharios

et al., 2024; Xie et al., 2024), as well as, firm value (Agyemang-Mintah & Schadewitz, 2019; Oyerogba & Ogungbade, 2020; Ullah et al., 2020). BGD offer varied perspectives and enhanced capacity to address complex, non-routine issues (Wang et al., 2023). Such diversity fosters richer debate and more comprehensive discussions, enabling high-quality strategic decisions that can boost firm performance and long-term value (Oyerogba & Ogungbade, 2020). Moreover, female directors can strengthen connections with key external stakeholders, enhancing legitimacy and access to valuable resources (Heydari Rostami et al., 2025).

However, emerging empirical evidence suggests that BGD may not always enhance FV (Jayanti et al., 2023; Wang et al., 2024). Greater gender diversity can, in certain contexts, increase coordination costs, communication barriers, and conflict within the boardroom (Jayanti et al., 2023). Heterogeneity in perspectives may prolong decision-making processes, potentially reducing board efficiency and delaying strategic responses to market changes (Hazaea et al., 2023). Based on the existing literature and drawings from stakeholder theory and resource-based theory, the following hypotheses are proposed:

H1: BGD positive relationship with FV.

Sustainability Committee and Firm Value

The effectiveness of a corporate board is determined not only by its composition but also by the robustness of its governance structure. Establishing a SC serves as a salient governance mechanism and a credible signal to stakeholders of the firm's awareness of, and commitment to, sustainability-related issues. Such committees are equipped to conduct more in-depth deliberations than the full board, enabling them to provide proactive strategic guidance in managing environmental challenges and advancing corporate sustainability agendas (Driss et al., 2024).

From a stakeholder theory perspective, a firm that actively seeks to address the needs and expectations of its key stakeholders enhances its legitimacy and gains broader societal acceptance, thereby positioning itself to achieve long-term strategic objectives, including the enhancement of FV (Shokomi & Yahaya, 2024). Moreover, an agency theory perspective, conflicts often arise between managers (agents) and shareholders (principals) when managerial actions deviate from shareholder interests in pursuit of personal benefits. In this context, the SC functions as a monitoring and oversight mechanism that mitigates opportunistic behavior, ensures managerial accountability, and aligns the interests of management, shareholders, and other stakeholders.

Empirical evidence corroborates this theoretical rationale, with prior studies documenting a positive association between the presence of an SC and FV (Ab Aziz et al., 2025; Shah et al., 2024; Shokomi & Yahaya, 2024). For example, Shokomi and Yahaya (2024) found that firms with dedicated sustainability committees exhibit higher firm value, attributable to improved environmental performance and enhanced disclosure quality. Similarly, Ab Aziz et al. (2025) reported that SCs contribute to superior ESG integration, which, in turn, strengthens investor

confidence and drives long-term firm value. Based on most of the relevant literature and grounded in stakeholder theory and resource-based theory, the following hypotheses are proposed:

H2: SC positive relationship with FV.

The role of Greenhouse Gas Emissions Disclosure

Environmental disclosure, particularly information related to GHG emissions, has gained increasing importance as a key factor used by investors to assess a firm's sustainability and risk profile, which in turn influences investment decisions. Investors tend to expect that companies assess the risks associated with GHG emissions and implement effective emission control measures (Sun et al., 2022). However, academic opinions on this issue remain controversy. In general, companies tend to prioritize economic performance over environmental responsibility. Climate change is often perceived as negative news by the capital market. Thus, investors may react unfavorably to a firm's environmental disclosures (Kurnia et al., 2020). Additionally, corporate investments in environmental initiatives may increase operational costs, potentially leading to reduced returns and a lower market value (Mahmudah et al., 2023).

Conversely, other studies have found a significantly positive relationship between GHD and FV (Hardiyansah et al., 2021; Kurnia et al., 2021; Sun et al., 2022). Companies with strong corporate governance structures are more capable of disclosing GHG emission data in a transparent and reliable manner, thereby enhancing their credibility and public image among stakeholders and investors. These firms are more likely to attract investors and customers, which can ultimately lead to an increase in firm value (Noor & Ginting, 2022; Suttipun & Dechthanabodin, 2022).

From a governance perspective, the influence of SC and BGD on FV is not solely direct; rather, it often operates through the GHD (Issa, 2025; Kurnia et al., 2025). A growing body of literature suggests that greater gender diversity on boards is associated with improved CSR performance (Buallay & Alhalwachi, 2022; Buerthey, 2021), a higher level of environmental disclosure (Buallay & Alhalwachi, 2022), and increased disclosure of GHG emission disclosure (Al-Qahtani & Elgharbawy, 2020; Hollindale et al., 2019; Saraswati et al., 2021). Tingbani et al. (2020) highlight that gender diversity exerts the most significant influence on GHD when at least three women serve on the board.

Moreover, SC as a specialized governance structure focusing on environmental and sustainability matters, is instrumental in formulating policies, overseeing implementation, and ensuring systematic reporting of GHG emissions. High-quality GHD reduces information asymmetry, signals a firm's proactive environmental management to capital markets, and consequently enhances FV through improved investor confidence and reduced perceived risk (Abdelrahman Adam Abdalla et al., 2024; Tingbani et al., 2020). Previous literature on the influence of sustainability committees on GHD that such specialized committees support the disclosure of GHG information to stakeholders and the public, while also promoting

the implementation of long-term climate change strategies (Issa, 2025). Instant, Driss et al. (2024) find a positive association between the presence of SC and GHD, this finding aligns with Li et al. (2023), document a positive relationship between SC presence and relationship between sustainability committees and environmental performance, indicating the proactive role of the composition and functions of these committees in enhancing corporate environmental performance.

Based on most of the relevant literature and grounded in stakeholder theory, legitimacy theory and Resource-Based theory, the following hypotheses are proposed:

H3: GHD positive relationship with FV.

H4: GHD is the mediation variable in the relationship between BGD and FV.

H5: GHD is the mediation variable in the relationship between SC and FV.

This study will examine the mediating role of GHD in the relationship between board BGD, SC, and FV. The conceptual framework is shown in Figure 1

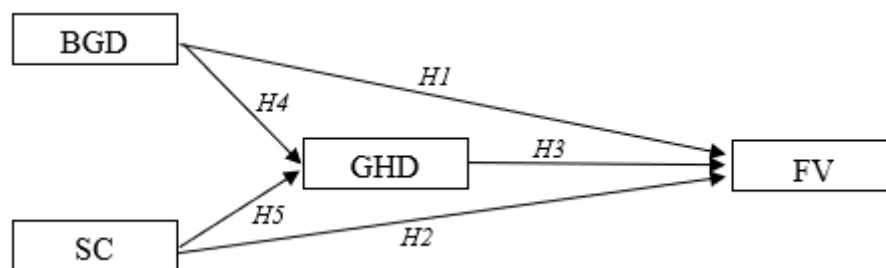


Figure 1 Conceptual framework

Methodology

Population and Sample

The population of this study consists of the listed companies on SET, totaling 697 firms as of June 2024. The samples excluded those in the financial and banking sectors of 70 firms, real estate investment trusts, and property funds of 56 firms which has different financial structures and business goals from other companies (Thongchai et al., 2023).

Secondary data were collected from financial statement, One Report, and sustainability report during the period 2019–2023, using the Workspace database. The sample excludes firms with incomplete data as well as those with outlier values identified through the Casewise Diagnostics method, where observations exceeding ± 3 standard deviations are considered outliers (Ariani et al., 2024). After this screening process, the final sample consists of 580 firm-year observations. The details of the sample are presented in Table 1.

Table 1 Number of samples

Panel A: by Year		
Year	Number of samples	
2019	76	
2020	99	
2021	122	
2022	132	
2023	151	
Total	580	
Panel B: by Industry Sector		
Industry Sector	Number of samples	Percentage (%)
Agribusiness and Food Industry	78	13.64
Resources	130	22.41
Technology	47	8.10
Services	141	24.31
Industrial Products	58	10.00
Consumer Products	9	1.55
Property and Construction	117	20.17
Total	580	100.00

Operational Definition and Measurement of Variables

Dependent variable

FV measured by Tobin's Q (Coluccia et al., 2020; Hutaaruk, 2024; Kyaw et al., 2024), as it is an indicator that reflects stock price volatility, cash flow growth, and market response (Zhu et al., 2025). Tobin's Q serves as a proxy for assessing the market valuation of a firm. It is calculated as the ratio of the market value of equity plus total debt to total assets.

Independent variable

BGD is measured by the proportion of the number female on board members to the total number of board members (Al-Qahtani & Elgharbawy, 2020; Buallay & Alhalwachi, 2022; Tingbani et al., 2020).

SC refers to the board structure in which a sustainability committee or sub-committee is established within the company, measured by using a dummy variable with the value of 1 if the company has a sustainability committee or subcommittee, and 0 otherwise (Alodat & Hao, 2025; Tingbani et al., 2020; Tron et al., 2025).

Mediator variable

GHD. It is the extent of greenhouse gas (GHG) emission disclosures in companies' annual and sustainability reports. The disclosure checklist was adopted from previous research

(Hardiyansah et al., 2021; Kurnia et al., 2021; Saraswati et al., 2021; Tingbani et al., 2020). This checklist was originally made based on the Information Request sheets by an organization called the carbon disclosure project (CDP). The disclosure checklist items are shown in Table 2. A score of 1 is assigned if a disclosure item is present, and 0 otherwise. The minimum possible score is 0, while the maximum possible score is 18.

Control variable

1) Firm size (Size) is measured by the natural logarithm of a company's total assets (Li et al., 2023; Oussii & Klibi, 2023).

2) Leverage refers to the proportion of a firm's capital that is derived from debt relative to the capital contributed by the owners. It is measured by debt-to-equity ratio (DE) (Oussii & Klibi, 2023; Tingbani et al., 2020).

3) Current ratio (CR) refers to a company's ability to meet its short-term obligations, measured by the ratio of current assets to current liabilities (Li et al., 2023; Oussii & Klibi, 2023; Tingbani et al., 2020).

4) Profitability refers to a company's ability to generate net profit from its total assets, measured by the ratio of net profit to total assets (ROA) (Oussii & Klibi, 2023; Tingbani et al., 2020).

5) Board size (BS) refers to the total number of the company's board committee, measured by counting the total number of board members (Huq et al., 2024).

6) Proportion of Independent board members (IBM) refers to board members who have no affiliations with the company and do not hold executive or internal staff positions. These individuals are external to the organization and are appointed to oversee the company on behalf of all shareholders. It is measured by the ratio of the number of independents on board members to the total number of board members (Huq et al., 2024).

Table 2 GHG emissions disclosure items

Category	Item
Climate change: risks and opportunities	CC1: assessment/description of the risks (regulatory, physical or general) relating to climate change and actions taken or to be taken to manage the risks CC2: assessment/description of current (and future) financial implications, business implications and opportunities of climate change
GHG emissions accounting	GHG1: description of the methodology used to calculate GHG emissions GHG2: existence external verification of quantity of GHG emission GHG3: total GHG emissions – metric tons CO ₂ -e emitted GHG4: disclosure of Scopes 1 and 2, or scope 3 direct GHG emissions GHG5: disclosure of GHG emissions by sources (e.g. coal, electricity, etc.) GHG6: disclosure of GHG emissions by facility or segment level

Table 2 GHG emissions disclosure items (Cont.)

	GHG7: comparison of GHG emissions with previous years
Energy	EC1: total energy consumed (e.g. tera-joules or peta-joules)
consumption	EC2: quantification of energy used from renewable sources
accounting	EC3: disclosure by type, facility or segment
GHG reduction	RC1: details of plans or strategies to reduce GHG emissions
and cost	RC2: specification of GHG emissions reduction target level and target year
	RC3: emissions reductions and associated costs or savings achieved to date as a result of the reduction plan
	RC4: cost of future emissions factored into capital expenditure planning
Carbon	ACC1: indication of which board committee (or other executive body) has
emission	overall responsibility for actions related to climate change
accountability	ACC2: description of the mechanism by which the board (or other executive body) reviews the company's progress regarding climate change

Data Analysis Method

This study applies descriptive statistics and inferential statistics. Descriptive statistics involve examining the mean, maximum, minimum, standard deviation, and percentages of the variables. Inferential statistics include correlation coefficient analysis to assess multicollinearity between variables, and multiple regression analysis.

Mediation analysis followed the three-step approach proposed by Baron and Kenny (1986). First, the effects of BGD and SC on GHD were estimated. Second, the impacts of BGD and SC on FV and the effect of GHD on FV were examined. Third, FV was regressed on both the independent variables (BGD, SC) and the mediator (GHD). Mediation is inferred when: (1) the independent variables significantly predict the mediator; (2) the independent variables significantly predict the dependent variable; and (3) the coefficients for the independent variables are reduced in the presence of the mediator, which itself has a significant effect on the dependent variable. Accordingly, a reduction in the predictive power of BGD and SC upon inclusion of GHD would indicate mediation.

Accordingly, four regression models are specified, consistent with the above steps, to examine the study's hypotheses and assess the mediating role of GHD in the relationship between BGD, SC, and FV.

Model 1 (Step 1)

$$\text{GHD} = \beta_0 + \beta_1 \text{BGD}_{it} + \beta_2 \text{SC}_{it} + \beta_3 \text{Size}_{it} + \beta_4 \text{DE}_{it} + \beta_5 \text{CR}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{BS}_{it} + \beta_8 \text{IBM}_{it} + \varepsilon_{it}$$

Model 2 (Step 2a)

$$FV = \beta_0 + \beta_1 BGD_{it} + \beta_2 SC_{it} + \beta_3 Size_{it} + \beta_4 DE_{it} + \beta_5 CR_{it} + \beta_6 ROA_{it} + \beta_7 BS_{it} + \beta_8 IBM_{it} + \varepsilon_{it}$$

Model 3 (Step 2b)

$$FV = \beta_0 + \beta_1 GHD_{it} + \beta_2 Size_{it} + \beta_3 DE_{it} + \beta_4 CR_{it} + \beta_5 ROA_{it} + \beta_6 BS_{it} + \beta_7 IBM_{it} + \varepsilon_{it}$$

Model 4 (Step 3)

$$FV = \beta_0 + \beta_1 BGD_{it} + \beta_2 SC_{it} + \beta_3 GHD_{it} + \beta_4 Size_{it} + \beta_5 DE_{it} + \beta_6 CR_{it} + \beta_7 ROA_{it} + \beta_8 BS_{it} + \beta_9 IBM_{it} + \varepsilon_{it}$$

Where

GHD	=	Greenhouse Gas emission Disclosure
FV	=	Firm Value
BGD	=	Board Gender Diversity
SC	=	Sustainability Committee
Size	=	Firm Size
DE	=	Debt to Equity Ratio
CR	=	Current Ratio
ROA	=	Return on Assets
BS	=	Board Size
IBM	=	Independent Board Members Ratio
β	=	Coefficient
ε	=	Error Term
i	=	Observed Firm
t	=	Time Period (Year)

Result

Descriptive statistics

In Table 3 present the descriptive statistics of the variables used in the study. FV, measured by Tobin's Q, ranges from 0.32 to 11.49, with a mean of 1.72 and a standard deviation of 1.50. GHD ranges from 1.00 to 16.00, with an average of 5.20 and a standard deviation of 3.04. BGD ranges widely from 0.00 to 71.43, with a mean of 19.78 and a standard deviation of 12.61. And among the firms sampled, 453 companies (78.10%) had established SC.

In examining the skewness and kurtosis values, Brown (2015) suggested that acceptable skewness values range between -3 to 3, while acceptable kurtosis values lie between -10 to 10. The skewness and kurtosis values of all the variables fall within the range of -0.07 to 2.73 and -0.73 to 9.55 respectively, indicating that the data exhibit a normal level for regression testing.

Table 3 Description of variables

Variables	Obs.	Minimum	Maximum	Mean	Std. Dev	Skewness	Kurtosis
FV	580	0.32	11.49	1.72	1.50	2.73	9.55
GHD	580	1.00	16.00	5.20	3.04	0.77	0.25
BGD	580	0.00	71.43	19.78	12.61	1.02	1.56
SIZE	580	20.99	32.23	24.35	1.61	0.53	0.65
DE	580	0.05	443.92	93.25	82.01	1.40	2.39
CR	580	0.09	9.68	1.85	1.35	1.85	4.53
ROA	580	-19.56	27.37	5.39	5.48	-0.07	2.50
BS	580	6.00	23.00	11.57	2.77	0.37	-0.35
IBM	580	0.49	99.77	44.13	25.36	0.42	-0.73
SC (Dummy variable) number of observations =1 (%) 453 (78.10%)							

Pearson's correlation coefficients result among the variables investigated are shown in Table 4, Across the dependent, independent, and control variables, the analysis results do not show very high correlations. Based on Pearson's correlation coefficients, the values range from -0.426 to 0.534, indicating that multicollinearity is not a concern (Cohen, 2013).

Table 4 Correlation matrix of variables

	FV	GHD	BGD	SC	SIZE	DE	CR	ROA	SI	BS	IBM
FV	1										
GHD	0.242**	1									
BGD	0.092*	-0.048	1								
SC	-0.010	0.429**	-0.097*	1							
SIZE	0.175**	0.534**	-0.204**	0.285**	1						
DE	-0.132**	0.135**	-0.006	0.102*	0.412**	1					
CR	-0.044	-0.133**	-0.079	-0.074	-0.248**	-0.426**	1				
ROA	0.311**	-0.107*	0.075	-0.136**	-0.228**	-0.407**	0.168**	1			
SI	-0.028	0.147**	-0.084*	0.024	0.195**	0.101*	0.015	-0.113**	1		
BS	0.084*	0.339**	-0.089*	0.130**	0.481**	0.114**	-0.068	-0.070	0.109**	1	
IBM	0.107**	0.337**	-0.099*	0.082*	0.256**	0.008	0.003	-0.076	0.189**	0.032	1

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

Multivariate and mediation analysis

Panel data were analyzed using pooled ordinary least squares (Pooled OLS), random effects, and fixed effects estimations for all model specifications. The Hausman test was subsequently employed to identify the most appropriate estimator for the dataset. Equations 1 - 4, found that p -values < 0.05, Accordingly, the Fixed effects regression model was applied (Hausman, 1978) as the preferred specification for this study.

Based on the results presented in Table 5, model 1 shows that both BGD and SC are positively and significantly associated with GHD (p -value<0.05 and 0.01 respectively). SC exerts the strongest effect on GHD, with a coefficient of 2.752, indicating its substantial role in enhancing disclosure level. Among the control variables, firm size and the proportion of independent board members also exhibit positive and significant effects on GHD, while board size has a negative and significant impact.

In model 2, BGD is positively and significantly related to FV (p -value<0.05), whereas SC shows a negative but statistically insignificant coefficient. Model 3 reveals that GHD has a positive and significant relationship with FV (p -value<0.1), suggesting its relevance in value creation. Finally, in model 4, when GHD is introduced alongside BGD and SC, the coefficient for BGD remains positive but decreases in coefficient, while SC becomes negative and statistically significant (p -value<0.1). This reduction in BGD and SC's coefficient, combined with the significance of GHD, is consistent with partial mediation as outlined by Baron and Kenny (1986) framework, indicating that GHD partially mediates the relationship between BGD, SC, and FV.

Table 5 BGD, SC, GHD and FV: multivariate and mediation analysis

	Model 1 (Step 1)	Model 2 (Step 2a)	Model 3 (Step 2b)	Model 4 (Step 3)
Explanatory variables	GHD	FV	FV	FV
BDG	0.028 ** (2.23)	0.014 ** (2.01)		0.012 * (1.78)
SC	2.752 *** (8.15)	-0.174 (-0.92)		-0.333 * (-1.65)
GHD			0.046 * (1.82)	0.058 ** (2.12)
SIZE	0.746 *** (3.65)	0.892 *** (7.82)	0.847 *** (7.31)	0.848 *** (7.36)
DE	0.004 (1.20)	-0.001 (-0.74)	-0.001 (-0.85)	-0.001 (-0.86)
CR	-0.080 (-0.56)	-0.085 (-1.07)	-0.094 (-1.19)	-0.081 (-1.02)
ROA	-0.013 (-0.54)	0.026 * (1.87)	0.029 ** (2.10)	0.026 * (1.93)
BS	-0.219 ** (-2.31)	-0.037 (-0.71)	-0.028 (-0.54)	-0.025 (-0.47)
IBM	0.018 *** (3.82)	0.001 (0.45)	0.001 (0.20)	0.000 (0.05)

Table 5 BGD, SC, GHD and FV: multivariate and mediation analysis (Cont.)

_cons	-14.048 **	-19.625 ***	-18.688 ***	-18.811 ***
	(-2.75)	(-6.88)	(-6.49)	(-6.56)
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Obs	580	580	580	580
R-squared	0.3122	0.1526	0.149	0.1617
Hausman (1978) test	0.0033	.0000	.0000	.0000

Note(s): t-values are in parentheses

***p < 0.01, **p < 0.05, *p < 0.1

Discussion and Conclusion

This study aims to examine the mediating role of GHD in relationship between BGD, SC and FV of companies on SET. Based on secondary data, the sample consists of 580 firm-years over the period 2019 to 2023. The analysis is conducted using panel data, fixed effects estimation model was applied. The empirical results demonstrate a positive and statistically significant association between BGD and FV, lending support to H1. This finding suggests that BGD may contribute to superior strategic decision-making, enhanced monitoring effectiveness, and a broader range of perspectives, all of which can create long-term value for shareholders. These results align with the stakeholder theory and the resource-based view, which posit that diversity in board composition can strengthen a firm's legitimacy and expand its resource base. The result is consistent with prior empirical evidence (Agyemang-Mintah & Schadewitz, 2019; Oyerogba & Ogungbade, 2020; Ullah et al., 2020). Notably, the present study extends the literature by confirming these effects within the listed companies on SET, thereby reinforcing the argument that BGD constitutes a critical governance attribute influencing firm value. The results reveal that the SC exhibits a negative and statistically significant association with FV, lending reject to H2. This result implies that, while SC are intended to strengthen sustainability governance, their direct impact on firm value may be constrained or even detrimental in the short term. The finding is consistent with prior study (Rini, 2024; Shah et al., 2024).

This study also reveals a positive association between the extent of GHG emissions disclosure and firm value, support H3, which aligns with prior studies (Hardiyansah et al., 2021; Kurnia et al., 2021; Sun et al., 2022). Firms demonstrating a strong commitment to addressing GHG emissions, one of the primary contributors to global warming, reflect an organizational orientation toward sustainability. Effective GHG emission performance often leads to increased disclosure, which serves as a positive signal to investors and other stakeholders. This proactive transparency enhances corporate reputation and public image, fostering trust, legitimacy, and support from the investment community and broader society. Consequently, such actions contribute to the enhancement of firm value.

Finally, this study provide evidence the mediating role of GHD in the relationship between BGD, SC and FV of the listed companies on SET. These results indicate that GHD serves as a mediating mechanism through which BGD contributes to FV. The findings suggest that BGD enhance corporate environmental transparency, which, in turn, is positively valued by the market. This supports H4 and this study shows that diverse boards tend to promote more comprehensive GHD, thereby improving firm reputation and investor confidence. As well as the results support H5, SC may not directly enhance FV and may even exert short-term negative pressure due to implementation costs, they contribute to FV indirectly by improving the quality and extent of GHD, which the enhancement of firm value. Together, these mediation effects highlight the critical role of GHD as a transmission channel linking governance attributes (BGD and SC) to FV. While BGD appears to have both direct and indirect effects on FV, SC's contribution is largely mediated, emphasizing that its potential depends on converting governance oversight into credible and transparent GHD.

Limitation and suggestion for future research

This study is limited to the listed companies on SET, which may restrict generalizability to other regulatory and cultural settings. Future research could test the model across different markets. GHD was measured from publicly available reports, which may not fully capture disclosure quality. Subsequent studies should integrate qualitative assessments or assurance data. While the Baron and Kenny (1986) approach was applied, potential endogeneity remains, advanced econometric techniques such as SEM could strengthen causal inference. Lastly, incorporating additional governance and firm-level variables could offer a more comprehensive understanding of the pathways linking sustainability governance, disclosure, and firm value.

References

- Ab Aziz, N. H., Alshdaifat, S. M., & Al Amosh, H. (2025). ESG controversies and firm performance in ASEAN: do board gender diversity and sustainability committee matter? *Business Strategy & Development*, 8(1), e70094.
- Abdelrahman Adam Abdalla, A., Salleh, Z., Hashim, H. A., Wan Zakaria, W. Z., & Al-ahdal, W. M. (2024). The effect of board of directors attributes, environmental committee and institutional ownership on carbon disclosure quality. *Business Strategy & Development*, 7(4), e70023.
- Agyemang-Mintah, P., & Schadewitz, H. (2019). Gender diversity and firm value: evidence from UK financial institutions. *International Journal of Accounting & Information Management*, 27(1), 2-26.
- Al-Qahtani, M., & Elgharbawy, A. (2020). The effect of board diversity on disclosure and management of greenhouse gas information: evidence from the United Kingdom. *Journal of Enterprise Information Management*, 33(6), 1557-1579.

- Alodat, A. Y., & Hao, Y. (2025). Environmental, social and governance (ESG) disclosure and firm performance: moderating role of board gender diversity and sustainability committee. *Sustainable Development*, 33(1), 636-651.
- Ariani, M., Hadiyatno, D., & Anam, H. H. (2024). *Metodologi penelitian: Langkah mudah menulis skripsi dan tesis*. PT. RajaGrafindo Persada-Rajawali Pers.
- Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of personality and social psychology*, 51(6), 1173.
- Borsuk, M., Eugster, N., Klein, P.-O., & Kowalewski, O. (2023). *Family Firms and Carbon Emissions*.
- Brown, T. A. (2015). *Confirmatory factor analysis for applied research*. Guilford publications.
- Buallay, A., & Alhalwachi, L. (2022). Board gender diversity and environmental disclosure: evidence from the banking sector. *Journal of Chinese Economic and Foreign Trade Studies*, 15(3), 350-371.
- Buertey, S. (2021). Board gender diversity and corporate social responsibility assurance: The moderating effect of ownership concentration. *Corporate Social Responsibility and Environmental Management*, 28(6), 1579-1590.
- Cohen, J. (2013). *Statistical power analysis for the behavioral sciences*. routledge.
- Coluccia, D., Dabić, M., Del Giudice, M., Fontana, S., & Solimene, S. (2020). R&D innovation indicator and its effects on the market. An empirical assessment from a financial perspective. *Journal of Business Research*, 119, 259-271.
- Deng, M., Zhang, P., Nie, Y., Shi, Y., Yang, H., Wu, D., Rong, X., & Ma, R. (2023). How to improve pollutant emission performances of household biomass cookstoves: A review. *Energy and Buildings*, 295, 113316.
<https://doi.org/https://doi.org/10.1016/j.enbuild.2023.113316>
- Driss, H., Drobetz, W., El Ghoul, S., & Guedhami, O. (2024). The Sustainability committee and environmental disclosure: International evidence. *Journal of Economic Behavior & Organization*, 221, 602-625.
- Freeman, R. E. (1984). *Strategic management: A stakeholder approach*. Boston: Pitman Publishing Inc.
- Gharios, R., Awad, A. B., Abu Khalaf, B., & Seissian, L. A. (2024). The impact of board gender diversity on European firms' performance: The moderating role of liquidity. *Journal of Risk and Financial Management*, 17(8), 359.
- Hardiyansah, M., Agustini, A. T., & Purnamawati, I. (2021). The effect of carbon emission disclosure on firm value: environmental performance and industrial type. *The Journal of Asian Finance, Economics and Business*, 8(1), 123-133.
- Hausman, J. A. (1978). Specification tests in econometrics. *Econometrica: Journal of the econometric society*, 1251-1271.
- Hazaea, S. A., Al-Matari, E. M., Farhan, N. H., & Zhu, J. (2023). The impact of board gender diversity on financial performance: a systematic review and agenda for future research.

- Corporate Governance: The International Journal of Business in Society*, 23(7), 1716-1747.
- Heydari Rostami, K., Nikzad Ghadikolaei, M., & Khalili, Y. (2025). The women's flourish in the board of directors and the company's sustainability performance. *Journal of Sustainable Human Resource Management*, 7(12), 161-147.
- Hollindale, J., Kent, P., Routledge, J., & Chapple, L. (2019). Women on boards and greenhouse gas emission disclosures. *Accounting & Finance*, 59(1), 277-308.
- Hummel, K., & Schlick, C. (2016). The relationship between sustainability performance and sustainability disclosure—Reconciling voluntary disclosure theory and legitimacy theory. *Journal of Accounting and Public Policy*, 35(5), 455-476.
- Huq, A. M., Cieřlak, K., & Sundberg, K. (2024). Board governance drivers of corporate sustainability levels in private firms: evidence from Sweden. *Sustainability Accounting, Management and Policy Journal*, 15(7), 106-132. <https://doi.org/10.1108/SAMPJ-04-2024-0402>
- Hutauruk, M. R. (2024). The effect of R&D expenditures on firm value with firm size moderation in an Indonesia palm oil company. *Cogent Business & Management*, 11(1), 2317448.
- Issa, A. (2025). Driving emissions reduction: the power of external sustainability assurance and internal governance committees [Article]. *International Journal of Disclosure and Governance*, 22(1), 140-154, Article 120424. <https://doi.org/10.1057/s41310-024-00242-7>
- Jayanti, R. D., Probohudono, A. N., & Endiramurti, S. R. (2023). Gender diversity among the board of commissioners and firm value in Indonesia. *International Journal of Economics, Business and Accounting Research (IJEBAR)*, 7(1), 84-93.
- Kurnia, P., Agustia, D., Soewarno, N., & Ardianto, A. (2025). The mediating role of carbon emission disclosure in the relationship between structure of corporate governance and firm performance. *Journal of Applied Accounting Research*.
- Kurnia, P., Darlis, E., & PUTR, A. A. (2020). Carbon emission disclosure, good corporate governance, financial performance, and firm value. *The Journal of Asian Finance, Economics and Business*, 7(12), 223-231.
- Kurnia, P., Nur, D., & Putra, A. A. (2021). Carbon emission disclosure and firm value: A study of manufacturing firms in Indonesia and Australia. *International Journal of Energy Economics and Policy*, 11(2), 83-87.
- Kyaw, K., Khatri, I., & Treepongkaruna, S. (2024). When R&D investment improves firm value: the role of board gender diversity. *Corporate Governance: The International Journal of Business in Society*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/CG-09-2023-0410>
- Lee, J.-H., & Cho, J.-H. (2021). Firm-value effects of carbon emissions and carbon disclosures—evidence from Korea. *International Journal of Environmental Research and Public Health*, 18(22), 12166.

- Li, Z., Jia, J., & Chapple, L. (2023). The corporate sustainability committee and its relation to corporate environmental performance. *Meditari Accountancy Research*, 31(5), 1292-1324.
- Lindblom, C. K. (1994). The implications of organizational legitimacy for corporate social performance and disclosure. Critical Perspectives on Accounting Conference, New York, 1994,
- Mahmudah, H., Yustina, A. I., Dewi, C. N., & Sutopo, B. (2023). Voluntary disclosure and firm value: Evidence from Indonesia. *Cogent Business & Management*, 10(1), 2182625.
- Muhammad, H., & Migliori, S. (2023). Effects of board gender diversity and sustainability committees on environmental performance: A quantile regression approach. *Journal of Management & Organization*, 29(6), 1051-1076.
- Noor, A., & Ginting, Y. L. (2022). Influence of carbon emission disclosure on firm value of industrial firms in Indonesia. *International Journal of Contemporary Accounting*, 4(2), 151-168.
- Oussii, A. A., & Klibi, M. F. (2023). Do CEO duality and expertise affect earnings management behavior? The moderating effect of family ownership [Article]. *Journal of Family Business Management*, 13(4), 1392-1409. <https://doi.org/10.1108/JFBM-03-2023-0030>
- Oyerogba, E. O., & Ogungbade, O. I. (2020). Gender diversity of the corporate board and firm value: The case of Nigeria listed companies. *Global Journal of Accounting*, 6(1), 53-68.
- Rini, R. K. (2024). Environmental and Social Performance, Firm Value, and the Role of Sustainability Committee. *Business Strategy & Development*, 7(4), e70052.
- Saraswati, E., Puspita, N. R., & Sagitaputri, A. (2021). Do firm and board characteristics affect carbon emission disclosures? *International Journal of Energy Economics and Policy*, 11(3), 14-19.
- Shah, S. Q. A., Lai, F. W., Shad, M. K., Hamad, S., & Tahir, M. (2024). Does the sustainability committee matter in the efficacy of sustainability reporting and firm performance? *Environment, Development and Sustainability*, 1-18.
- Shokomi, L., & Yahaya, O. A. (2024). Sustainability committee and firm value. *Shokomi, L., & Yahaya, OA (2024). Sustainability committees and firm value. NDA Open Access Articles*, 9(3), 1-38.
- Sun, Z.-Y., Wang, S.-N., & Li, D. (2022). The impacts of carbon emissions and voluntary carbon disclosure on firm value. *Environmental Science and Pollution Research*, 29(40), 60189-60197.
- Suttipun, M., & Dechthanabodin, P. (2022). Environmental, Social and Governance (ESG) Committees and Performance in Thailand. *Asian Journal of Business and Accounting*, 205-220.
- Thongchai, C., Srisawangwong, P., & Putekunsakon, A. (2023). Firms Characteristics and Environmental Disclosure: Case Study of the Listed Companies in the Stock Exchange of Thailand. *KKBS Journal of Business Administration and Accountancy*, 7(2), 47-62.

- Tingbani, I., Chithambo, L., Tauringana, V., & Papanikolaou, N. (2020). Board gender diversity, environmental committee and greenhouse gas voluntary disclosures. *Business Strategy and the Environment*, 29(6), 2194-2210.
- Tron, A., Colantoni, F., Celentano, N., & Caputo, A. (2025). Delving into the influence of sustainability strategy: Exploring the influence of sustainability committees on company performance. *Business Strategy and the Environment*, 34(2), 1551-1573.
- Ullah, I., Fang, H., & Jebran, K. (2020). Do gender diversity and CEO gender enhance firm's value? Evidence from an emerging economy. *Corporate Governance: The International Journal of Business in Society*, 20(1), 44-66.
- Wang, K., Ma, J., Xue, C., & Zhang, J. (2024). Board gender diversity and firm performance: Recent evidence from Japan. *Journal of Risk and Financial Management*, 17(1), 20.
- Wang, Y., Ones, D. S., Yazar, Y., & Mete, I. (2023). Board gender diversity and organizational environmental performance: An international perspective. *Current Research in Ecological and Social Psychology*, 5, 100164.
- Xie, F., Guo, Y., Daniel, S. J., & Liu, Y. (2024). The dynamic relation between board gender diversity and firm performance: the moderating role of shareholder activism. *Review of Quantitative Finance and Accounting*, 62(1), 225-246.
- Zhu, J., Zhang, C., Sun, J., & Ding, J. (2025). The impact mechanism of interactive carbon disclosure on firm value moderated by investors' online social networks. *Research in International Business and Finance*, 75, 102771.