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The Role of Carbon Emission Disclosure in Moderating Profitability and GCG on Firm Value in Indonesia

The Wechen Abraham Tedja[1], Daniel Sugama Stephanus[2*], Tarsisius Renald Suganda[3], Bagas Brian Pratama[4]

[1,2,3,4]Department of Accounting, Universitas Ma Chung, Malang, Indonesia

daniel.stephanus@machung.ac.id

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ABSTRACT

This study aims to examine the relationship between profitability and good corporate governance (GCG), measured through independent commissioners, institutional ownership, managerial ownership, and gender diversity, on firm value, with carbon emission disclosure as a moderating variable. This study employs the panel data regression method using a sample of energy sector companies listed on the Indonesia Stock Exchange from 2019 to 2023. The findings suggest that profitability significantly enhances firm value, whereas independent commissioners and gender diversity have a negative impact. On the other hand, institutional ownership and managerial ownership do not show any effect. Additionally, carbon emission disclosure can positively moderate the relationship between independent commissioners, institutional ownership, and gender diversity with firm value. However, carbon emission disclosure negatively moderates the relationship between profitability and managerial ownership with firm value. The findings of this study can serve as a reference for companies in addressing environmental responsibility disclosures and provide recommendations for the government to consider policies regarding carbon emission disclosure in sustainability reporting.

Keywords: profitability; good corporate governance; firm value; carbon emission disclosure.

INTRODUCTION

PSAK 237 is an accounting standard that addresses recognizing, measuring and disclosing provisions, contingent liabilities and contingent assets. This PSAK relates to corporate social and environmental responsibility policies because it relates to costs that are not certain to arise as a present obligation of the company due to past events. (Rengganis et al., 2023). This indicates that disclosures related to social responsibility are based on this PSAK. One form of disclosure of social and environmental responsibility is the disclosure of carbon emissions. Carbon emission disclosure is a calculation of energy, environmental costs used, emissions, and reductions generated and regulations regarding energy use in the company. (Pujiati, 2022). This disclosure is still voluntary because not all companies have made this disclosure.

This disclosure also serves as a follow-up to the commitment made by the Government of Indonesia to achieve net-zero emissions by the year 2060 (Kementerian ESDM, 2022). This commitment needs support and concern from all parties, especially companies. In Indonesia, the largest emission-contributing sector is energy sector companies. According to data from Kementrian PPN (2022), in 2022 the energy sector in Indonesia contributed 50.6% of total emissions. In 2023, carbon emissions reached their highest level in the atmosphere compared to the previous year. (Copernicus Climate Change Service, 2024; Dlugokencky, 2024). Meanwhile, in the previous year, carbon emissions also increased, especially in Indonesia with the amount of carbon increasing by 18.3% (Global Carbon Project, 2023). The rise in carbon emissions has led to an increase in the Earth's average temperature, or global warming. According to data published by the Copernicus Climate Change Service (2024), in 2023, the Earth's average temperature reached its highest level in history, reaching 14.98°C. Therefore, carbon emission disclosure is one of the steps to prevent global warming.

Additionally, carbon emission disclosure is also beneficial for obtaining legitimacy. Companies can use carbon emission disclosure as a tool to gain legitimacy from stakeholders. According to Probosari & Kawedar (2019), carbon emission disclosure can be considered as the company's seriousness to deal with global warming problems due to the greenhouse gas effect. Therefore, carbon emission disclosure can enhance a firm's reputation in the eyes of the public. Companies that disclose carbon emissions not only gain legitimacy but can also influence their firm value. Firm value represents the market value that indicates the price of a company when sold (Brigham & Houston, 2020). Firm value can be influenced by carbon emission disclosure, as such disclosures can attract investors who prefer companies that showcase environmental responsibility (Ramadhan et al., 2023). Firm value will increase as more investors invest. By making these disclosures, a company's stock price can rise, thereby enhancing its value. This aligns with the findings of Hardiyansah & Agustini (2021) & Ramadhan et al., (2023), which indicate that companies engaging in carbon emission disclosure have a significant positive impact on firm value. However, this contradicts the study by Kurnia et al., (2021), which found that firm value cannot be influenced by carbon emission disclosure.

Firm value can also be affected by profitability (Bon & Hartoko, 2022). Profitability serves to measure a company's ability to earn on its total assets or equity. A high level of profitability can attract investors to invest. High profitability levels can attract investors, encouraging investment. As a result, increased profitability leads to greater investor interest, ultimately raising firm value. This is supported by several previous studies, which conclude that profitability significantly positively affects firm value (Bon & Hartoko, 2022; Mubyarto, 2020; Safitri et al., 2022). However, this finding contradicts the studies conducted by Hapsoro & Falih (2020); Sihombing et al., (2023), which show

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that profitability has no impact on firm value. In addition to profitability, GCG also plays a crucial role in determining firm value. Effective corporate governance can benefit companies by balancing various interests within the organization (Bawai & Kusumadewi, 2021). If corporate governance is not properly implemented, firm value may decline. Usually this happens because management is more concerned with personal interests and makes the company's profits fall, which has an impact on the firm value. GCG can be assessed through factors such as the number of independent commissioners, institutional ownership, managerial ownership, and gender diversity (Monica et al., 2021; Permana et al., 2023).

Several previous studies have examined the impact of GCG on firm value. Research on independent commissioners has been conducted by Oktari et al., (2018) & Permana et al., (2023), showing that independent commissioners positively affect firm value. However, a study by Susilowati et al. (2022) found that independent commissioners negatively influence firm value. Other studies suggest that institutional ownership positively influences firm value (Permana et al., 2023; Sutrisno, 2020). Conversely, research by Sihombing et al. (2023) provides different findings, indicating that institutional ownership has no impact on firm value. Additionally, managerial ownership has been found to positively influence firm value, suggesting that higher managerial ownership leads to higher firm value (Permana et al., 2023). However, this finding is not supported by Sutrisno (2020), who argues that managerial ownership does not impact firm value. Gender diversity has also been studied by El-Deeb et al., 2022 & Monica et al., (2021), with differing conclusions regarding its effect on firm value.

Since research gaps exist in examining the nexus between profitability and GCG on firm value, this study offers several significant contributions. First, this research contributes to promoting sustainability specifically for energy companies. By implementing sustainability principles, energy companies can build a good reputation among shareholders and stakeholders. Second, the connection between profitability and firm value helps explain how profitability influences firm value. High profitability reflects good financial performance, which can enhance investor confidence and ultimately increase firm value. Third, GCG contributes to understanding how GCG practices can affect firm value. GCG helps enhance transparency, accountability, responsibility, independence, and fairness, which can increase investor confidence and positively impact firm value. Fourth, the relationship between carbon emission disclosure and firm value contributes to understanding corporate transparency in disclosing carbon emissions. Transparency in carbon emission disclosure reflects a company's commitment to environmental responsibility, which can enhance its reputation and impact firm value.

Further research on this topic is needed by considering carbon emission disclosure, in line with the issue of carbon emissions contributing to global warming and climate change. Therefore, this study aims to examine the effect of profitability and GCG on firm value, with carbon emission disclosure as a moderate variable. To build upon this framework, the relationship between profitability, GCG, carbon emission disclosure and firm value is analyzed in greater depth. First, a company's profitability can draw investors, drive up stock prices, and ultimately enhance firm value (Bon & Hartoko, 2022). Additionally, a high profitability level, which reflects strong company performance, has become a key factor in obtaining loans from creditors. This is because companies in a good financial position find it easier to secure financing (Hapsoro & Falih, 2020). Thus, the level of profitability can serve as a positive signal for both investors and creditors, leading to a higher company value as profitability increases. This is also in line with the research conducted by Bon & Hartoko (2022; Mubyarto (2020); Safitri et al., (2022) which confirm that profitability positively

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influences firm value. Based on previous theories and studies, the hypothesis can be stated as follows: Profitability positively influences firm value (H_1).

Second, companies that implement GCG will gain trust from the public and investors. According to Yameen et al. (2019), GCG helps improve company performance by providing guidance for managers and employees to work more effectively. Indicators of GCG, measured through independent commissioners, institutional ownership, managerial ownership, and gender diversity, can influence firm value in different ways. Independent commissioners play a role in ensuring that stakeholders have access to high-quality company information (Setiadi et al., 2020). nstitutional ownership functions as a mechanism to monitor management's decisions and actions (Sihombing et al., 2023). Meanwhile, managerial ownership helps prevent the company from being solely controlled by managers by granting them shares, aligning their interests with the company's and optimizing firm value (Sutrisno, 2020). Regarding gender diversity on the board of directors, female executives tend to focus more on social performance and reduce negative activities that could harm firm value (El-Deeb et al., 2022). If the company has GCG criteria, the company value tends to increase. This is consistent with the study conducted by Permana et al., (2023), which states that independent commissioners and institutional ownership positively affect firm value. Additionally, research by Sihombing et al., (2023); Sutrisno, (2020), also confirms that institutional ownership has a positive impact on firm value. Furthermore, the study by El-Deeb et al., (2022), finds that gender diversity positively influences firm value. Based on previous theories and studies, the hypotheses can be stated as follows:

H_2: Independent commissioners positively influence firm value.

H_3: Institutional ownership positively influence firm value.

H_4: Managerial ownership positively influence firm value.

H_5: Gender diversity positively influence firm value.

Third, according to legitimacy theory, carbon emission disclosure is implemented to obtain stakeholder approval and support for the company's operations. According to Ramadhan et al., (2023) orporate transparency efforts related to environmental disclosures can create a positive market reaction, benefiting the company's stock price and ultimately increasing firm value. Additionally, GCG highlights company expenses related to carbon emission disclosure, attracting investors, especially those who prioritize environmental concerns (Ramadhan et al., 2023). Based on previous theories and studies, the hypotheses can be stated as follows:

H_6: CED positively moderates the relationship between profitability and firm value

H_7: CED positively moderates the relationship between independent commissioners and firm value.

H_8: CED positively moderates the relationship between institutional ownership and firm value.

H_9: CED positively moderates the relationship between managerial ownership and firm value.

H_{10}: CED positively moderates the relationship between gender diversity and firm value.

RESEARCH METHODS

This research utilizes quantitative data obtained from secondary sources, specifically company websites, including annual and sustainability reports. Data was collected using

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documented techniques. The study population consists of companies in the energy sector that are listed on the Indonesia Stock Exchange (IDX) from 2019 to 2023. The sample consists of energy sector companies that remained listed and published both annual and sustainability reports throughout the study period. The method of data analysis that is used is panel data regression.

The dependent variable in this study is Tobin's Q, which serves as a proxy for firm value. This metric compares a company's debt and shares capital to its total assets. Meanwhile, profitability and GCG are used as independent variables in this study. Profitability is represented by Return on Assets (ROA), which is determined by comparing net income after tax to total assets. Meanwhile, Independent commissioners, institutional ownership, managerial ownership, and gender diversity serve as proxies for GCG. In this study, carbon emission disclosure functions as a moderating variable, measured using an 18-item checklist developed by Choi et al., (2013), consisting of 18 items. The formula for calculating these variables is as follows:

Table 1. Research Variable Formulas

Variable	Formula
FV	(Market Value + Total Debt) / Total Assets
ROA	Net Income After Tax / Total Assets
Independent Commisioners	Number of Independent Commissioners / Total Board of Commissioners
Institusional Ownership	Shares Held by Institutions / Total Outstanding Shares
Managerial Ownership	Shares Owned by Management / Total Outstanding Shares
Gender Diversity	Number of Female Directors / Total Number of Directors
CED	Disclosed Items) / Total Predefined Items

RESULT AND DISCUSSION

Table 2. shows the results of the model selection test. Based on the Chow test, the appropriate regression model is fixed effect because the cross-section F probability value is below 0.5, which is 0.0. Furthermore, the Hausman test shows a probability value of cross-section F of 0.9522. These results are above 0.5 and the appropriate regression model is random effect. Then, the LM (Langrange Multipler) test shows that the right regression model is random effect because the Breusch-Pagan value is less than 0.05, which is 0.0. Therefore, the right regression model in this study is random effect.

Table 2. Selection Model Test

Effects Test	Chow	Hausman	LM
Cross-section F	0.0000	0.9522	
Breusch-Pagan			0.000

Source: Data processed (2025)

Table 3. shows the results related to statistical descriptions in this study. The analysis results show the mean, maximum, minimum, and standard deviation of the 95 observed data per variable.

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Table 3. Descriptive Statistics

	Mean	Max	Min	Std Dev	N
FV	0.79	2.29	0.24	0.39	95
ROA	6.76	45.43	-11.65	9.64	95
IND	44.26	80.00	25.00	10.91	95
INS	7.79	41.28	0.00	9.57	95
MOWN	1.42	15.26	0.00	3.67	95
GEN	12.92	66.67	0.00	17.03	95
CED	61.40	88.89	5.56	23.62	95
SIZE	30.34	32.76	27.57	1.41	95
LEV	23.41	58.12	0.00	16.06	95

Source: Data processed (2025)

Table 4. Weighted Statistics

	Result
R-squared	0.158401
Adjusted R-squared	0.090686
S.E. of regression	0.205057
F-statistic	2.339231
Prob(F-statistic)	0.030926

Source: Data processed (2025)

Table 4 shows that the baseline regression model used to examine the influence of profitability and GCG on firm value is appropriate for use. This is indicated by the F-statistic, which is below 0.05, specifically 0.03. Additionally, the independent variables in this study are able to explain 9% (Adjusted R-squared) of the dependent variable, while the remaining 91% is explained by variables outside the study.

Table 5. Hyphotesis Result

Variable	Coeficient	t-Statistic	Prob (1-Tailed)
Constant	4.5904	2.7450	0.0037
ROA	0.0127	3.2248	0.0009***
IND	-0.0042	-1.3738	0.0865*
INS	-0.0043	-0.8061	0.2112
MOWN	-0.0146	-0.7637	0.2236
GEN	-0.0034	-1.4230	0.0792*

SIZE	-0.1208	-2.1704	0.0164**
LEV	0.0027	0.8505	0.1987

Source: Data processed (2025)

Table 5 indicates that profitability positively influences firm value, whereas independent commisioners and gender diversity negatively impact firm value. The positive direction indicates that a higher profitability can increase firm value, whereas the negative direction suggests that as independent commisioners and gender diversity increase, firm value decreases. Meanwhile, institutional ownership and managerial ownership have no effect on firm value. Therefore, H_1 is accepted, while H_2, H_3, H_4, and H_5 are rejected.

Table 6. Weighted Statistic (With Moderation)

	Result
R-squared	0.9622
Adjusted R-squared	0.9561
S.E. of regression	0.0818
F-statistic	158.6479
Prob(F-statistic)	0.0000

Source: Data processed (2025)

Table 6 shows that the F-statistic is below 0.05, indicating that the second regression model examining the impact of profitability and GCG on firm value with carbon emission disclosure as a moderating variable is appropriate for use. Meanwhile, the independent variables in this study explain 95.61% (Adjusted R-squared) of the dependent variable, while the remaining 4.39% is explained by variables outside the study.

These results also indicate that the regression model with the moderating variable, in terms of the coefficient of determination, is stronger than the baseline regression model. This is evidenced by the increase in the adjusted R-squared from 9% to 95.61%, demonstrating that the role of carbon emission disclosure enhances the relationship between profitability and GCG on firm value. The role of carbon emission disclosure as a moderating variable can be further examined in Table 7.

Table 7. Hypothesis Result (With Moderation)

Variable	Coefficient	t-Statistic	Prob. (1-tailed)
Constant	1.1239	4.5775	0.0000
ROA	0.0045	1.7286	0.0439
IND	-0.0171	-22.7874	0.0000
INS	-0.0468	-1.9673	0.0263
MOWN	0.0118	1.9318	0.0285
GEN	-0.0016	-2.5510	0.0063
CED	-0.0003	-0.5762	0.2831
ROA*CED	-0.0001	-2.0756	0.0206**

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IND*CED	0.0199	41.4187	0.0000***
INS*CED	0.0015	1.9568	0.0269**
MOWN*CED	-0.0006	-2.3722	0.0101**
GEN*CED	0.0000	1.5265	0.0654*
SIZE	-0.0062	-0.7205	0.2367
LEV	-0.0012	-1.9136	0.0296

Source: Data processed (2025)

Table 7 shows that the relationship between independent commisioners, institutional ownership, and gender diversity on firm value can be positively moderated by carbon emission disclosure. independent commisioners, institutional ownership, and gender diversity when not moderated by carbon emission disclosure provide results that independent commisioners and gender diversity negatively affect firm value, while institutional ownership has no effect. However, after being moderated by carbon emission disclosure the relationship between independent commisioners, institutional ownership, and gender diversity is shown to influence firm value, indicating that carbon emission disclosure can strengthen this relationship. Based on these results, H_7, H_8, and H_{10} are accepted.

Additionally, Table 7 also shows that the relationship between independent commisioners, institutional ownership, and gender diversity on firm value can be negatively moderated by carbon emission disclosure. Negative moderation means that carbon emission disclosure weakens the relationship between profitability and managerial ownership on firm value. Based on these results, H_6 and H_9 are rejected.

The results of the study show that profitability measured using profitability has a positive effect on firm value. Companies with high profitability demonstrate operational efficiency and drive stock price increases due to investor confidence, which will ultimately increase the firm value. Accordig to Bon & Hartoko (2022); Mubyarto (2020) profitability serves as a signal for investors, indicating the company's prospects, which in turn stimulates stock demand and increases firm value. These findings align with studies conducted Bon & Hartoko (2022); Mubyarto (2020); Safitri et al., (2022), which also state that profitability positively influences firm value. In the energy sector, profitability is a crucial factor, as high profitability strengthens competitiveness amid global energy price volatility and government policies on renewable energy transition (Muttaqien et al., 2024). Energy companies that can maintain profitability levels reflect their ability to adapt to government policies and global energy prices. Thus, energy companies with high profitability will boost investor confidence and positively impact firm value.

The results of the study indicate that independent commissioners have a negative effect on firm value. These findings are consistent with the study conducted by Susilowati et al., (2022). A high number of independent commissioners has not been able to provide objective oversight of the company. According to Susilowati et al., (2022), the presence of independent commissioners can lead to inefficiencies in corporate management, as company oversight is also conducted by other parties, not solely by independent commissioners.

Institutional ownership has no effect on firm value. High institutional ownership has not been able to provide optimal oversight of management. This may occur because institutional ownership tends to overlook minority shareholders and prioritize individual interests (Riyadh et al., 2022). hese

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findings are consistent with the study conducted by Sihombing et al., (2023), which also concluded that institutional ownership does not influence firm value.

Managerial ownership has no effect on firm value. It is suspected that management prioritizes personal interests over those of investors. This may occur because management has access to internal company information (Sutrisno, 2020). These findings are consistent with the study conducted by Sutrisno (2020) which also states that managerial ownership does not influence firm value.

Gender diversity has a negative effect on firm value. According to Huang (2024), the presence of women may have a negative impact due to tokenism, disruptions in board dynamics, or challenges in integration. These findings contrast with the study conducted by El-Deeb et al. (2022) which states that gender diversity positively influences firm value.

Regarding the moderating variable, the research findings show that no company conducts a complete carbon emission disclosure because this disclosure is voluntary and there are no regulations regarding the items that must be disclosed. However, carbon emission disclosure can moderate the relationship between independent commisioners, institutional ownership, and gender diversity on firm value. Companies that engage in carbon emission disclosure can enhance their firm value, as it reflects environmental responsibility, gaining support from stakeholders. This disclosure can make the public respond positively to the disclosures made by the company, so that it can attract investors and increase the stock price as well as the firm value will be higher (Hardiyansah & Agustini, 2021).

In Indonesia's energy sector companies, carbon emission disclosure is a crucial aspect, as this sector is the largest contributor to carbon emissions in the country. Although it is disclosed voluntaryly, most energy companies have implemented carbon emission disclosure as part of their sustainability strategy. Energy sector companies that still rely on fossil fuels cannot avoid environmental impacts, so transparency related to carbon emissions can help companies to maintain their reputation and attract more investors who care about the environment and sustainability. For this sector, carbon emission disclosure can assist companies in identifying opportunities for energy efficiency and environmentally friendly technological innovations that have the potential to reduce operational costs in the long run. Additionally, this disclosure shows the company's commitment to sustainable business practices to increase trust from stakeholders and investors.

On the other hand, carbon emission disclosure provides different results on the relationship between profitability and managerial ownership on firm value. carbon emission disclosure negatively moderates the relationship between profitability and managerial ownership on firm value. The presence of carbon emission disclosure weakens the relationship between profitability and managerial ownership because this disclosure requires high cost. According to Kurnia et al., (2021), carbon emission disclosure demands significant expenses and higher cash outflows, which can hinder the increase in firm value. Additionally, companies that engage in carbon emission disclosure may be perceived negatively, as there are concerns that the costs of disclosure outweigh the benefits received by the company (Muhammad & Aryani, 2021).

CONCLUSION

This study finds that profitability positively affects firm value, whereas independent commissioners and gender diversity have a negative impact. Meanwhile, institutional ownership and

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managerial ownership do not influence firm value. However, these relationships can be moderated by carbon emission disclosure. carbon emission disclosure positively moderates the relationship between independent commisioners, institutional ownership, and gender diversity with firm value. Conversely, carbon emission disclosure weakens the relationship between profitability and managerial ownership with firm value.

These findings can serve as a reference for energy sector company management to focus on sustainable business practices while considering environmental factors. Companies can also leverage carbon emission disclosure as a strategic tool to enhance firm value and mitigate negative investor perceptions regarding such disclosures. Furthermore, since Indonesia has not yet established a reporting standard for carbon emission disclosure, companies can adopt global reporting standards such as TCFD and SASB. These findings can also serve as a consideration for the government in formulating policies related to carbon emission disclosure, ensuring that companies adhere to a standardized framework for disclosing relevant items.

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