

# Carbon emissions disclosure and firm value: A study of firms in Indonesia

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## Abstract

This study aims to examine the effect of carbon emissions disclosure on firm value in Indonesia using statistical analysis methods. This research uses panel data which consists of a combination of time series and cross section. A total of 1,830 data from 366 Indonesian companies were collected from annual reports and sustainability reports for an observation period from 2018 to 2022 as a sample of the research. Firm value is measured using Tobin's Q. The results showed that the disclosure of carbon emissions had an effect on firm value. It was also figured out that a control variable, leverage, affected firm value. These results indicate that information about carbon emissions promotes firm value. The disclosure of carbon emissions by the company will affect investors' decisions. This is consistent with the stakeholder theory, according to which investors have the right to obtain information about the company's activities from annual reports and sustainability reports. Companies are encouraged to foster the initiative to disclose carbon emissions as an effort to reduce the threats of global warming and strengthen stakeholders' trust in making investment decisions.

**Keywords:** *carbon emissions, disclosure, firm value, stakeholder, Indonesia*

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## 1. Introduction

Climate change, carbon emissions, and global warming are of global concern as they continue to intensify and adversely affect the environment. According to the Intergovernmental Panel on Climate Change (IPCC, 2022), countries around the world are experiencing an elevated global surface temperature, which results in extreme climate change. As stated by NASA, since the beginning of the industrial era in 1750, human activities have caused the concentration of CO<sub>2</sub> in the atmosphere to increase by about 50%. In light of this issue, corporate stakeholders need to raise human awareness to reduce the negative impacts caused by humans on the environment, including those in Indonesia.

The risk and damage from climate change are mounting as global warming escalates. Environmental problems occur as a result of industrialization activities, including uncontrolled corporate activities that depletes the ozone layer, excessive natural resources extraction, global warming, and hazardous waste pollution. Not only Indonesia, countries such as China, the U.S., Japan, and Mexico are currently also experiencing the boiling temperature of the Earth (Bisset, 2023). Such is the effect of climate change that arises from the accumulation of carbon emissions in the atmosphere. In response, various sectors are now competing to find alternatives to reduce carbon emissions (Ardhi, 2023). Some companies claimed that their products are environmentally friendly, but industrial entities have provided no sufficient explanation of their efforts to reduce the impact of environmental damage. Such an environmental problem provides an impetus to the rise of social and environmental accounting (Suaryana et al., n.d.).

According to data from the Energy Institute, a total of 34.37 billion tons of CO<sub>2</sub> was emitted from the global energy sector in 2022, the highest in history (Muhamad, 2023). The Global Atmospheric Research (EDGAR) reported that in 2022, China ranked first as the largest carbon emitter in the world, while Indonesia ranked seventh by emitting 1.24 Gt CO<sub>2</sub>, an increase from 2021's CO<sub>2</sub> emissions of 1.12 Gt (Martin & De Melo, 2023). Disclosure of carbon emissions provides a means of dialog between the company and stakeholders (Adams & McNicholas, 2007). Environmental disclosure can help enhance the trust of the company's stakeholders and minimize idiosyncratic risk (Hasseldine et al., 2005). Benlemlih and Girerd-Potin (2017) and Jo and Na (2012) also stated that an increase in corporate social responsibility (CSR) disclosure will reduce idiosyncratic risk, but Humphrey et al. (2012) found no

correlation between the two of them. Carbon emissions disclosure (CED) facilitates stakeholders' decision-making pertaining to the company's carbon emissions and mediates the relationship between public ownership and firm value (Ng et al., 2022).

Previous research explains that CED made by CDP does not affect the increase in firm value (Najah, 2012), but (Matsumura et al., 2014) found that carbon emissions are negatively related to firm value. Market reaction is diminished in companies that have poor environmental performance. Investors are concerned about the costs incurred by the company to deal with global warming. Additionally, Broadstock et al. (2014) found that the level of carbon emissions, company size, and the quality of company management affect CED; the larger the company size, the more likely it is to disclose carbon emissions.

Rahmawati et al. (2022) concluded in a study that attention to every aspect of company activities affects company value. It has been found that the better the company value, the higher the company profitability. In addition to making it easier for companies to gain support from stakeholders, disclosure of carbon emissions is also able to influence company value. Disclosure of carbon emissions is therefore no longer seen as a burden because it can enhance company value and the government's favorable image (Hardiyansah et al., 2021). Not only the government, businesses are also starting to consider environmental issues when making business decisions. According to Lash and Wellington (2007) and Kolk and Pinkse (2005), the issue of climate change has become one of the top priorities to be resolved in recent decades.

According to Botosan et al. (2000), businesses with high levels of disclosure will have a lower cost of equity (COE). Hence, adopting CED will increase firm value. Hail et al. (2008) found strong evidence that cross-listing firms on U.S. exchanges lowers the cost of equity and accounts for more than half of the increase in firm value. In addition, Sindy (2017) argues that carbon emissions disclosure is a component of sustainability reporting that is expected to provide information to stakeholders. The inclusion of carbon emissions disclosure in financial statements is important as part of corporate responsibility. The CED can be used by investors as a benchmark for decision-making (Bahriansyah & Ginting, 2022). In other words, the company's efforts to reduce carbon emissions are in line with the concept of CSR. By implementing carbon accounting in the industry, the level of greenhouse gas air pollution, which is a factor of global warming, can be lowered. In addition, carbon accounting also has the benefit of adding value to the company.

Research by Anggraeni (2015), Clarkson et al. (2011), Al-Tuwaijri et al. (2003), and Krishnan (2003) concluded that companies in Indonesia have low levels of CED, but it was found that CED affects firm value, suggesting that the market responds to information provided by CED. As such, companies take a deeper interest in improving the quality of information about their carbon emissions as this will have an impact on firm value.

The Sustainable Development Goals (SDGs) include 17 goals from various aspects to address changes in sustainable development. This research relates to 5 goals points of the Sustainable Development Goals (SDG) including: (7) Affordable and Clean Energy, (8) Decent Work and Economic Growth, (9) Industry, Innovation, and Infrastructure, (10) Sustainable Cities and Communities, (11) Responsible Consumption and Production (SDGs Indonesia, n.d.). Previous research examining the manufacturing sector in Indonesia by Kurnia et al. (2021) showed that disclosure of carbon emissions affects company value, as environmental responsibility increases competitive advantage and investor confidence and creates good corporate governance, keeping in mind that investors consider environmental aspects as well, especially carbon emissions. Disclosure of carbon emissions can drive stock prices and firm value up because investors care about environmental issues (Berthelot et al., 2011), and failure to integrate climate change and business can reduce firm value (Matsumura et al., 2014). Anggraeni (2015) found that disclosure of carbon emissions affects business value, while Saka and Oshika (2014) combined voluntary disclosure with carbon emissions to assess firm value. The market welcomes the publication of sustainability reports and social and environmental disclosures (Guidry & Patten, 2010). However, in view of the gap in existing research findings that are restricted only to companies engaged in the manufacturing sector, this study aims to determine how carbon emissions disclosure impacts firm value in all sectors in Indonesia.

## **2. Literature review**

### ***2.1. Stakeholder Theory***

The stakeholder theory describes which parties are responsible for the company's actions (Freeman, 1983). According to Kelvin et al. (2017), companies must maintain relationships with their stakeholders by fulfilling their wants and needs. One way to do so is by issuing sustainability reports that convey information about the company's economic,

social, and environmental performance to all its stakeholders, and it is expected that such sustainability reports include disclosure of carbon emissions. According to the stakeholder theory, companies must provide benefits to stakeholders, including shareholders, creditors, consumers, suppliers, the government, communities, and analysts, to name a few. Among their interests in the company are matters related to the environment (Salbiah & Mukhibad, 2018). Since support from stakeholders determines the running of a company, it is important that companies seek stakeholder support (Chariri, 2007). The better the company adaptability, the stronger the stakeholders. The company's effort to communicate these matters with stakeholders is regarded as a part of social disclosure.

As revealed by Epstein and Freedman (1994), information provided voluntarily in corporate annual reports attracts individual investors. This information encompasses corporate social and environmental information. Therefore, investors are expected to give a better valuation to companies with good disclosure practices, including in disclosing carbon emissions.

## ***2.2. Carbon Emissions***

According to Roy (2022), carbon-emitting industrial activities that do not consider the environment increase the atmospheric carbon dioxide concentration and hinder carbon dioxide absorption by nature. This condition has escalated since the outset of the industrial revolution, with most of carbon emissions originating from production machines, ultimately leading to global warming. As human activities elevate carbon dioxide levels, nature can no longer absorb the entire amount of carbon dioxide available (Kelvin et al., 2017).

Developing countries consider carbon emissions disclosure as novelty, so not many companies practice it (Irwhantoko & Basuki, 2016). According to Akadiati et al. (2023), sustainability reporting in Indonesia is voluntary. Sustainability reports were made mandatory in 2019 in Indonesia, but the implementation has been postponed to 2021 and 88% of companies in Indonesia had disclosed their sustainability reports (Andy, 2023). The Indonesian Institute of Accountants (IAI) publishes transparency and social responsibility regulations for companies in Indonesia which are regulated in PSAK No.1 Paragraph 9; this can indirectly encourage companies to disclose their environmental responsibilities. Therefore, disclosure reports are not only used for investors, but can also be used by companies to maintain the image and value of the company. Based on Presidential Regulation No. 61 of 2011 on the National

Action Plan for Greenhouse Gas Reduction, which is still voluntary, Indonesia has committed to reducing the level of carbon emissions. Voluntary social and environmental disclosure is still carried out by companies to maintain the company's reputation and maintain the company's image in the eyes of the public. As explained in article 4, business actors contribute to GHG reduction. One of the efforts that companies can make is to disclose carbon emissions.

Disclosure of carbon emissions is deemed crucial as it contains information needed by stakeholders. Investors want to know the environmental risks of the company's operations, as well as the company's sustainable development activities and environmental protection efforts (Sudibyo, 2018). Walley and Whitehead (1994) argued that a firm should not take only a value-based approach that allows for an information exchange on environmental costs and benefits. This research discusses the impact of carbon emissions on firm value by estimating the impact of carbon emissions disclosure on firm value.

### ***2.3. Firm Value***

Firm value can be defined as the value of the company's share price or the value of the company's assets when the company is sold (Agustia et al., 2019). The prosperity of shareholders and the company value will grow along with the increase in share prices (Iskandar et al., 2016). Tobin's Q ratio is used to measure firm value, obtained by multiplying the closing price of a stock by the number of shares outstanding, adding it to the total book value of liabilities, and dividing it by the total book value of assets. A high firm value (above 1) indicates that the value of the stock price is higher than the replacement value of the assets (Kurnia et al., 2021). According to Eko et al. (2013) maximizing company value is the main goal of the company. Firm value can be broken down into liquidation value, book value, intrinsic value, nominal value, and market value (Christiawan & Tarigan, 2008).

Disclosure of carbon emissions made by companies with good corporate governance can increase the companies' value because investors consider environmental issues, especially carbon emissions (Tang, 2016). Investors prefer businesses that are environmentally responsible, especially in situations where climate change occurs (Berthelot et al., 2011). Businesses' carbon emissions can cause their stock price and company value to decline. Reducing carbon emissions will involve investor costs (Kurnia et al., 2021). When firm value is high, it can have an impact on market confidence, both for current performance and future

prospects (Salvatore, 2005). This is because shareholder prosperity is positively correlated with stock prices (Zuhrufiyah & Anggraeni, 2019).

#### ***2.4. Carbon Emissions Disclosure and Firm Value***

The relationship between carbon emissions disclosure and business value is in line with the stakeholder theory and the signal theory, where the company discloses information as a sign that it is successfully carrying out its operations. These signals are sure to be well-received by the parties involved, especially shareholders, which will increase their trust in the company and in turn boost the stock price and company value (Zuhrufiyah & Anggraeni, 2019).

From where investors stand, firm value is of the utmost importance because it reflects how the market values the company as a whole. Firm value can increase the profits of the company's shareholders, where shareholders' prosperity is proportional to the share price; the higher the share price, the higher the prosperity of shareholders. Investors generally leave the company's management in the hands of managers or commissioners to take care of the company value (Zuhrufiyah & Anggraeni, 2019).

Carbon emissions disclosure assesses the company's carbon emissions and sets emissions reduction targets (Sari & Budiasih, 2022). According to the Statement of Financial Accounting Standards (PSAK) No. 1, "*companies shall provide additional reports concerning the environment (or added value), especially for industries whose primary resources pertain to the environment (or employees and other stakeholders are important financial statement users)*". The fact that stakeholders need information about carbon emissions makes this disclosure imperative. They want to know about the environmental risks of the company's business operations and the company's sustainable development activities and environmental protection efforts (Sudibyo, 2018). Given that carbon emissions disclosure is a novel concept in developing countries, many companies have yet to make any carbon emissions disclosure. In addition, companies in developing countries lack funds for disclosure as compared to companies in developed countries. For instance, Indonesia is a developing country where carbon emissions disclosure is not mandatory; however, companies may disclose carbon emissions voluntarily (Irwhantoko & Basuki, 2016). Although it is not compulsory, companies often choose to disclose carbon emissions in their accountability reports to inform

stakeholders. Investors also favor businesses that provide environmental information (Roy, 2022).

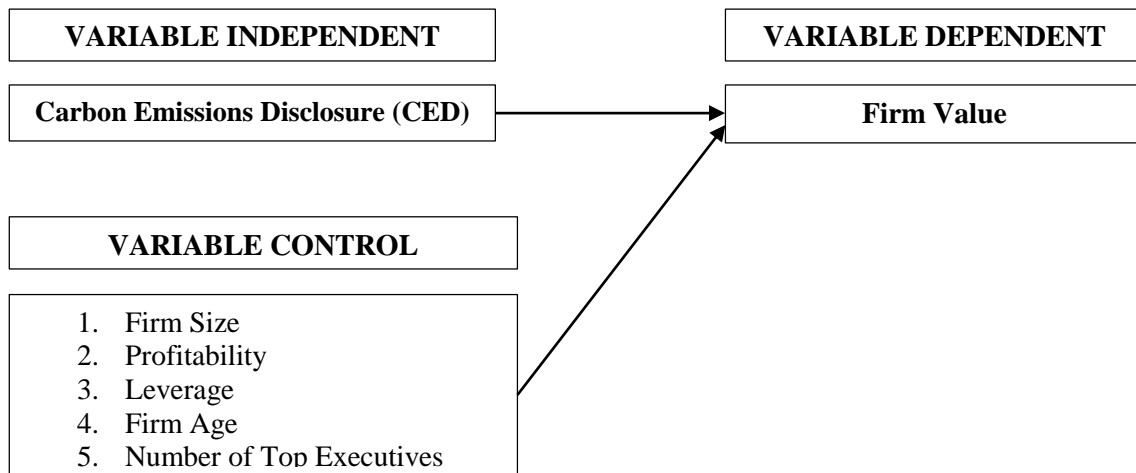
Several previous studies have examined the disclosure of carbon emissions of companies in Indonesia (Anggraelni, 2015b; Clarkson et al., 2011; Al-Tuwaijri et al., 2003). Krishnan (2003) concluded that companies in Indonesia have a low level of CED but it is also found that CED affects firm value. Therefore, companies take a deeper interest in improving the quality of carbon information as this will have an impact on firm value. Griffin et al. (2012) stated that the positive market reaction to the disclosure of carbon emissions is due to investors' belief that the management has the ability to control the environmental impact of business operations.

Previous research has yielded inconsistencies in findings. Some studies discovered that disclosure of carbon emissions information has an influence on firm value (Hanifah, 2017; Elmpiris et al., 2021), while one study found that CED is regarded as "bad news" and causes anxiety as to potential costs that companies must incur to address global warming (Lelel et al., 2015). Thus, the hypothesis in this study is:

***H1: Disclosure of carbon emissions affects firm value***

**Figure 1**

*Research framework*





### 3. Methodology

#### 3.1. Population and Sample

The population in this study consisted of IDX-listed Indonesian companies. Secondary data were collected using the documentation method by tracing the annual reports and sustainability reports of the sample companies, aided by the Stata computer program. A total of 1,830 data were retrieved from 366 Indonesian companies for the 2018–2022 observation period. The inclusion criteria used in this study were that the companies must have published annual reports and sustainability reports on the IDX's website ([www.idx.co.id](http://www.idx.co.id)) from 2018 to 2022 and that the companies must have been listed on the Indonesia Stock Exchange (IDX) in the period from 2018 to 2022.

#### 3.2. Variable Operationalization

The dependent variable used in this study was firm value. Several indicators adopted from Hel et al. (2021) were used to measure the value of CED to prove whether the disclosure of carbon emissions has an effect in future firm value. The formula used to measure firm value (Olayinka & Oluwamayowa, 2014):

$$\text{Tobin's Q} = \frac{\text{Total Market Value} + \text{Total Book Value of Liabilities}}{\text{Total Book Value of Assets}}$$

where total market value is the market capitalization of the company, while market capitalization is the share price multiplied by the number of shares outstanding.

CED was an independent variable which measured carbon emissions. The operational formula for this variable is as follows (He et al., 2021):

$$\text{SCORE (CED)}_j = \sum_{i=1}^8 \text{Score } (I^i_j).$$

**Table 1**

*Carbon emissions disclosure index*

Category	Indicator
<b>Carbon emissions disclosure (CED)</b>	CED-1 : Emissions reduction targets and results
	CED-2 : Energy consumption of total operations in the reporting year
	CED-3 : Carbon emissions measurement method
	CED-4 : Direct greenhouse gas emissions
	CED-5: Indirect greenhouse gas emissions of energy

This research uses panel data as a regression model. Panel data consists of a combination of time series and cross section. This study aims to examine the effect of carbon emissions disclosure on firm value in Indonesia using panel data regression. The control variables in this study were company size, profitability, leverage, company age, and number of top executives. Table 2 provides descriptions of these control variables:

**Table 2***Variable operationalization*

No	Control Variable	Description
1	Firm Size	Calculation of the natural logarithm of total assets in this study was carried out to normalize the distribution of the values of the company size Choi et al. (2013). Environmental accounting literature indicates that large companies play an important role in reducing corporate carbon emissions and in disclosure (Freldman & Jaggi, 2005).
2	Profitability	$ROA = \frac{EBIT}{TA} \times 100$ <p>where ROA is the return on assets, EBIT is earnings before interest and taxes, and TA is total assets (Choi et al., 2013; Nirelsh &amp; Vellnampy, 2014).</p>
3	Leverage	Leverage is a corporate financial ratio that compares total debt against total corporate assets (García-Telruell et al., 2009).
		$Leverage = \frac{Total\ of\ Liabilities}{Total\ of\ Asset}$
4	Firm Age	The age of the company reflects how long the company has survived. Companies that have been established for a long time have higher profitability than companies that have just been established. This is because older companies have a more stable level of sales and have established a name for themselves among society. The age of the company was calculated by subtracting the year the company was founded from 2022.
5	Number of Top Executives	Top management is the highest group of executives in the company who have the responsibility of making strategic decisions for the company. Their contributions include devising strategies, making key decisions, monitoring performance, and establishing external relationships. Top-level management is the highest position within the company. The managing director, finance director, and marketing director are some of the said executives. The number of top executives was calculated from the board structure revealed in the annual report.

## 4. Findings and Discussion

### 4.1. Findings

This section provides a statistical data description that includes the mean, standard deviation, minimum, and maximum values of all variables in this study. A total of 1,830 data from the financial reports, annual reports, and official websites of 366 Indonesian companies included in this study were observed.

**Table 3**

*Statistical data description*

<b>Var</b>	<b>N</b>	<b>Mean</b>	<b>Std. Dev</b>	<b>Min</b>	<b>Max</b>
<b>FV</b>	1.830	0.591	9.413	-233.200	10
<b>CARDIS</b>	1.830	1.730	2.076	0	5
<b>LEV</b>	1.830	1.185	2.781	-34.930	50.189
<b>PROF</b>	1.830	0.241	2.819	-11.758	61.782
<b>TMTSZ</b>	1.830	8.024	3.661	2	29
<b>AGE</b>	1.830	34.803	19.289	4	116
<b>SIZE</b>	1.830	17.267	6.649	1.853	30.412

Descriptive statistical analysis was intended to provide a statistical data description that covers the mean, standard deviation, minimum, and maximum values of all variables in this study. The variables were company value (FV), carbon emissions disclosure (CED), leverage (LEV), profitability (PROF), number of top executives (TMTSZ), company age (AGE), and company size (Size). These variables were observed for a five-year period from 2018 to 2022.

Based on table 3, the independent variable in this study, disclosure of carbon emissions, had a mean value of 1.730 and a standard deviation value of 2.076 (mean < SD). The dependent variable firm value had a mean value of 0.591 and a standard deviation value of 9.413 (mean < SD). The statistics for the five control variables are as follows: leverage had a mean value of 1.185 and standard deviation value of 2.781 (mean < SD), profitability had a mean value of 0.241 and a standard deviation value of 2.819 (mean < SD), number of top executives had a mean value of 8.024 and a standard deviation value of 3.661 (mean > SD), company age had

an average value of 34.803 and a standard deviation value of 19.289 (mean > SD), and company size had an average value of 17.267 and standard deviation value of 6.649 (mean > SD).

Mean values that were smaller than the standard deviation values for the variables leverage and profitability indicate that the data for these variables had heterogeneous distribution. It shows that the data deviation was greater and it could be concluded that the variables, leverage and profitability, have unequal distribution. This occurs because the data on the leverage and profitability variables have a large enough gap between the data. The other variables, number of top executives, company age, and company size, had mean values that were greater than the standard deviation values, suggesting that the data for these variables had homogeneous distribution. It also shows that the data deviation was smaller; it could be concluded that the variables number of top executives, company age, and company size are equally distributed. The variables have a set of data that does come from variations that are not much different.

**Table 4**

*Total carbon emissions disclosure*

Category	Indicator	Number	Percentage
Carbon Emissions Disclosure (CED)	CED-1	647	21%
	CED-2	763	25%
	CED-3	482	16%
	CED-4	623	20%
	CED-5	590	19%
<b>Total</b>		<b>3,105</b>	<b>100%</b>

The independent variable CED refers to voluntary disclosure related to the company's carbon emissions. This variable was measured using five indicators adopted from the research of Hel et al. (2021). Table 4 shows that CED-3 had the lowest percentage (16%), while the highest was obtained b CED-2 (25%).

**Table 5***Best model selection results*

F stat PLS	0.00000
F stat FEM	0.00000
F stat REM	0.00000
Chow's test on H1	<b>FEM</b>
LM test on H0	<b>REM</b>
Hausman's test	<b>REM</b>
Model selected	<b>REM</b>

Table 5 presents the regression results for the Fixed Effects Model and Random Effects Model, as well as results of best model testing by Chow's test, Hausman's test, and LM test. The Fixed Effects Model was selected once based on Chow's test results, while the Random Effects Model (REM) was selected twice based on the LM and Hausman's test results. In conclusion, the Random Effects Model (REM) was selected for the research.

**Table 6***Hypothesis test results*

Variable	Coef.	T	p > [t]
<b>Carbon emissions disclosure</b>	-0.352	-3.07	0.002
<b>Leverage</b>	-0.307	-4.31	0.000
<b>Profitability</b>	0.005	0.07	0.943
<b>Number of Top Executives</b>	0.091	0.63	0.532
<b>Firm Age</b>	-0.025	0.24	0.807
<b>Firm Size</b>	0.000	0.00	0.999
<b>C</b>	1.705	0.37	0.715

Based on table 6, the variable CED had a regression coefficient value of -0.352 and a probability level of 0.002, which was smaller than  $\alpha$  (0.05), showing that CED had a significant effect on firm value. Therefore, the hypothesis proposed in this study was accepted. This finding is in line with the research by Anggraelni (2015b), Gabrielllel and Toly (2019), Rahmanita (2020), and Zuhrufiyah and Anggraelni (2019).

The first control variable, leverage, had a regression coefficient value of -0.307 and a probability level of 0.000, which was smaller than  $\alpha$  (0.05). This shows that leverage had a significant effect on firm value. This finding supports the results of research by Gabrielllel and Toly (2019) and Rahmanita (2020). The results demonstrated the company's ability to fulfill its debt obligations with its total assets. The higher the leverage, the higher the company value; vice versa, the lower the leverage, the lower the company.

The second control variable, profitability, had a regression coefficient value of 0.005 and a probability level of 0.943, which was greater than  $\alpha$  (0.05). This value indicates that profitability had no effect on firm value. This finding does not support the results of research by Irwhantoko and Basuki (2016a) and Zuhrufiyah and Anggraelni (2019) that profitability has a significant effect on firm value.

The third control variable, number of top executives, had a regression coefficient value of 0.091 and a probability level of 0.532, which was greater than  $\alpha$  (0.05). This shows that the number of top executives had no effect on firm value. The fourth control variable, company age, had a regression coefficient value of -0.025 and a probability level of 0.807, which was greater than  $\alpha$  (0.05). This shows that company age had no effect on firm value. The last control variable, company size, had a regression coefficient value of 0.000 and a probability level of 0.999, which was greater than  $\alpha$  (0.05). This shows that company size had no effect on firm value, which is in line with the results of research by Gabrielllel and Toly (2019) and Rahmanita (2020).

#### ***4.2. Discussion***

This study aims to prove the effect of carbon emissions disclosure on firm value, with company size, profitability, leverage, company age, and number of top executives serving as control variables. The subjects in this study were companies listed on the Indonesia Stock

Exchange (IDX). A total of 1,830 data from 366 Indonesian companies during the period from 2018 to 2022 was used.

The results of this study indicate that information about carbon emissions has the ability to increase firm value. This means that the disclosure of carbon emissions made by the company can influence investors' decisions in making investment decisions. The results of this study provide evidence that CED affects firm value. A regression coefficient of -0.352 and significance probability of 0.002, which is smaller than 0.05. The disclosure of carbon emissions reflects good corporate governance and superior carbon performance that can increase firm value. Enhanced corporate environmental disclosure can benefit the firm by increasing its value through reduced cost of capital or increased cash flows or both.

Relationships with stakeholders can be maintained by delivering sustainability reports, which can also include carbon emissions disclosure, to all stakeholders. According to the stakeholder theory, investors have the right to obtain information about company activities from annual reports and sustainability reports. The main foundation of stakeholder theory is that for a company to survive, it must maintain good relationships with its key stakeholders in an appropriate manner (Rizkika Alfaiz & Aryati, 2019). It has been discovered in this study that CED has a low level of influence on firm value. The company must have a good relationship with stakeholders, one of which is by fulfilling their wants and needs because of their role in influencing the availability of resources needed for business operations (Hörisch et al., 2014).

According to the results of this research, carbon emissions and leverage affected the disclosure of carbon emissions and firm value. The positive relationship between leverage and firm value can be seen from the company's ability to repay its debts with its assets. It was found that the higher the level of leverage, the higher the company value; vice versa, the lower the level of leverage, the lower the company value. Debt policy favors firm value; in other words, the higher the debt capital structure, the higher the firm value (Sudiyatno et al., 2010). The other variables, company age, profitability, number of top executives, and company size had no effect on the disclosure of carbon emissions and firm value. In other words, company value in the case of non-financial companies in Indonesia is not influenced by company age, company size, profitability, and the number of top executives.

## 5. Conclusion

This study concludes that the firm value of non-financial companies in Indonesia is influenced by the disclosure of carbon emissions. This indicates that the disclosure of carbon emissions has a crucial role in the long-term sustainability of the company. However, the implementation of CED in companies in Indonesia is still relatively low, which is caused by the lack of awareness of companies in disclosing their carbon emissions openly through sustainability reports. The implementation of corporate sustainability, a strategy in which companies provide goods and services in an environmentally friendly manner and support their economic growth, is still relatively low in Indonesia (Laskar, 2018). Based on Law No. 40 of 2007 on Limited Liability Companies, Article 66c, companies are required to incorporate social and environmental responsibility reports in annual reports. In addition, Circular Letter of the Financial Services Authority (OJK) No. 30/SEOJK.04/2016 requires issuers or public companies to include social and environmental responsibility reports in annual reports or sustainability reports.

This study has practical implications for resolving the rampant issue of climate change through policy-making in relation to carbon emissions disclosure by the Indonesian government, keeping in mind its impact on firm value and corporate sustainability. It is expected that new policies will be able to raise Indonesian listed companies' awareness of the importance of making environmental disclosures, especially carbon emissions disclosures. Based on the results of this study, companies are advised to include the disclosure of carbon emissions in financial statements. Investors are also expected to consider the disclosure of carbon emissions made by companies in making investment decisions. Carbon emissions disclosure also has a valuable role in informing the government's law-making.

This study has limitations in terms of the carbon emissions disclosure index used. The index has not been able to describe all information that can comprehensively reflect the quality of carbon emissions disclosure by companies. It is expected that these limitations pertaining to the carbon emissions disclosure index can be addressed in future research.



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